BEYOND IVORY TOWER. NAVIGATING HIGHER EDUCATION IN THE FUTURE

Juan José Ganuza and **Antonio Cabrales** (coordinators)

FUNCAS Social and Economic Studies, 10

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Introduction

Higher education has major challenges ahead. The technological revolution could profoundly change the demand for university studies and teaching methodology; new alternative players to traditional universities could also emerge. But we've been here before, and the changes have been really small. Will this time be different?

Some indications show that it might be. Online learning and distance education have moved from a secondary alternative to an integral part of the education system. Digital platforms offer access to educational resources on an unprecedented scale, breaking down geographical and economic barriers, and democratizing knowledge. Are our educational institutions and pedagogical models ready to take full advantage of these tools?

Globalization has made the world more interconnected. Universities no longer compete only at the local or national level, but on a global stage. Students seek educational experiences that prepare them for an international job market, where cultural diversity and competition are the norm. At the same time, nativist tendencies and rejection of the international global order are everywhere. How can our universities adapt to offer relevant education not only locally, but also in a global context?

In parallel, the nature of work is changing. Automation and artificial intelligence are redefining the jobs and skills needed for the future. In an ideal world, universities should rethink their curricula to prepare for the new economy. But do we know which direction to go in? Do we need to be more technical, or will generative AI already do that? More specialized, or more generalist?

Finally, demographic trends and climate crisis portend unflattering fiscal scenarios in the coming decades. How will universities adapt if states decrease (or withdraw) from public funding of universities, which is dominant in much of the world?

In this book we want to reflect on how universities should face these challenges and also the problems they have traditionally faced such as funding and their own governance. The book is structured in four parts.

Part I addresses how internationalization and digital transformation and artificial intelligence are going to affect teaching in universities and how universities should design their educational strategies.

The first chapter by **Parama Chaudhury** and **Cloda Jenkins** looks at how universities globally, but in more detail those in the UK, have responded to the various crises since the COVID-19 pandemic and also how they are coping with technological transformation. The chapter illustrates that despite the negative effects the pandemic had on the educational community, it also brought positive changes at the organizational level such as the acceleration of the digitization of universities. The main consequence of this experience is the need for universities to design organizational systems that are capable of adapting to a changing context. It is also important for universities to generate value locally but to be able to compete and train globally. To this end, the diversity of faculties and students is fundamental.

Mariano Fernández Enguita's contribution reflects specifically on how digitalization and, in particular, artificial intelligence will change university education. To do so, he analyzes the different technological revolutions that universities have faced since the introduction of the printing press, to conclude that they have all had positive and negative aspects, but that many of them have not significantly altered how knowledge is transmitted in universities. However, artificial intelligence (AI) can have a major transformative effect on learning and teaching processes and their organizational architecture. The reason is that AI can provide the ability to personalize teaching and to do so in an integrated way.

Technological changes are challenging all university disciplines, but they are affecting the various fields of study unevenly. **Juan Luis Suárez** documents with data from Canadian universities the decline in demand for humanities studies. This diagnosis contrasts with the need for the humanities to be able to assimilate and integrate technological advances positively in our society. In the author's words, which we share, the humanities are more necessary than ever and therefore new strategies are needed. In particular, he proposes to use AI as a transforming lever for humanities studies, which should change the design of their degrees to enhance complementarity with technology.

Part II of this book is devoted to the interaction between the university, the labor market, research, and the productivity of the economy. The first chapter by **José Ignacio Conde-Ruiz, Juan José Ganuza, Manu García** and **Carlos Victoria**, begins with an analysis of the evolution of the demand for university studies in Spain over the last three decades, where important gender differences in the choice of degrees are found. The central part of the contribution focuses on the development of three indexes (RTI index, routine task intensity), artificial intelligence (AI) exposure index and software exposure index that measure the exposure of different university degrees to technological change. The indices are constructed using similar indices for the labor market that exist in the literature (which measure the possibility of replacement by technology of different occupations and also complementarity) and a database that relates university degrees to occupations. These indexes allow sorting of studies by the degree of threat or complementarity with digitization and AI, and are very informative in explaining both the employability and the salary of different studies.

Along the same lines, in the chapter by **Juan F. Jimeno** and **Ana Lamo** they point out that the impact of technological change on employment depends on the complementarity of job profiles with robotics and AI. Using European data, they analyze the impact of technological change at the beginning of the last decade and find a skill bias. The complementarity between technology and technology and labor is higher for skilled workers than for unskilled workers. Employment and wages rose more in occupations with a relatively higher proportion of young and skilled workers. Based on this result, the authors discuss what type of studies should be further invested in, in order to take advantage of the complementarities between new technologies and human capital. However, the authors caution that the emergence of generative AI with more generalist skills may be more disruptive in job substitution.

The chapter by **Aitor Lacuesta, Marta Martínez-Matute, Jorge Sainz** and **Ismael Sanz** complements the study of university demand with an analysis of changes in supply in the face of a structural change in the labor market. The authors demonstrate with data on Spain that, in line with the evidence shown in previous literature, the demand for university studies is partly determined by earnings expectations. As a reaction to the heterogeneity in future earnings of the different degrees, the cut-off grades (which are an indicator of increased demand) increased for studies with higher expected salaries, and applications to study in communities other than one's habitual residence also increased. In contrast, the supply of places in public universities did not change with respect to the expected results of each type of studies in the labor market. This potential mismatch between supply and demand is aggravated by the universities' strategy of increasing the number of courses offered without increasing the number of places in courses with excess demand.

Miguel Urquiola closes this part with a reflection on the role that university research should play in society. The chapter begins by showing historical evidence of the positive impact of university research on the development of countries. Since the data suggest these positive causal effects of research on welfare, the second part of the chapter focuses on the strategies that need to be implemented and the aspects that need to be improved to boost research within the university system: i) attracting and retaining a research talent base; ii) measuring research performance; iii) securing public funding and popular and political support, iv), creating incentives and recognition for high quality research, etc....

Part III deals with funding, equity, and diversity in the university. Undoubtedly, the future will bring financial difficulties for the state and individuals. Whether due to the passage of time of universities, or the effects of climate change or technological transformation. The university does not cease to be an expense that affects a minority of the population, which does not even have that much participation in elections. And what can we do in this context?

Stefania Paredes-Fuentes discusses the importance of embracing diversity and creating inclusive environments by breaking down the exclusive "ivory walls" of academia. The chapter, based on personal experience in UK academia and experience in promoting diversity, provides practical strategies for building inclusive academic communities. It emphasizes understanding the negative impacts of a lack of diversity, clarifies the meanings of diversity and inclusion, and suggests ways for individuals to contribute through behavior and teaching practices. While individual efforts are crucial, structural support from universities is also necessary. Having adequate resources is vital to avoid competition and tension among staff.

Antonio Cabrales, Maia Güell, Rocío Madera and **Analía Viola** argue that given the financial challenges we have mentioned, there is a need for change. Financial challenges mentioned above, funding needs to be changed. Current tuition rates, evenly distributed across income levels. To address this, the chapter advocates income-contingent loans (ICLs), which are flexible and progressive. These loans allow students to pay fees with government loans, repaid based on post-graduation income, easing the financial burden on those with lower incomes. The study uses Spain as a case study, highlighting its fiscal constraints and labor market challenges, and suggests that adopting a system similar to the UK ICL model could improve university funding, reduce regressive impacts and improve access to education.

José García Montalvo and **José Montalbán Castilla** begin by noting that, in recent years, private investment in Spanish universities has soared, with notable acquisitions such as Permira's purchase of Universidad Europea de Madrid for €770 million and CVC's acquisition of Universidad Alfonso X el Sabio for €1.1 billion. This trend contrasts sharply with the decline in enrolment at public universities over the past two decades, while enrolment at private universities has increased significantly. As a result, the percentage of students at private institutions has doubled. Despite being traditionally considered superior, public universities now struggle to compete due to regulatory restrictions, lack of flexibility and insufficient funding. In contrast to proactive measures taken by the Obama administration in the United States to increase transparency and incentivize public universities based on performance, Spain has responded by tightening regulations on private institutions. The chapter compares various models of higher education funding, emphasizing the current challenges faced by Spanish public universities in adapting to the competitive landscape.

The book closes with a couple of contributions on the crucial issue of how universities are governed. There is little point in having resources or excellent professionals if managers make disastrous decisions.

Carles Ramió points out that the effectiveness of universities depends on their ability to balance autonomy, funding, governance and the quality of teaching and research. Public and private universities have different models for achieving this balance, each with its own strengths and weaknesses. In any case, it appears that universities must adapt to the changing demands of students and society by embracing innovation in teaching and research. For example, a strong emphasis on quality teaching, combined with a commitment to research, is essential for universities to remain competitive in the global marketplace. In this context, effective governance and funding models are critical for universities to fulfil their mission and achieve their goals.

In the epilogue, **Rolf Tarrach** wonders whether it is worth continuing to write about Spanish universities given the extensive literature but gives us his view based on experience with European university systems. While Spanish universities rank well in terms of funding, important problems persist, such as misinformed comparative statistics and neglected gender disparities. He insists on key global issues, such as AI in education and academic rankings. It also stresses the critical role of primary and secondary education in shaping future university success, advocating for greater support and better compensation for teachers at these critical stages.

Madrid, October 2024

Juan José Ganuza and **Antonio Cabrales**

PART I

Challenges of University Education

GLOBAL CHALLENGES, LOCAL SOLUTIONS: THE ROLE OF UNIVERSITIES IN EDUCATION FOR THE FUTURE*

Parama CHAUDHURY
Cloda JENKINS

Abstract

Universities around the world provide a crucial space for learning and social development for a seemingly ever-growing number of students, from a wide range of backgrounds and at different stages in their life. The fundamental role of universities as the center of education, optimizing the synergies with research, remains today and into the future. What is changing is the context within which universities operate. Financial pressures, geopolitical tensions, global climate and health emergencies and superfast technological change present challenges to the delivery of high-quality university experiences in a competitive global higher education market. In parallel, the demographics of staff and student bodies are changing. The welcome (albeit all too slow) improvement in diversity and an increased focus on lifelong learning challenge the traditional model of what is taught and how it is taught. In this chapter we discuss how these challenges affect the ability of universities to deliver on their integrated research-education missions. Putting measures in place to ensure resilience to shocks and an ability to adapt with changing context can allow for universities, open to evolving, to turn the apparent challenges into opportunities for growth and improved education experiences for staff and students. Impact and continued value-added comes from being agile.

Keywords: University, education, AI, MOOC, lifelong learning, climate emergency, pandemic, fake news, diversity, inclusivity, funding.

JEL classification: I20, I23, I29.

* As befits a piece on the future of education and discussing AI, we have made use of Microsoft Copilot for our literature review alongside more common portals such as Google Scholar and EconLit.

I. DEVELOPMENTS IN HIGHER EDUCATION: SIMULTANEOUS CHALLENGES AND OPPORTUNITIES

In this chapter, we discuss the various challenges that higher education institutions –universities– have faced over the last couple of decades and which continue in various forms. We consider how universities can respond to these challenges and develop an institutional structure that is resilient to such issues. In many cases, the challenges are both a threat and an opportunity, with universities able to redefine the role of higher education in society and reaffirm their institutional value-added. Our focus is on the education remit of universities, recognizing that the challenges we discuss also impact on research funding and activity. As the world continues to change in various dimensions, universities have a chance to embrace this change and adapt to underline their role as centers of education. This will require a significant amount of strategic rethinking and detailed structural and operational work but given that universities have managed to engage in this kind of adaptation over many centuries, there is almost certainly reason to be hopeful about the future.

Many of the challenges and opportunities we discuss here are global in nature, in the sense that universities around the world are facing some version of these issues. In some cases, the solutions will need to have a global dimension as well –coordinated across countries and across international discipline networks. For example, understanding the implications of the rapid development of Artificial Intelligence (AI)– traditional and generative (Marr, 2023) –for higher education will require sharing lessons and adaptations across universities as what is feasible changes at pace. In most cases, the specifics of the solutions and exactly how the higher education sector takes advantage of the opportunities presented will have to be local in nature. Continuing with the case of AI and the role of Large Language Models (LLMs) (Ahn, 2023), the appropriate response is likely to be different depending on the existing regulatory arrangements for the university sector particularly relating to academic integrity requirements. The changing demographics of the key stakeholders within a university –staff and students– is another good example of where a common general change across countries will have different responses by country. The exact changes –more diversity across the various groups within the country, more internationalization, changing preferences for education in terms of how people access it, what subjects they want to study and when in their life they engage– will vary from country to country and by type of institution. So, the response will also need to be localized with the detailed work required to develop and deliver appropriate action reflecting the specific context.

We start by focusing on challenges external to the university. We consider both worldwide developments such as the COVID-19 pandemic and developments like education funding pressures which are largely locally defined but are being faced by many university systems around the world. The geopolitical landscape including the Russian invasion of Ukraine in 2022 and the 2023 escalation in the Israeli-Palestinian conflict, and the pandemic have also disrupted student mobility over the last few years. This of course directly affects students and universities in those areas, with examples like the Kyiv School of Economics who have been proactively fundraising and rebuilding to continue their work and contribute to the efforts of the Ukrainian government (Gregory, 2023). Geopolitical conflicts, and responses to them including sanctions and changes in migrations rules, put physical restrictions on travel and as a result dampen the growth in international student enrollment which in many countries is a key revenue source for universities, and a defining feature of their global outlook. They also restrict access to the best educators in many fields who in peaceful times would work across countries. Faced with these challenges, universities might feel compelled to adapt by, for example, enhancing online learning experiences, fostering cross-cultural collaboration, and providing flexible study options. At the very least, this places an onus on institutions to diversify income streams, optimize resource allocation, and explore innovative funding and delivery models. In many cases, this kind of rethinking of the university's role can bring wider benefits, as the modern academy (Moscardini *et al.,* 2022) responds to a world where content access is no longer restricted to a select few and content delivery is no longer the key purpose of higher education.

At the same time, increased political polarization in many countries along with the spread of misinformation and "fake news" through social media has challenged the critical thinking and rigorous academic discourse which is the raison d'etre of higher education institutions (Baines, 2022). In the US, some leading politicians have taken to imposing their ideological preferences on local universities (Contreras, 2023) while in the UK, political debate on the role of universities, alongside legislation for free speech, has seen tightening of regulatory structures in ways which could be conceived as limiting the role of universities in national discourse (Beech, 2022). While much of the misinformation onslaught manifests as a challenge, it can also provide universities with an opportunity to redefine their value-added and play a crucial role in promoting media literacy, evidence-based reasoning, and respectful dialogue. More generally, they can foster open-mindedness and a spirit of scientific skepticism and inquiry and equip students with tools to navigate complex information landscapes. They can also lead the conversation on complex issues in civil society by making their research outputs, or versions of them, accessible to wider audiences and teaching and engaging directly with the public through media and outreach. This is core to the remit of knowledge exchange of a university, taking the research and education remits to a wider group.

Alongside these external changes, within the university, student and staff cohorts have become increasingly diverse with people from various backgrounds, cultures, and abilities entering the higher education sector in different roles (Wilson *et al.,* 2022). The value of the diversity is recognized but there is work to be done to ensure that interactions amongst individuals from different backgrounds happens in a way that unleashes the benefits of different ways of thinking and different lived experiences (Carey, 2023). Universities are increasingly working out how best to create inclusive environments that address cultural biases and provide equitable opportunities for all. In many countries, there are stricter statutory requirements which mandate accessible facilities, digital content, and support services for students and staff with disabilities. These imply an obligation for universities to invest in accessible infrastructure, assistive technologies, and training for faculty and staff. In parallel to these legal requirements, institutions face a growing push from their stakeholders and society at large to actively combat discrimination, promote social justice, and ensure equal access to education. This involves addressing systemic inequalities, fostering dialogue on race, ethnicity, gender and other protected characteristics. Yet again, these challenges present opportunities. Universities can play a leading role in helping society understand and define what inclusion means, starting with their own policies and sharing their research in this area in the spirit of the knowledge exchange role (Koutsouris, 2022). The ongoing digital transformation of the world around us provides universities with a chance to leverage technology for blended education delivery, personalized learning, virtual collaboration, and data-driven decision-making which can enhance educational outcomes for all students (Alamri *et al.,* 2021 and Liu *et al.,* 2017). Lifelong learning programs can cater to diverse learners, upskilling professionals, and promoting continuous education beyond traditional degrees. This kind of expansion can in turn help universities address their financial pressures by expanding their consumer base. Finally, universities can drive research and policy making on pressing global issues, such as climate change, public health, and social justice by extending the focus on interdisciplinarity into their education provision. Collaborations across discipline and geographic borders can lead to breakthroughs affecting education as well as research.

Whilst we highlight potential action that universities can take to adapt in the face of the challenges discussed it is important to emphasize that this is not easy or straight-forward. Many of the challenges discussed in this chapter are extensive and university staff and leaders can often feel overwhelmed by them. The drive for constant change, at the very least, is tiring, and at worst, can mean that business as usual is impossible. Investment is needed for any change, in physical and human capacity, but having a vision and stakeholder buy-in to it is equally important (Kotter, 2012). For progress to be made adapting to the challenges, university leaders need to bring their existing and potential workforces along with them while retaining civil society's trust in what they do as educators. It is important to keep in mind at times like this, that universities have continued to exist, albeit in changing form, over a long history of external and internal challenges. With this word of caution about the difficulty of universities transforming in mind, we proceed in Section II to discuss the external changes that universities face and how they can respond to them. We examine financing and political challenges and AI and other technology-related challenges. In Section III we turn our attention to internal changes linked to the diversity of student and staff cohorts. We present our conclusions in Section IV.

II. HOW CAN UNIVERSITIES RESPOND TO EXTERNAL SHOCKS?

We start by looking at how external (global and local) challenges have affected universities in the recent past and how they might respond to these. Since the turn of the 21st century, alongside the Great Recession, the two biggest external shocks to the traditional university system have been the COVID-19 pandemic where local lockdowns and global travel restrictions shone a light on the centrality of in-person teaching and learning in most universities' activities, and the advent of increasingly sophisticated technologies that directly impact education provision. Both can be viewed as challenges and as opportunities. The pandemic brought to light the best practice in online asynchronous and synchronous teaching and learning which many universities have been developing for years, even while classrooms remained empty, and students were increasingly unhappy at not being able to enjoy the traditional university life. The growth of Massive Open Online Courses (MOOCs) and the rapid development of Generative Artificial Intelligence (Gen AI) can provide stiff competition to university education models, but they can also be used to democratize education and expand a university's reach.

Other external changes are unambiguous challenges. In the UK for example, funding for higher education has dried up at a time when government policy changes have made the revenue stream from international student demand more volatile. In the US, the cost of university to students has been soaring for many years, and the student loan system has created serious debt issues for many individuals. Meanwhile, the increased polarization of public debate and politics has created a difficult atmosphere for free speech and vigorous debate, which lie at the core of a university's mission. In this section, we discuss these changes that originate outside of the university sector but impact directly on it and indeed can be impacted by research and education in universities. We propose ways in which universities can respond to the resulting challenges and where possible, take advantage of the opportunities presented by these developments.

1. Financial Sustainability

As Brown and Hoxby (2014) show, the Global Financial Crisis (GFC) and the consequent Great Recession led to significant strain on American universities' finances through reduced endowment returns, decreased charitable giving and in the case of public institutions, tighter government budgets. The latter was also a key development in the UK and EU, where most universities are publicly funded, and the recession led to austerity measures of varying severity.

Early in 2024, the lobby group Universities UK published a report on the financial sustainability of the UK higher education system, prepared by the consultancy firm, PwC, which found that funding per student at UK universities was at its lowest level since the turn of the century (Kett and Ashford, 2024). The restriction in government grant funding since the Great Recession and the subsequent austerity drive, coincided with a period where research income options were increasingly competitive. Tuition fee income needed to fill a large and growing funding gap. In the UK, with a cap on nominal fees charged to "home" (resident in the UK) undergraduates, universities have had to rely more heavily than before on fee income from overseas students and those in postgraduate taught degrees. A 2020 report from the European Universities Association (Estermann *et al.,* 2020) finds that while only a few European countries cut higher education funding immediately after the GFC, by 2012, 14 out of the 24 university systems studies had done so. Similar funding constraints prevail in the US as well, at least outside of the elite private universities (Oliff, 2015).

Fee income is unpredictable because of changes in the level and nature of demand for universities' traditional offering –undergraduate and postgraduate taught degrees. Demand is correlated with demographic changes, international mobility of students and labour market changes. Population growth has led in some countries to a rise in demand for "first" degrees as discussed in Section III.1, as well as to a growth in the enrollment in postgraduate degrees (House, 2020). This has, and will continue to be, tempered in some countries by reductions in birth rates and aging populations. The demographic changes leading to the rise in undergraduate enrollment are likely to stabilize in the next decade or so (Bekhradnia and Beech, 2018). There is also uncertainty and fluctuations in the number of students moving across countries to study, with political, policy and natural factors (such as a pandemic) changing the ease with which people can migrate for education. In the UK, for example, the growth in postgraduate enrollment seems to have levelled off with Brexit and changes in immigration rules. Unless participation rates in higher education increase, these trends in student numbers and hence tuition fee income imply additional pressures on university finances.

A potential mitigating factor could be increased employer demand for university degrees – if more jobs require such degrees, and if those already with a graduate requirement now require master's degrees, for example, then potential students might be more inclined to go to university and to stay in university for longer. The evidence here is mixed. In some countries and some sectors, high supply of well-qualified graduates with bachelor's degrees has led to employers putting more emphasis on postgraduate qualifications as a selection mechanism. For example, Modestino *et al.* (2019) find that US employers increased the skill requirements for their job postings during a period where there was a glut of graduate applicants. Degrees that help graduates develop skills that employers are looking for, through research-based education and experiential teaching experience, could be in higher demand. The increased focus on transferable skills does mean that there is less focus on the subject that a graduate has studied and increasing number of employers not stating a required degree class that they are looking for (Forsdick, 2023). English, engineering, economics and philosophy graduates with different level of qualification are all eligible to apply for the same jobs. On the other hand, there is growing recognition that employees may not always need a degree qualification. There are concerns about the trends of overqualification in "non-graduate" occupations, such as security guard, care worker and waitstaff (CIPD, 2022) and evidence on firms moving away from undergraduate degree requirements (Fuller *et al.,* 2022; Intelligent, 2023; Hays, 2024).

There may be a "hollowing-out" of the graduate labour market (Xu, 2023), with a relatively greater demand for postgraduate degrees compared to undergraduate degrees in some sectors and countries and less demand for degree qualifications in other sectors. Where employers are not requiring a degree, they will be developing staff hired from high school through a mix of on-the-job training and degree-style learning opportunities through a career rather than before. This implies a very different type of provision for universities with a higher proportion of older and more qualified students and a parallel demand for shorter experiences, with university qualification status, from professional learners. This can be an opportunity, especially if postgraduate degrees and lifelong learning courses can be more profitable for universities, but needs careful planning given the difference between the provisions in terms of the kind of education and student experience as well as the characteristics of the student body.

In such an uncertain situation, and without much respite in sight, universities have of necessity had to look at alternative revenue models. The income from teaching is needed to meet the rising costs of education provision and in many universities in the US, UK and the EU to cross-subsidize research. Thus, the need to think creatively about university finances is doubly important. Hoxby (2014) and Brown and Tiu (2014) focus on American universities' endowment management and asset allocation models. For universities without significant endowments and limited philanthropic scope, the 2024 PwC report suggests corporate partnerships to provide students with valuable opportunities they can leverage into the workforce, while at the same time providing alternative income streams. Finally, extending the education provision beyond traditional university students by providing online and hybrid short courses with or without accreditation may be a profitable way for universities to diversify their finances. For both this initiative and for streamlining administrative and other costs, AI and other technological advances discussed in Section II can help.

2. Polarization of Political Discourse in a World of Fake News and Misinformation

In addition to the changes in the financial security of universities, or perhaps related to them, the political landscape in many countries has changed since the early years of the 21st century. There has been more polarization and the growing importance of conservative or right-wing views, some of which strike at the very heart of a university's mission.

Even before Donald Trump's victory in the 2016 US Presidential election and the EU referendum in the UK in the same year, issues around propaganda, the tone of political discourse and protected speech have been contentious. Universities often define themselves as centers for intellectual discourse, where diverse perspectives intersect. They play a pivotal role in fostering an environment conducive to robust debate, critical thinking, and the exchange of ideas. By upholding academic freedom, universities empower students and faculty to express their views openly, even when those views challenge prevailing norms. However, recent debates around "no platforming" and "safe spaces" have raised concerns about the delicate balance between free speech and safeguarding marginalized voices (Malcolm, 2020). The challenge for universities is to find the balance between protecting freedom of expression whilst ensuring respectful discussion does not cause harm (Macgregor, 2020; Kings Policy Institute, 2022; Bacevic, 2024).

Universities can also be battlegrounds for what is often referred to as "culture wars." These conflicts arise from differing ideologies, values, and worldviews. Given that universities comprise a somewhat self-selected group of people who are likely to hold strong views and be able to argue their case, this is not at all surprising. As educational institutions, universities have an obligation to model and facilitate respectful dialogue, encouraging students and staff to engage with diverse perspectives. By promoting cultural awareness and knowledge of historical context, universities can foster understanding and bridge ideological divides or at very least, promote an environment of "disagreeing well" (Spence, 2023). This is essentially what academic do in their research and their teaching, facilitating and contributing to discussions on contentious issues with the focus on critical analysis rather than dogmatism (Revers and Traunmuller, 2020).

The changes in the political landscape have happened alongside a significant shift in how people access information online and resulting concerns about misinformation and fake news. For example, in the UK 71% of 16- to 24-year-olds access their news via social media and they are most likely to read the news items that are being read by others (Ofcom, 2024). As the amount of information on the internet has grown, and social media sites present news in bite sized chunks driven by algorithms and limited fact checking, trust in democratic institutions and experts has fallen (Baines, 2022). In this information landscape universities are under increasing pressures to justify their role. Through their education provision, universities can also help by contributing significantly to data and media literacy and critical analysis. Using rigorous research- and evidence-based teaching, they can equip students with the tools to discern reliable information from "fake news". By emphasizing critical thinking, fact-checking, and source evaluation, universities can counter the proliferation of disinformation and thereby provide a valuable contribution to democratic societies where credible, high-quality information plays a big role. Building digital literacy, ethics and communication skills into programs can also help students to responsibly navigate the information landscape.

More broadly, universities can play a crucial role in nurturing informed citizens who can navigate complex political and societal challenges. By nurturing intellectual curiosity and a healthy level of skepticism, promoting rigorous research, and fostering respectful dialogue, they contribute significantly to addressing free speech concerns, combating fake news, and navigating culture wars. These skills and competencies may also be the key value-added in a world increasingly dominated by AI.

3. Pandemic, Climate and Other Extreme Disruptors

Amid these economic and political challenges, the worsening climate crisis and the more recent COVID-19 pandemic disruptions have meant among other things, that the essentially global nature of many of the world's top universities has come under scrutiny. While in many countries, universities are at the forefront of the response to these major challenges with their research, their education provision has been put to the test.

The COVID-19 pandemic provided the latest example of how easily the status quo of traditional university education provision can be disrupted. At the most basic level, university education moved away from on-campus provision to online provision and slowly to more hybrid or blended models, as happened with primary and secondary education in many countries. As countries around the world closed their borders, students scrambled to get home in the middle of teaching with no clear idea of when they would be able to return or what would happen to their classes and assessments in the interim. While these changes were forced upon universities in an emergency, as recent research has found, there are several lessons from this experience which can be beneficial for universities in the long run (Champagne and Granja, 2021).

The pandemic prevented many students from travelling to their university while environmental concerns have led to less enthusiasm for the long-haul flights which have traditionally carried international students to the leading universities in Australia, Canada, the UK, the US and some European countries. At the same time, many universities are having to depend on overseas student fees for their financial sustenance. These revenue sources are also particularly susceptible to global disruptions as well as to change in perceptions among potential students. As table 1 shows for many countries a high proportion of their student base are international (from another country). A disruption to the students' ability to, or interest in, travelling overseas to study has a significant

TABLE 1

SHARE OF INTERNATIONAL STUDENTS IN TERTIARY EDUCATION IN 2021

Country	%	*Country*	%	*Country*	%	*Country*	%
Luxembourg	49	New Zealand	12	**OECD – Europe**	8	Korea	4
Australia	22	Portugal	12	Finland	8	Spain	4
United Kingdom	20	Estonia	12	Iceland	8	Italy	3
Austria	19	Germany	11	Lithuania	7	Israel	3
Switzerland	18	Slovak Republic	11	Sweden	7	Greece	3
Canada	17	Denmark	10	**OECD – Total**	6	Türkiye	3
Czechia	16	Belgium	10	Japan	6	Chile	1
Netherlands	15	Ireland	9	Poland	5	Mexico	1
Hungary	14	Slovenia	9	United States	5	Colombia	0
Latvia	13	France	9	Norway	4		

Source: Share of international students enrolled by field of education, accessed March 23rd 2024 (OECD, 2024): https://www.oecd-ilibrary.org/education/data/education-at-a-glance/share-of-international-students-enrolled-by-field-of-education_e86f4692-en impact on their financial resources. In the UK, where student migration reached an all-time high in 2022 (Cuibus and Walsh, 2024), a third of higher education providers saw a sharp fall in the growth of non-EU overseas applications in 2023 (FT, 2023). In both the US and the UK, political developments including the rise of the right wing and exclusionary politics and Brexit and its fallout (Tournier-Sol, 2021; Moreau, 2016), respectively have led to a distinct change in student perception of the attractiveness of moving to these countries, despite their universities continuing to be recognized as world-leading academic institutions.

The application of these lessons to other disruptions which might not be widespread is obvious. For example, at any point in time geopolitical disturbances or climate change related disruptions in particular parts of the world might mean that students in those areas cannot attend university in person, constrained in a similar way to what happened with lockdown measures in the pandemic. Whilst the crisis may not be global, the impacts in particular areas can be similar and significant. There is value in learning how to adapt to the risks by developing a plan for online provision which is roughly equivalent to the in-person provision, and to plan provision for the specific challenges of online provision including digital poverty and social isolation and its effects on mental health. This is likely to bring broader benefits for other groups as well. For example, students who have caring responsibilities or health issues might benefit from such flexible provision, as explained further in Section III. Universities will need to continue to rethink how they can bring education to those who are unable to travel, at a particular point in time or on a more permanent basis, making best us of the available technologies. Changing the nature of where people are taught and how through technologies does challenge the traditional university model, however.

4. The Growth of Massive Open Online Courses

In addition to their core education provision, universities are increasingly having to navigate the uncharted territories carved out by the spread of free online content such as MOOCs, Gen AI and other emerging technologies. This is nothing new –the first calculators, computers and other educational technologies have also required universities to rethink their education provision and processes. With the rise of Gen AI in the form of ChatGPT and similar technologies and the earlier development of high-quality content on portals such as Coursera, universities are having to question and consider their role as education providers. We explore here, and in sub-section 5, how institutions can both address the specific issues surrounding the value-added of academic staff in teaching and learning design thrown up by new technologies as well as embrace the possibilities that these technologies bring in terms of improving core education processes.

Coursera and EdX, two of the biggest providers of MOOCs were founded in 2011 (Ng and Widom). Ten years earlier, however, MIT launched its Open Courseware initiative which provided the course content for most of its undergraduate and graduate courses online for free (MIT Open Learning, 2021). Despite this, the demand for a traditional university education has shown no signs of abating, boosted by demographic changes as well as the perceived benefits of a college degree in challenging times for the global economy. In the UK, despite a period of slow economic growth following the GFC, Brexit and the COVID-19 pandemic, enrollment in both undergraduate and postgraduate degree programs has continued to grow (HESA, 2022). This points to the fact that "going to university" is about much more than content and so even when content from the world's top universities is freely available online, students seek out the full experience of being at university. This in turn means that universities need to prioritize student experience, whereas in the past they may have focused more on education as knowledge transmission. Student experience is of course not just about extracurriculars or social activities. A student's educational experience –the way teaching and learning is shaped inside and outside the classroom– along with peer interactions and network building can make the in–person university experience a valuable complement to the content provided. But to ensure high quality student experience, universities first need to understand who their student body is, and their needs, preferences, challenges and motivations. Section III of this chapter focuses on this issue.

Going forward, the availability of MOOCs and similar online learning will continue to broaden access to higher education which can be a blessing in disguise for universities. On the one hand, creating and selling university-designed and delivered MOOCs is an alternative revenue source at a time when, as discussed in sub-section 1 of this Section, public funding may be restricted (Morris *et al.,* 2020). The opportunities to sell online courses, rather than give them away for free, is helped by employers becoming more aware of and valuing credentials issued by online portals (Horton, 2020). This may seem at first like a challenge to the demand for traditional university education but as much of this provision is developed by universities themselves, they can use their reputation to develop this funding source. On the other hand, broadening access to higher education can extend universities' traditional "consumer base". More and more people can get a low-stakes taste of the kind of learning universities excel at through these online portals, and when convinced of the value, and when the time is right for them, they may be more likely to commit to the longer and in-person degree format. In other words, the rise of MOOCs may help broaden the revenue base for universities even vis-à-vis their traditional provision.

One key difference between traditional university programs and MOOCs are in terms of completion rates. MOOCs often have completion rates in single digits (Duncan *et al.,* 2022) though there is quite a lot of variation across individual courses. This creates an interesting situation for universities. On the one hand, this highlights the unique value-added of a standard university educational experience. On the other hand, if universities intend to expand their provision into the MOOC space, this finding suggests that they will need to make significant effort to modify their current provision. More generally, given the essentially learner-centred approach of MOOCs in contrast to more instructor-centred approaches in in-person university settings, development of MOOC activity requires additional resources invested in course design. A recent study looking at a British and a Spanish university reiterates this point (Leon-Urrutia *et al.,* 2018). The courses delivered on campus will need to be redesigned for MOOC delivery, but putting in this effort and investment will increase returns as the learners are more likely to succeed in completing and paying for the full experience.

5. Gen AI and Education

The rise of Gen AI and, LLMs are possibly the biggest technological development in the higher education sphere since MOOCs and arguably have the potential to have a much bigger impact (Milano *et al.,* 2023). At the very least, AI can analyze vast amounts of data to identify trends in student performance, enabling educators to tailor curricula to meet individual learning needs. Personalized learning experiences, powered by AI algorithms, can adapt to students' pace, learning approach, and preferences, fostering a more engaging and effective educational environment. As we discuss in Section III there is an increased need for such an approach due to changes in the student body.

In this section we focus on how Gen AI might affect instructors and university personnel, looking at both the challenges and the opportunities (Gan *et al.,* 2023). The most obvious effect is probably in terms of how we educate and how and what we assess. Education models focused on students learning facts (content-focused) and reproducing them as assessment of learning are likely to be made obsolete by the rise of Gen AI. At the same time, the ability to curate, evaluate and apply content is likely to become more valuable than ever. This directly affects assessment design –how can we tell what a student knows or is able to do (Perkins, 2023)? On the one hand, there can be a temptation to make all assessment closed book and in-person, so that there can be certainty that what the student produces is their own work. However, this form of assessment may not appropriately measure how well students have developed evaluation skills, and indeed have mastered the skills needed to use AI tools effectively. Instructors face a challenge to find assessment formats, and teaching strategies that prepare students for those assessments and life after university, that are authentic for a GenAI world (McArthur, 2023). Those that design institutional and even national regulations on academic integrity will also need to reassess how to protect the value of a degree without limiting the scope for students and lecturers to embrace AI tools where the gains clearly outweigh the downsides.

Gen AI technologies can be used to ease some of the costs of designing and developing content for teaching and assessing and more broadly delivering an appropriately supportive student experience (Aldawan and Alsaeed, 2020). This kind of support can range from help with producing lecture notes and slides, to writing assessments and to a certain extent, marking and feedback though this functionality is probably less developed than others. While early LLMs like ChatGPT 3.0 had clear limitations, others such as Microsoft Copilot and Google Bard and even later versions of ChatGPT are more able, for example, to extract reliable information. Study support is another area in which AI can help –there is already limited evidence of chatbots used as "study buddies" or tutors (Labadze *et al.,* 2023) which can provide individualized and real-time assistance to students, thereby relieving instructors from answering similar questions multiple times and focusing instead on other areas which need specialized and human attention.

While the potential benefits of AI in higher education are immense and some of these can help to address the many challenges facing universities discussed in the previous section, there are significant ethical considerations involved in the wider adoption of these technologies. Responsible innovation implies safeguarding against biases in AI algorithms, protecting data privacy, and ensuring equal access to educational opportunities (Slimo and Carballido, 2023). Beyond the legal protections, transparency in AI decision-making is crucial. Students and educators alike will need to understand how AI influences assessments, grading, and learning experiences. Institutions must establish robust ethical guidelines for the use of technology, emphasizing accountability and fairness in all AI applications. Finally, as universities become data-driven entities, the security and privacy of student and faculty information are key areas where universities will need to review and strengthen their policies (Huang, 2023). Strict protocols for data protection will need to be in place, ensuring that the benefits of technological advancements do not compromise the confidentiality and integrity of sensitive information.

III. HOW CAN UNIVERSITIES RESPOND TO THE CHANGING NATURE OF THEIR STUDENT AND STAFF POPULATION?

While external changes and shocks are a key element that universities will continue having to respond to in the coming years, the change in the characteristics of their main stakeholders, students and academics is at least as big a challenge. The people working in and learning in universities have become more diverse and their preferences over work and study patterns have changed. Over the last few decades, higher education has generally seen an expansion all over the world with a doubling between 2000 and 2020 and participation rate of 40% in 2020 (UNESCO, 2022). A larger proportion of the population is going to university and many more are continuing to postgraduate study. At the same time, the demographic profile of the student body is changing, with for example an increase in the proportion of females studying and a tripling of the number of students studying outside their home country (UNESCO, 2022). A combination of inclusion policies and natural demographic change has meant increased diversity on the staff front too, although it still does not match the diversity amongst student populations.

While the increased demand for higher education has meant larger student enrollment in many countries around the world, in the US and the UK at least, there has also been a growing trend towards precarious contracts for staff (Wolf and Jenkins, 2021). Parallel to this, recruiting and retaining academic staff who teach has also become a challenge in many countries (Lord, 2022). European universities tend to have very different institutional structures, but here too, the literature shows for example, issues around workload and job satisfaction among Spanish academics following on from changes to the governance and regulation to public universities (Olaskoaga-Larrauri *et al.,* 2018). In this section, we consider the details of the changes in the staff and student bodies, evaluate the implications of these changes for higher education and the structure of the academy, and discuss how universities can respond to the resulting challenges and opportunities.

1. Changes in Staff and Student Characteristics

In the UK, the number of students aged 18 to 24 in full-time education has almost doubled between 1992 when a major drive to expand higher education started, resulting in approximately 1 in 3 people in this age range being in full time education in 2016 (ONS, 2016). Female students comprised the majority at both the undergraduate and postgraduate population in 2020-2021, with increased representation in the undergraduate student population from students from disadvantaged backgrounds and areas, of non-white ethnicity, mature students and those with disabilities (OfS, 2022). The US saw a slightly different pattern, with undergraduate enrollment as a proportion of the population falling between 2010 and 2021 after a steady rise since the second World War, and at a time when tuition fees have risen steadily in real terms (Irwin *et al.,* 2023). Post-baccalaureate enrollment, however, has increased. The demographic profile of students in US higher education institutions has also changed dramatically over the last few decades, with an increase in diversity in ethnicity, gender, socioeconomic status, age and disability status (Cheeseman Day, 2020). In both countries, more recently, the COVID-19 pandemic directly affected both attainment and mental health status of higher education students significantly and changed the perception of the value of in-person versus online or hybrid education (ONS, 2020). In addition, school level attainment effects imply long run effects for universities as students may arrive with a different level of maturity or knowledge due to disruptions in their schooling at a younger age.

In addition to these demographic changes, the way in which students engage with university learning has changed. For example, –not surprisingly given the recent cost of living crisis– in many countries, a higher proportion of students are working whilst they study (Remenick and Bergman, 2020). This may have implications for the student support universities provide, for example in terms of providing employment opportunities within the university. There is also increased competition for student time, from social media and extracurricular activities to pressure to succeed in internships, which overall reduces the amount of time spent on study (Barton, 2024). These competing pressures also mean that students have more choices to make about when to study, including when to attend live teaching sessions. Spending time on your degree during 'normal' working hours is no longer the default. All this might mean that a more flexible learning environment is needed, to facilitate those considering work today as well as their future careers needs. This can also benefit other groups of students, for example, those who have caring responsibilities, commuting students or those with specific disabilities.

Just as the student body has changed, so has the staff profile. The pace of change is slow but data from the Higher Education Statistical Authority in the UK shows that the proportion of females working in universities has increased from 46% to 48% between 2017/2018 and 2021/2022. During the same period, the proportion of white staff fell from 77% to 72% and the proportion of staff with a declared disability increased from 4% to 6% (HESA, 2023). In the US there has also been an increase in the proportion of females working in universities and an increase in the proportion of people of color, although there is significant variation by job role and position (ACE, 2019). There is less inclusivity when it comes to the pipeline moving upwards In the university rankings, with most academics in top universities still coming from a small set of other top universities (Wapman *et al.,* 2022). In the UK, there is also a rise in temporary contracts (HESA, 2023) and a casualization of the workforce which in recent years has led to significant industrial action.

Growing dependence on such a contingent faculty body is also evident in the US (Colby, 2023).

2. Implications of the Changes in University Staff and Student Bodies

The diversification of the student and staff body has meant that universities have had to think about how to support different kinds of needs while also reaping the benefits of a workforce that better represents the general population. Equity and inclusion have become non-negotiable considerations for universities. From the legal requirements to consider protected characteristics and to find reasonable adjustments for students and staff with disabilities, to good practice to build a harmonious working and learning environment in a multicultural setting, universities are having to think seriously about elements of their core activities which they may have neglected before. For example, the fundamental nature of education has come under pressure. The increased diversity of the student body, and changes in how they have experienced education since the pandemic, has led to increased demand for inclusive and flexible education. This can include requests for live teaching sessions to be delivered in hybrid mode or at the very least recorded, pushback from students when the timetable is not working for them and increased focus on having spaced out and flexible assessment deadlines.

These requests for a change in what is taught and how it is taught fall to staff to deliver, both in the classroom and in the wider student experience. Universities need to equip their staff with the ability to respond to these challenges, while at the same time, providing a supportive environment for them. A more diverse workforce is likely to help in supporting a more diverse student body, but if the representation in the former lags, universities will face a challenge in providing an appropriate learning environment. Amongst academics, including in leadership positions, there is still a high proportion of white males which means the diversity of thinking needed to consider the changing demands of students is not always evident. As a result, a more conscious effort has been made in many institutions to design actively inclusive strategies for the workforce and for the design and delivery of teaching. This often includes policies on recruiting, training and hiring practices to ensure that institutions and their students can benefit adequately from a diverse global talent pool. The increase in non-permanent and part-time contractors, particularly in the case of instructors, also requires consideration of how best to recruit, train and retain staff and how to ensure sharing of lessons learnt across faculty from one year to the next. In some countries, such as the UK, the expectation for a greater focus on equity and inclusive practice is also reflected in national regulations providing an extra incentive for universities to act.

3. Flexible Personalized Learning Models for Student Success

The changes in student behaviors and the diversity of the cohort, and wider demands on their time alongside studying, suggest that a more flexible approach to teaching and learning may be needed at least for some of the student body. A blended approach, with a mix of asynchronous materials a student covers in their own time and timetabled live sessions that are recorded, is a common middle ground that has emerged since the pandemic. Such a flexible approach needs to be designed with care, to ensure the maximum benefit whilst managing potential downsides.

One of the lessons emerging from the COVID-19 pandemic experience is that high quality blended learning provision is possible but requires a great deal of resources (Herpich, 2022). This is true both in terms of technical systems and in terms of staff training and support. It also requires managing student expectations around what a university education is and broadening the definition of this beyond contact hours. In addition, the experience of the pandemic has highlighted issues such as digital poverty (Times Higher Education, 2021) which imply that while universities can indeed harness technology to reduce inequalities in access to education, there are other reasons why these inequalities might persist. For universities in cities and other areas with a premium on physical space, this also means reimagining the use of this space to maximize impact. Whereas a lecture-based model of education focused on content delivery might have been the norm, universities are able to think more carefully for example about what kinds of content delivery can occur online and what parts of the learning experience inherently require in-person interaction. Such systemic reviews can in turn help universities to clarify their raison d'etre in a world of MOOCs as discussed earlier.

There is a lot that can be done with data to personalize the flexible learning journey for students. Given the extent to which Virtual Learning Environments or Learning Management Systems (VLEs or LMSs) are ubiquitous across higher education, universities are already using data analytics through these and other portals to individualize the learning experience (Krawitz *et al.,* 2018). This may range from using data mining to identify and target students at risk of dropping out (Alyahan and Dustegor, 2020) and supporting distance learning programs (Mattingly *et al.,* 2012) to tracking engagement of different groups of students (Foster and Siddle, 2019). Like any prediction model, the efficacy of this process depends on the data available on which to train the model, but as more and more universities are using VLEs extensively in their core education provision, the quality and amount of this data will make these predictions better and easier to interpret and use (Francis *et al.,* 2019). While there are always concerns about data privacy and the ethics of such data use, there is an increasing feeling that such an approach is required with appropriate safeguards to move from VLEs being largely a content repository as they often were prior to the pandemic, to becoming more of an "immersive and social learning environment" within a "structured ecosystem" (Brown and Foster, 2023).

Even where students are not driven by their personal circumstances or global events like the pandemic, universities may be faced with a demand for more personalized and customizable learning models. One such situation is the development of the Lifelong Learning Entitlement (DfE, 2023) in the UK, which is the government's attempt to enable learners to accumulate credits towards a qualification in discrete units rather than having to commit to a multi-year degree. The stated motivation for the introduction of this policy is to help broaden access to higher education and to make it easier for the workforce to upskill at any point in their lives. While the take-up of this offer is yet to be seen, the rise in employers accepting MOOC credentials suggests that this kind of provision may be in demand. One obvious change that universities will need to make to facilitate the Lifelong Learning Entitlement is more modularization so that learners can take classes at different times according to their preferences and needs. While this may not be a major change for many universities, it is likely that such learners will be less likely to be attending university in person for extended periods, and therefore will need a blended provision.

The demand for more modular learning is likely to also lead to a demand for interdisciplinary provision, which many universities may not have focused on in the past. This might in part be driven by learner interest and a move towards a learner-defined education path, compared to the traditional degrees based on core disciplines and defined by universities. This is of course a natural next step from the classic liberal arts model popular in American universities but is not quite the same thing. The demand for this kind of education may also be driven by employers looking for potential hires with skills spanning disciplines (Becerra, 2021). More generally, as interdisciplinary research especially focused on global problems such as climate change, geopolitics and pandemics has become more popular, interdisciplinary education seems to be the natural next step.

4. Using Technology and Training to Meet Wider Needs of Staff and Students

No matter how the education delivery model develops, universities will need to pay more attention to the support provided to students to enable them to learn how to learn in a resilient and adaptable way whatever their context. While the 2021 UK National Student Survey (OfS, 2021) brief on student experience during the pandemic finds that undergraduate students in the country generally found their universities' response to the teaching and assessment challenges at this time satisfactory, they had less favorable impressions of the mental health and other student support provisions. Not surprisingly, staff training in disability awareness (Morina *et al.,* 2020), inclusive pedagogies, and student support more generally has become an important part of most universities' provision to meet their legal obligations as well as to ensure that their offering is appropriate to facilitate student success. While there has been successful ramping up of support in many universities around the world, the growing demand for higher education itself implies that these efforts may need to increase over time. At the same time, universities and their staff will need to understand the nuances of specific types of support that are most impactful for specific groups of students (Barnes *et al.,* 2024).

One of the potential benefits of the developments in learning technology including Gen AI as discussed earlier is that it allows universities to use data on learner behavior to identify the need for intervention to improve student outcomes and to tailor those interventions. Such use of "learning analytics" can be a first step to understand both the issues facing individual students and to equip staff with a better understanding of individual circumstances even within large student cohorts so that they can develop appropriate support. Similar considerations abound for staff as well, especially given the additional workload and skill development associated with making changes to meet the needs of the diverse student body. As the nature of the university's mission in higher education has and continues to evolve, academics have needed to change too. They are moving from being largely focused on disciplinary knowledge development and dissemination to having to be competent in a range of other student experience related skills (Whitchurch, 2023). While universities in many countries also have a legal obligation to provide support for staff mental health, there is a risk that this provision constantly falls short as staff are asked to do more and more to support students who may also be needing more and more (Jayman *et al.,* 2022). This cycle of increasing pressure on scarce resources, to deliver on the education mission for a diverse student population, needs to be managed through training and support provision for staff. Of course, increased investment in human and physical capital will help increase the productivity of the resource as well.

IV. CONCLUSION

Universities worldwide are navigating a complex landscape of challenges that impact their education provision. These challenges span global and local contexts, and their implications are profound. As we look ahead, it is important for universities to proactively respond to these challenges and embrace them as opportunities for growth and innovation. In this chapter, we have considered a range of different changes that directly or indirectly affect universities and developed potential responses which may end up transforming these institutions for the better.

The COVID-19 pandemic has disrupted traditional education models, forcing universities to rapidly adapt to remote and hybrid learning. However, it also helped to surface good practice existing within universities and the need to continue investing in robust digital infrastructure, faculty training, and student support to ensure resilient education delivery. Concurrently, geopolitical tensions and shifting alliances impact international collaborations and student mobility. Many universities have the networks to diversify partnerships, foster cross-cultural understanding, and promote global citizenship and move beyond these challenges. Finally, rapid technological advancements, including MOOCs and AI, are reshaping education. Universities must integrate these tools thoughtfully, enhancing personalized learning experiences and improving administrative efficiency, and where possible, seize the opportunity to both cut costs and develop new revenue streams using these technologies.

Universities are at their heart a function of their people, and here too, there has been significant change. Student and staff demographics are evolving faster than ever. Universities will need to address the needs of non-traditional and lifelong learners, international students, and a diverse staff cohort. Cultivating inclusive environments and tailoring support services are critical. Increasingly, learners are also demanding flexibility in the education offering, to fit around their lives and their skill requirements. In order to address these, universities will need to explore competency-based education, micro-credentials, and stackable degrees. Customized pathways and lifelong learning opportunities empower students and enhance employability. This can be a challenge at any time, but with shrinking budgets, reduced public funding, and increased competition, university management and staff can feel like they are constantly operating at heightened levels of financial and operational stress. Diversifying income sources, optimizing resource allocation, and fostering industry partnerships can mitigate financial strain.

Going forward, universities must be agile, forward-thinking, and responsive to both global and local dynamics. By embracing challenges as catalysts for positive change, institutions can shape a resilient and impactful future for higher education. They will also need to be innovative about their external engagement, working with policy makers, industry and the third sector to develop solutions to global and local problems and to remind internal and external stakeholders of their value to society.

BIBLIOGRAPHY

AHN, S. (2023). The impending impacts of large language models on medical education. *Korean Journal of Medical Education, 35*(1), 103-107. https://doi.org/10.3946/kjme.2023.253

ALAMRI, H. A., WATSON, S., and WATSON, W. (2021). Learning Technology Models that Support Personalization within Blended Learning Environments in Higher Education. *TechTrends,* 65*,* 62–78. https://doi.org/10.1007/s11528-020-00530-3

ALDAHWAN, N., and ALSAEED, N. (2020). Use of Artificial Intelligent in Learning Management System (LMS): A Systematic Literature Review. *International Journal of Computer Applications, 175*(13), 16-26.

ALYAHYAN, E., and DÜŞTEGÖR, D. (2020). Predicting academic success in higher education: literature review and best practices. *International Journal of Educational Technology in Higher Education,* 17. https://doi.org/10.1186/s41239-020-0177-7

AMERICAN ASSOCIATION OF UNIVERSITY PROFESSORS. AAUP Data Snapshot. https://www.aaup.org/sites/default/files/AAUP%20Data%20Snapshot.pdf (accessed April 8, 2024).

AMERICAN COUNCIL ON EDUCATION. (2020). Postsecondary Faculty and Staff. https://www.equityinhighered.org/indicators/postsecondary-faculty-and-staff/ (accessed April 8, 2024).

ANG, A., and WIDON, J. (2014). *Origins of Modern MOOC*. http://www.robotics.stanford.edu/~ang/papers/mooc14-OriginsOfModernMOOC.pdf (accessed April 8, 2024).

BACEVIC, J. (2024). No Such Thing as Free Speech? Performativity, Free Speech, and Academic Freedom in the UK. *Law Critique.* https://doi.org/10.1007/s10978-023-09373-2

BAINES, P. (2022) Fake news and disinformation abounds, but what can universities do? *Times Higher Education.* https://www.timeshighereducation.com/campus/fake-news-and-disinformation-abounds-what-can-universities-do (accessed April 8, 2024).

BARNES, N., FISCHER, S., and KILPATRICK, S. (2024). Going above and beyond: Realigning university student support services to students. *International Journal* *of Educational Research, Volume 124,*102270. ISSN 0883-0355, https://doi.org/10.1016/j.ijer.2023.102270

Barton, A. (2024). AWOL from Academics. *Harvard Magazine.* https://www.harvardmagazine.com/2024/03/university-people-the-undergraduate-balance?utm_source=substack&utm_medium=email (accessed April 8, 2024).

Becerra, I. (2021). The Need for Interdisciplinarity in Higher Education. *Forbes.* https://www.forbes.com/sites/forbesbusinesscouncil/2021/07/22/the-need-for-interdisciplinarity-in-higher-education/ (accessed April 8, 2024)

Beech, D. (2022). Are universities losing the culture war? *Higher Education Policy Institute blog.* https://www.hepi.ac.uk/2022/05/28/are-universities-losing-the-culture-war/ (accessed April 8, 2024).

Bekhradnia, B., and Beech, D. (2018). Demand for Higher Education to 2030. *Higher Education Policy Institute Report*. https://www.hepi.ac.uk/wp-content/uploads/2018/03/HEPI-Demand-for-Higher-Education-to-2030-Report-105-FINAL.pdf (accessed April 8, 2024).

Berge, Z. (2012). Learning Analytics as a Tool for Closing the Assessment Loop in Higher Education. *Knowledge Management & E-Learning An International Journal.*

Brown, G., and Foster, C. (2023). The Use of Virtual Learning Environments in Higher Education –Content, Community and Connectivism– Learning from Student Users. In H. Jahankhani, A. Jamal, G. Brown, E. Sainidis, R. Fong, and U. J. Butt (eds) *AI, Blockchain and Self-Sovereign Identity in Higher Education. Advanced Sciences and Technologies for Security Applications.* Springer, Cham. https://doi.org/10.1007/978-3-031-33627-0_6

Brown, J., and Hoxby, C. (2015). *How the Financial Crisis and Great Recession Affected Higher Education.* University of Chicago Press.

Carey, R., Stephens, N., Townsend, S., and Hamedani, M. (2023). College Campuses Are Becoming More Diverse. But How Much Do Students from Different Backgrounds Actually Interact? *Kellogg Insight.* https://insight.kellogg.northwestern.edu/article/college-campuses-diversity-student-interaction (accessed April 8, 2024).

Champagne, E., and Granja, A. (2021). How the Covid-19 Pandemic May Have Changed University Teaching and Testing for Good. The Conversation.

https://theconversation.com/how-the-covid-19-pandemic-may-have-changed-university-teaching-and-testing-for-good-158342 (accessed April 8, 2024).

Cheeseman Day, J. (2020). 88% of Blacks Have a High School Diploma, 26% a Bachelor's Degree. America Counts: Stories. *US Census Bureau*. https://www.census.gov/library/stories/2020/06/black-high-school-attainment-nearly-on-par-with-national-average.html (accessed April 8, 2024).

CIPD. (2022). What is the scale and impact of graduate overqualification in the UK? London: Chartered Institute of Personnel and Development. https://www.cipd.org/contentassets/3b163ee99bd746f5abe87e5dcd49fd6d/graduate-overqualification-uk_tcm18-112169.pdf (accessed April 8, 2024).

Contreras, J. (2023). 'Hostile takeover': the tiny Florida university targeted by Ron DeSantis. *The Guardian*. https://www.theguardian.com/us-news/2023/jan/29/ron-desantis-florida-university-new-college-woke-war (accessed April 8, 2024).

Cuibus, M., and Walsh, P. (2024). *Student Migration to the UK. The Migration Observatory*. University of Oxford. https://migrationobservatory.ox.ac.uk/resources/briefings/student-migration-to-the-uk/ (accessed April 8, 2024) .

Duncan, A., Premnazeer, M., and Sithamparanathan, G. (2022). Massive open online course adoption amongst newly graduated health care providers. *Advances in Health Sciences Education,* 27, 919–930. https://doi.org/10.1007/s10459-022-10113-x

Estermann, T., Bennetot Pruvot, E., Kupriyanova, V., and Stoyanova, H. (2020). *The impact of the Covid-19 crisis on university funding in Europe*. European University Association (EUA). https://eua.eu/downloads/publications/eua%20briefing_the%20impact%20of%20the%20covid-19%20crisis%20on%20university%20funding%20in%20europe.pdf (accessed April 8, 2024).

Financial Times. (2023). Foreign Students Cool on British Universities as Funding Strain Worsens. https://www.ft.com/content/9f5bdf46-41ae-450e-a625-117fd19865f4 (accessed April 8, 2024).

Forsdick S. (2023). *Time to ditch the degree? Why many employers no longer think they are necessary*. Raconteur, September https://www.raconteur.net/talent-culture/graduate-employers-21-degree (accessed April 17, 2024).

Foster, E., and Siddle, R. (2020). The effectiveness of learning analytics for identifying at-risk students in higher education. *Assessment & Evaluation in Higher Education, 45*(6), 842–854. https://doi.org/10.1080/02602938.2019.1682118

Francis, P. *et al.* (2020). Thinking critically about learning analytics, student outcomes, and equity of attainment. *Assessment & Evaluation in Higher Education, 45*(6), 811–821. doi.org/10.1080/02602938.2019.1691975

Fuller, J., Langer, C., and Sigelman, M. (2022). Skills-Based Hiring Is on the Rise. *Harvard Business Review (HBR)*. https://hbr.org/2022/02/skills-based-hiring-is-on-the-rise

Gan, W., Qi, Z., Wu, J., and Lin, J. C. -W. (2023). Large Language Models in Education: Vision and Opportunities. *2023 IEEE International Conference on Big Data (BigData),* 4776-4785. https://doi.org/10.1109/BigData59044.2023.10386291. https://ieeexplore.ieee.org/abstract/document/10386291?casa_token=TeoptMqLhZoAAAAA:7ohlkHEiVlBTvclK5oJM458FVqku_6qb2ZKN6ciKYmVUv%20fQ_6qb2ZKN6ciKYmVUvfQ_nsAm0jBwioTM4F9UsDyjQBev (accessed April 8, 2024).

Gregory, T. (2023). *Education and Resilience in Kyiv.* https://harris.uchicago.edu/news-events/news/education-and-resilience-kyiv (accessed April 8, 2024).

Hays. (2024). *Hays UK, Salary & Recruiting Trends 2024*. https://www.hays.co.uk/career-advice/article/is-degree-educated-thing-of-past#:~:text=Organisations%20are%20more%20open%20to%20hiring%20those%20without%20a%20degree&text=Almost%20half%20(45%25)%20of,Salary%20and%20Recruiting%20Trends%20Guide (accessed April 15, 2024).

Herpich, N. (2022). Taking the Best of Innovations, Lessons of Pandemic Education. *Harvard Gazette.* https://news.harvard.edu/gazette/story/2022/03/taking-best-of-innovations-lessons-of-pandemic-education/ (accessed April 8, 2024).

Higher Education Statistics Agency (HESA). *Higher Education Staff Statistics: UK, 2021/22.* https://www.hesa.ac.uk/news/17-01-2023/sb264-higher-education-staff-statistics (accessed April 8, 2024).

Higher Education Statistics Agency (HESA). *Higher Education Student Statistics: UK, 2021/22.* https://www.hesa.ac.uk/news/19-01-2023/sb265-higher-education-student-statistics (accessed April 8, 2024).

House, G. (2020). Postgraduate Education in the UK. *Higher Education Policy Institute (HEPI) Analytical Report.* https://www.hepi.ac.uk/wp-content/uploads/2020/05/Postgraduate-Education-in-the-UK.pdf (accessed April 8, 2024).

Huang, L. (2023). Ethics of Artificial Intelligence in Education: Student Privacy and Data Protection. *Science Insights Education Frontiers,* 16, 2577-2587. https://doi.org/10.15354/sief.23.re202

Intelligent. (2023). Nearly half of companies plan to eliminate Bachelor's degree requirements in 2024, November (accessed April 15, 2024).

Irwin, V. (2023). *Report on the Condition of Education 2023.* National Center for Education Statistics at Institute of Education Sciences. https://nces.ed.gov/pubs2023/2023144.pdf (accessed April 8, 2024).

Jayman, M., Glazzard, J., and Rose, A. (2022). Tipping point: The staff wellbeing crisis in higher education. *Frontiers in Education,* 7, 929335. https://doi.org/10.3389/feduc.2022.929335

Kett, P., and Ashford, D. (2024). UK Higher Education Financial Sustainability Report (PwC). https://www.pwc.co.uk/government-public-sector/education/documents/higher-education-financial-sustainability-report.pdf (accessed April 8, 2024).

Kotter, J. (2014). *The 8-Step Process for Leading Change*. https://www.kotterinc.com/methodology/8-steps/ (accessed April 8, 2024).

Koutsouris, G., Stentiford, L., and Norwich, B. (2022). A critical exploration of inclusion policies of elite UK universities. *British Educational Research Journal,* 48, 878–895. https://doi.org/10.1002/berj.3799

Krawitz, M., Law, J., and Litman, S. (2018). *How higher-education institutions can transform themselves using advanced analytics.* McKinsey and Company. https://www.mckinsey.com/industries/education/our-insights/how-higher-education-institutions-can-transform-themselves-using-advanced-analytics (accessed April 8, 2024).

Labadze, L., Grigolia, M., and Machaidze, L. Role of AI chatbots in education: systematic literature review. *International Journal of Educational Technology in Higher Education,* 20, 56. https://doi.org/10.1186/s41239-023-00426-1

León-Urrutia, M., Cobos, R., and Dickens, K. (2018). MOOCs and their Influence on Higher Education Institutions: Perspectives from the Insiders.

*Journal of New Approaches in Educational Research, 7(*1), 40-45. https://doi.org/10.7821/naer.2018.1.252

Liu, D. YT., Bartimote-Aufflick, K., Pardo, A., and Bridgeman, A. J. (2017). Data-Driven Personalization of Student Learning Support in Higher Education. In A. Peña-Ayala (Ed.), *Learning Analytics: Fundaments, Applications, and Trends* (94). Springer. https://doi.org/10.1007/978-3-319-52977-6_5

Malcolm, F. (2021). Silencing and freedom of speech in UK higher education. *British Educational Research Journal,* 47, 520-538. https://doi.org/10.1002/berj.3661

Marr, B. (2023). The Difference Between Generative AI and Traditional AI: An Easy Explanation for Anyone. *Forbes.* https://www.forbes.com/sites/bernardmarr/2023/07/24/the-difference-between-generative-ai-and-traditional-ai-an-easy-explanation-for-anyone/ (accessed April 8, 2024).

McArthur, J. (2023). Rethinking Authentic Assessment: Work, Well-Being, and Society. *High Education,* 85, 85–101. https://doi.org/10.1007/s10734-022-00822-y

McGregor, J. (2020). Free Speech, Universities, and the Development of Civic Discourse. In M. C. Navin and R. Nunan (eds), *Democracy, Populism, and Truth. AMINTAPHIL: The Philosophical Foundations of Law and Justice,* vol 9. Springer, Cham. https://doi.org/10.1007/978-3-030-43424-3_6

Milano, S., McGrane, J. A., and Leonelli, S. (2023). Large language models challenge the future of higher education. *Nature Machine Intelligence,* 5, 333–334. https://doi.org/10.1038/s42256-023-00644-2

MIT News. (2021). How MIT OpenCourseWare became an educational resource to millions around the world. https://news.mit.edu/2021/mit-courseware-educational-resource-to-millions-0406 (accessed April 8, 2024).

Moreau, M-P. (2016). B*rexit and The Rise of Right-Wing Populism: A Politics of Othering.* Gender and Education Association GEA. http://www.genderandeducation.com/issues/brexit-and-the-rise-of-right-wing-populism-a-politics-of-othering/ (accessed April 8, 2024).

Moriña, A., Perera, V. H., and Carballo, R. (2020). Training Needs of Academics on Inclusive Education and Disability. *Sage Open, 10*(3). https://doi.org/10.1177/2158244020962758

MORRIS, N. P., IVANCHEVA, M., COOP, T. *et al.* Negotiating growth of online education in higher education. *International Journal of Educational Technology in Higher Education, 17*(48). https://doi.org/10.1186/s41239-020-00227-w

MOSCARDINI, A. O., STRACHAN, R., and VLASOVA, T. (2022). The Role of Universities in Modern Society. *Studies in Higher Education, 47*(4), 812-830. https://doi.org/10.1080/03075079.2020.1807493

OFCOM. (2024). *Online news: research update.* March. https://www.ofcom.org.uk/research-and-data/multi-sector-research/social-media-online-news (accessed April 17, 2024).

OFFICE FOR NATIONAL STATISTICS. (2016). *How Has the Student Population Changed?* https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/livebirths/articles/howhasthestudentpopulationchanged/2016-09-20 (accessed April 8, 2024) .

OFFICE FOR NATIONAL STATISTICS. (2020). *Coronavirus and the Impact on Students in Higher Education in England: September to December 2020.* https://www.ons.gov.uk/peoplepopulationandcommunity/educationandchildcare/articles/coronavirusandtheimpactonstudentsinhighereducationinenglandseptembertodecember2020/2020-12-21 (accessed April 8, 2024).

OFFICE FOR STUDENTS. (2021). *The National Student Survey: Student Experience during the Pandemic.* https://www.officeforstudents.org.uk/publications/the-national-student-survey-student-experience-during-the-pandemic/ (accessed April 8, 2024) .

OFFICE FOR STUDENTS. (2022). A Statistical Overview of Higher Education in England. *OfS Annual Review.* https://www.officeforstudents.org.uk/publications/annual-review-2022/a-statistical-overview-of-higher-education-in-england/#sectionthree (accessed April 8, 2024).

OLASKOAGA-LARRAURI, J., GONZÁLEZ-LASKIBAR, X., BARRENETXEA-AYESTA, M., and DÍAZ-DE-BASURTO-URAGA, P. (2019). The sign of the new millennium. Organisational changes and job satisfaction at Spanish public universities. *European Journal of Education,* 54, 137–150. https://doi.org/10.1111/ejed.12314

PERKINS, M. (2023). Academic integrity considerations of AI Large Language Models in the post-pandemic era: ChatGPT and beyond. *Journal of University Teaching and Learning Practice,* 20. https://doi.org/10.53761/1.20.02.07

The Pew Charitable Trusts. (2019). Federal and State Funding of Higher Education. *Issue Brief.* https://www.pewtrusts.org/en/research-and-analysis/issue-briefs/2019/10/two-decades-of-change-in-federal-and-state-higher-education-funding (accessed April 8, 2024).

The Policy Institute, King's College London. *Managers and Academics in a Centralising Sector.* https://www.kcl.ac.uk/policy-institute/assets/managers-and-academics-in-a-centralising-sector.pdf (accessed April 8, 2024).

The Policy Institute, King's College London. The state of free speech in UK universities: what students and the public think. https://www.kcl.ac.uk/policy-institute/assets/the-state-of-free-speech-in-uk-universities.pdf (accessed April 8, 2024).

Purbasari Horton, A. (2020). *Could Micro-Credentials Compete with Traditional Degrees?* BBC Worklife. https://www.bbc.com/worklife/article/20200212-could-micro-credentials-compete-with-traditional-degrees (accessed April 8, 2024).

Remenick, L., and Bergman, M. (2021). Support for Working Students: Considerations for Higher Education Institutions. *The Journal of Continuing Higher Education, 69*(1), 34–45. https://doi.org/10.1080/07377363.2020.1777381

Revers, M., and Traunmüller, R. (2020). Is Free Speech in Danger on University Campus? Some Preliminary Evidence from a Most Likely Case. *Köln Z Soziol,* 72, 471–497. https://doi.org/10.1007/s11577-020-00713-z

Salford, T. (2022). Why is recruitment and retention in the university sector more difficult than other sectors? *Times Higher Education*. https://www.timeshighereducation.com/campus/why-recruitment-and-retention-university-sector-more-difficult-other-sectors (accessed April 8, 2024).

Sasser, A., Shoag, D., and Ballance, J. (2019). Upskilling: Do Employers Demand Greater Skill When Workers Are Plentiful? *The Review of Economics and Statistics,* 102, 1-46. http://dx.doi.org/10.1162/rest_a_00835

Slimi, Z., and Carballido, B. (2023). Navigating the Ethical Challenges of Artificial Intelligence in Higher Education: An Analysis of Seven Global AI Ethics Policies. *TEM Journal.* 590-602. https://doi.org/10.18421/TEM122-02

Spence, M. *Balancing humility and conviction is the art of disagreeing well*. Times Higher Education. https://www.timeshighereducation.com/opinion/

balancing-humility-and-conviction-art-disagreeing-well (accessed April 8, 2024).

Times Higher Education. (2021). *The COVID-19 pandemic forces UK universities to reimagine their campuses.* https://www.timeshighereducation.com/hub/coursera/p/covid-19-pandemic-forces-uk-universities-reimagine-their-campuses (accessed April 8, 2024).

Tournier-Sol, K. (2021). From UKIP to Brexit: The Right-Wing Populist Surge in the UK. In: K. Tournier-Sol, and M. Gayte (eds), *The Faces of Contemporary Populism in Western Europe and the US.* Cham.: Palgrave Macmillan. https://doi.org/10.1007/978-3-030-53889-7_1

UK Department for Education. (2023). *Lifelong Learning Entitlement Overview.* https://dera.ioe.ac.uk/id/eprint/40179/1/Lifelong%20Learning%20Entitlement%20overview%20-%20GOV.pdf (accessed April 8, 2024).

UNESCO Institute for Statistics. (n.d.). *Education for All Global Monitoring Report: Literacy for Life.* https://uis.unesco.org/sites/default/files/documents/f_unesco1015_brochure_web_en.pdf (accessed April 8, 2024).

Wapman, K. H., Zhang, S., Clauset, A., *et al.* Quantifying hierarchy and dynamics in US faculty hiring and retention. *Nature,* 610, 120–127. https://doi.org/10.1038/

Whitchurch, C. (2023). The Changing Profile and Work Experiences of Higher Education Staff in the 21st Century. *Higher Education Policy Institute blog.* https://www.hepi.ac.uk/2023/08/18/the-changing-profile-and-work-experiences-of-higher-education-staff-in-the-21st-century/ (accessed April 8, 2024).

Wilson, K., Neylon, C., Montgomery, L., Huang, C., Handcock, R. N., Roelofs, A., Hosking, R., and Ozaygen, A. (2022). Global Diversity in Higher Education Workforces: Towards Openness. *Open Library of Humanities, 8*(1). https://doi.org/10.16995/olh.4809

Xu, X. (2023). *The changing geography of jobs*. London: Institute for Fiscal Studies. https://ifs.org.uk/publications/changing-geography-jobs (accessed 8 April 2024).

THIS IS IT: AI WILL CHANGE UNIVERSITY FOR GOOD

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Abstract

Higher education has long been living with the promise, or the threat, that (micro)computing, the internet, or now artificial intelligence, will change everything–whether to reinforce it, turn it upside down, or leave it by the wayside. If we are to learn from the past "to avoid repeating it," the lesson is clear: once again, technology will not deliver what it promises, especially not to this millenium-old institution, which is much older and more stable than the rest of the educational system. But there is something new: each new technological ecosystem that has penetrated education since the advent of writing, including the printing press, has done so by multiplying access to information and the reach of communication, but always at the cost of more uniformity, rigidity, and one-sidedness. The paradigmatic example in this realm is the fiasco of mass media (film, radio, television...), but also, earlier, the enduring textbook and, later, the ephemeral computer-assisted learning. However, the fifth transformation of information and communication, the digital one, in which we are already immersed, brings two more things: the increasingly developed capacity for personalization and the emerging capacity, just beginning with generative AI, for interaction. In an institution that, unlike earlier educational stages, is free from the custodial function, this can and should bring substantial changes in the processes and relationships of learning and teaching, as well as in its organizational and even material architecture.

Keywords: Higher education, digital transformation, artificial intelligence, educational innovation, AIEd.

JEL classification: I20, I29.

Since the initial enthusiasm about the abundance of Open Educational Resources (OER), including the hybrid teaching developed during the pandemic, the MOOCs (Massive Open Online Courses) or edupunk (a "do it yourself" recovered or reinvented for education), we have not stopped hearing and repeating that the university would change radically, or even be swept aside by the new forms of teaching and learning driven by the digital transformation. But we have also heard that an institution with almost a millennium of tradition does not need to change in essence, and in fact it has not done so, beyond merely integrating the new models in the offer of proven models, and eventually for improvement, with audiovisual media (audio, film, radio, television) and subsequent generations of information technology. As if that were not enough, now comes Artificial Intelligence (AI), in particular the Generative Artificial Intelligence (GenAI), which questions the usual evaluation mechanisms and the relevance of the knowledge we were used to evaluate, or so many thought when ChatGPT proved capable of passing one academic test after another.

More of the same, over and over again? Yes and no. Unlimited digital resources, ubiquitous and deinstitutionalized learning, courses without limits or prices, smart tutoring for all, hybrid education... Each of these waves of euphoria has been followed by the realization of its limits and its unforeseen consequences: information overload, digital garbage, lurking distractions, the persistence of institutional credentialism, the deflation of MOOCs, the inadequacy and bias of massive and longitudinal data, the awkwardness and boredom of video in the pandemic, and so on. If not more of the same, it is true that we tend to predict the future based on the past. Looking back without anger, we now have more than a century of grandiloquent promises about how each new electronic medium (film, radio, television, video, and, of course, computers) would revolutionize education. However, since Edison announced the replacement of the schoolbook by the motion pictures, one hundred and two classes of students and teachers have gone through school without such a thing happening. Looking a little closer, computer science in particular has been proposing the same thing since the sixties of the last century. Mass media, the broadcasters, failed time and again because, even though their appeal to the (audiovisual) senses and their (mass) scalability were in their favor, it soon became clear that their total one-sidedness, their rigid sequentiality and their strict uniformity were against them. Additionally, the personalization offered first by the *teaching machines,* also a century ago, and then by the *computer-assisted instruction* for the last six decades, never went beyond customizing the timing and branching the itinerary through the same and unique content, with the paradox of being able to lead to discursive boredom to the point of despair. There is every reason to think that we are only facing new iterations of a more than familiar process, something like the *edutech* variant of *Groundhog Day.*

But there are three elements to consider that anticipate something different. The first element is that we are experiencing a transformation of the information ecosystem like no other since the printing press, comparable in scope and depth only to the advent of the printing press or, before that, to the advent of writing or language. In a technical sense, the printing press simply massified literacy, but over time this gave way to a cascade of reforms and religious wars, nation states, the progressive formation of the public sphere and public opinion, mass schooling, the press as the fourth power. The digital transformation is already bringing about broader, faster, and deeper changes whose scope we have yet to grasp. The second is that, in a kind of confirmation of what Engels called *the first law of dialectics,* the transition *from quantity to quality,* changes that are apparently only affecting scale and speed end up transforming processes and structures –the availability of digital resources, for example, begins by facilitating access to formerly limited resources, the same function that the lesson, the textbook, the maps or the typical multicopied readings had before, and ends up rendering this function partly superfluous and calling for a new, essential and difficult task of curation. The third is that specifically Gen AI, the subject of this paper, gives learning resources a quality that was previously exclusive to the teacher: the ability to adapt and interact, something that no previous technology, strictly speaking, offered *per se.*

I. MOOCS: A TSUNAMI, MUCH ADO ABOUT NOTHING

In the year 2000, at the turn of the millennium, having overcome the Y2K scare, which did not materialize, and having just finished a semester as a visiting lecturer at the London School of Economics, I was approached by its director, Anthony Giddens, with a proposal to contribute some of my own material to Fathom, an online learning portal created on the initiative of Columbia University and already joined by the LSE and Cambridge (later Chicago, Michigan and the RAND corporation), the British and New York libraries and the Smithsonian Museum (shortly after followed by the British Natural History Museum, the British Museum of Science, the Victoria and Albert Museum, the Woods Hole Oceanographic Institution and the American Film Institute). Fathom intended to offer not only online courses, as open and distance universities did and, to a lesser extent, in-person universities and business schools were already doing, but rather all kinds of official or open educational and multimedia resources for the academic community, hence the collaboration between universities, libraries, and museums. The future was already there, and it was hard to imagine a more powerful consortium, so without giving it a second thought, I joined enthusiastically with some written work, an interview, and made myself available to participate in any other way. However, Fathom did not do much more than that, it lasted barely two years, and very few people remember or even know of its ephemeral existence.

At the end of the first decade of the century, however, more ambitious proposals began to emerge. On the one hand, there were the formulas that suggested leaving the university institutions behind in favor of self-organizing one's own education, leveraging the abundance of online resources available and the possibility of liaising on internet with kindred spirits and relevant experts. In 2008, Jim Groom took on Blackboard, the first large-scale commercial LMS (learning management system) and coined the term *Edupunk* (Groom, 2008), which was greeted with some enthusiasm (Ebner, 2008; Piscitelli *et al.,* 2012), and which would encourage or make room for somewhat more specific concepts, though never much, such as *heutagogy* (Hase and Kenyon, 2000; Blaschke, 2012) inside and *DIY* education (Kamenetz, 2011) outside, *ubiquitous learning* (Cope and Kalantzis, 2009; Kidd and Chen, 2011) or *invisible learning* (Cobo and Moravec, 2011) galore, etc. On the other hand, there were recursive prophecies about the end of the university as we knew it, to be replaced by totally or essentially online formulas. As early as 1997, business guru Peter Drucker predicted: "Thirty years from now, large university campuses will be relics. Universities will not survive" (Lenzner and Johnson, 1997). Less a guru than an entrepreneur and venture capitalist himself, Peter Thiel launched in 2010 *20 under 20* (20 annual scholarships for people under 20), later renamed the Thiel Fellowships, for young university students, or those about to start, with a business idea and willing to leave the classroom to devote themselves fully to it, which would simply confirm that in the entrepreneurial culture that inhabits the intersection of American universities and the technology sector, a good idea that finds funding may well provoke and justify academic desertion (in various ways, this was or would be the story of Gates, Jobs, Ellison, Dell, Page and Brin, Fanning, Zuckerberg, Musk, Kalanick, Dorsey, Koum and others); while irrelevant against the backdrop of the unstoppable expansion of higher education, they were nonetheless an ostentatious sign of the questioning of their value from the high-tech field and by an active employer and *headhunter,* even though he himself had been a model scholar, LLM from Stanford.

But the university has survived all these calls to flee, just as schools did in the 1970s with the Illichian calls for de-schooling, often applauded but never supported. It is true that the rising costs of college are hardly sustainable, either for the public budget or for private spending. In the first case, the government can always respond by diluting the resources (*i.e.,* increasing the number of places without increasing the endowments at the same rate) or by differentiating the supply (*i.e.,* allowing an increasing stratification of degrees and differentiating the value of the centers), but even if the latter is a general trend, the teaching staff is less elastic downwards than upwards in the face of fluctuations in demand induced by demographic or economic cycles, and the rising costs of supplies and services can hardly be avoided. In the second case, the costs are borne, with determination or resignation, by families with middle-class aspirations, few children, two sources of income, and a willingness to go into debt if necessary, to the point that there is growing alarm about the rise, or even the bubble (Marr and Hornton, 2009) of student debt in countries with more neoliberal education policies, such as the United States or Chile, where such investment can be individually very profitable. However, given the expansion, it does not seem to be a good idea for everyone, with the corresponding risk of default and, in the rebound, personal ruin, social friction and discrediting of higher education, in addition to increasing inequality. In any case, neither the number of enrollments nor the cost of university education has ever stopped increasing.

More focused on the present and future of large companies, including universities, the late Clay Christensen, the *disruption* guru, predicted in the last decade that between a quarter and half of American colleges (out of an estimated four thousand, of very different nature) would disappear or merge within a decade or a little more (though he always said this in informal contexts such as conferences and interviews, which made it even easier to jump into the headlines) (Hess, 2018; Horn, 2018). Christensen saw it because of online courses, which already had a long tradition, albeit for a minority, but also, more specifically, because of the (then) recent growth of specialized college-level online courses that could be taken in high school (the Advanced Placement courses, a very specific and controversial modality in the United States); the supplemental courses for college students, as well as the already noticeable retail of purely online charter schools (cybercharters, such as Florida Virtual, Pennsylvania Cyber, Aspire, Laureate, and others) and purely or primarily distance universities (such as Western Governors, Southern New Hampshire, Phoenix Online, American Public, Strayer, Grand Canyon, Arizona State, Liberty, etc.). He saw all of them as a perfect, rather than canonical, example of his model of disruptive innovation: a product that starts out as second-rate, for a new audience that cannot afford first-rate, but whose quality gets closer and closer to first-rate until it surpasses it. It should be noted that although MOOCs had their moment of glory during this decade, Christensen does not even mention them in his works on disruption in higher education (Christensen *et al.,* 2011, 2012), as his diagnosis had nothing to do with them. On the contrary, in one of the few texts in which he and one of his collaborators mention MOOCs, they do so in a clearly disdainful way toward their "tremendous fanfare" (Weise and Christensen, 2014: 4). Despite his exaggerated predictions, Clay Christensen and his institute's criticism of the university (as well as the school) was not in the sense of a massive replacement of in-person teaching by a distance or online formula, but with an eye to mixed or blended formulas, years before the COVID-19 pandemic brought the idea of hybrid education into the limelight.

MOOCs (Massive Open Online Open Courses had their moment of glory, which was neither brief nor discreet. The first MOOC officially considered as such, *Connectivism and Connective Knowledge,* directed by George Siemens and Stephen Downes, took place in 2008. In 2011, Sebastian Thrun and Peter Norvig at Stanford launched their *Introduction to Artificial Intelligence* course as such, which surpassed 160,000 students and was soon emulated by Andrew Ng and other professors at the same university. Seeing the opportunity, Thrun founded Udacity in 2011, and Andrew Ng, along with Daphne Koller, founded Coursera in 2012. That same year, the Massachusetts Institute of Technology joined the race by creating MITx, which, with Harvard's collaboration, would soon become edX, both initiatives were spearheaded by Anant Argawal. Referring to this, and in the same year, John Hennessy, president of Stanford University, proclaimed: "A tsunami is coming" (Auletta, 2012), and the *New York Times* (Pappano, 2012) declared it *the year of the MOOC.* Immediately after, there were impressive enrollment numbers, regularly in the tens of thousands; continuity figures were not that high, though; and completion figures were even lower. While the organizers debated how to foster virtual ("collaborative") contact among enrolled students, how to administer a feasible (and reliable) assessment, and how much to charge for certification (of attendance, of achievement, of passing the bar, of having learned as much as within their ivy-covered walls?), the vast majority of their students did not complete the program, did not go beyond following a couple of units or accessing their open resources, merely took a peek, or simply did not reappear after enrolling. (Rivard, 2013). And, by the way, those who peeked the most and who took the best advantage of them were not the *outcasts of the earth,* but rather those already advantaged in society and in the educational system, yet another case of the *Matthew effect* (Saleh and Sanders, 2014).

Prima facie, therefore, a bluff, a resounding failure in terms of effectiveness, efficiency, and equity. In fact, what seems to have stuck in the minds of everyone in general, and university professors in particular, is simply that the spectacular enrollment figures were followed by no less spectacular dropout figures. But things are never that simple: the 4 or 5% of enrollees who complete MOOCs (those superstar MOOCs, to be exact) certainly pale in comparison to the 84.6% of students who graduate from Harvard at the end of the expected four years, let alone the 96.7% who will have done so at the end of six years, but it should not be ignored that those who managed to enrolled on campus were already only 5.9% of the applicants, so the graduates would be 5% of those who applied for admission after four years and less than 6% after six years, which gives us surprisingly similar percentages in both cases, within the ivy and far from it. MOOCs have been accused of being too easy, but Harvard has long been suspected of inflating grades. Applicants who did not get into Harvard would undoubtedly go elsewhere, but those who dropped out of MOOCs could have dropped out of any course of study, including other MOOCs. In any case, of those who enrolled, it is more than likely that many did so out of curiosity, to obtain the learning materials, or for more limited purposes than to do the full course, since price was not a barrier to entry.

The objection that MOOCs have their audience in developed countries and among the more educated population, including those with higher education (also among teachers, by the way) is undoubtedly stronger, *i.e.,* that they are part of the Matthew effect, whereby the already rich (in education) become richer (in education and in economic value) and the poor become poorer (at least in relative terms). The problem is, however, that this criticism is applicable to the entire university subsystem, old or new, residential, in-person or online, because of its selectively cumulative character in a society and economy where degree level is increasingly associated with already growing inequalities of wealth and income, status and life opportunities; especially when it is a private expenditure, but also when it is publicly funded (see Hayes, 2013; Frank, 2016; Markovits, 2019; Carnevale *et al.,* 2020; Sandel, 2020). But however much one may say or wish otherwise, this is to be expected of any university offering, all the more so when it targets a new territory or a new community.

Even in the middle of the golden year, it was clear that there was another problem, not so much on the outside as on the inside. Amherst, Duke, and a few other universities refused to join Harvard and MIT in edX when they could have, but the most paradigmatic case was in California, specifically at San Jose State University (SJSU). Michael Sandel is a political philosopher, a lecturer at Harvard, with a very solid body of essential writings in the field. His course *Justice* was the first that this university offered for free online. Although it never came to contest the top of the popularity charts with computer science courses (*Machine Learning* by Ng, from Stanford, *Programming* by Severance, at Michigan, etc.), courses closer to self-help (*Science of Well-Being,* by Santos, at Yale, *Learning to Learn: Powerful Mental Tools...,* by Oakley, at San Diego, etc.), or second language courses with professional horizons (*English for the Workplace...,* from Pennsylvania, or *Chinese for Beginners,* from Beijing, etc.), *Justice* made Sandel a kind of academic rock-superstar not only in and around Boston, but on a global scale. But at the other side of the country, in the heart of Silicon Valley, at SJSU (the only public university in the valley, on the southern shore of the bay), which undoubtedly has a hard time competing with Stanford or Berkeley, among others, someone had an idea: to combine the master classes of the best MOOCs with the personal attention of their own faculty, following the latest pedagogical trend, the so-called *flipped classroom.* There was no problem with some MIT MOOCs and in-house in-person engineering courses, such as the electrical engineering course, in which its students were split into two groups. One group followed the initiative, and the other did not. The initiative offered better results than the traditional format (Ghadiri *et al.,* 2013; Ghadiri, 2014). But the idea upset philosophy lecturers, who are always more sensitive about their aura and were angry about the proposal to do something like this with Michael Sandel's course and local philosophers. "There is no pedagogical issue in our department that *JusticeX* [Sandel's MOOC with edX] is designed to address, and we have sufficient faculty to teach our equivalent course," Sandel was informed in an open letter. Sandel was forced to issue a sort of apology, explaining that he had merely offered some resources and did not want to take anyone's job, especially not his colleagues' (Carey, 2016).

II. THE PANDEMIC: EVERYONE GOES HOME AND WEARINESS FOR ALL

In the end, the MOOCs did not wipe out anything, but at the end of the decade another *tsunami* was lurking: the COVID-19 pandemic, which forced the evacuation of classrooms, starting with the university. Few spaces are as densely populated as classrooms, so during the period of exponential spread and high incidence of the virus, they were natural candidates for closure, especially where the students were already adults so there was not the relative counterbalance of the care function. There were organizations with powerful digital infrastructures, though more for some things than for others, with operational LMS (Learning Management Systems, then whitewashed as *Virtual Learning Environments*, VLE) in frequent, even daily use by everyone, though often only at the most basic level (uploading presentations or texts in pdf format, communicating exam dates or grades, scheduling tutorials by chat or e-mail...). The participants were presumably well equipped and competent: lecturers who used at least ofimatics and something more in their back office, *i.e.* to prepare their classes, and possibly even more tools for research; students who were *digital natives*, *i.e.* at least regular users; and all of them had one or more personal devices and were predictably better or worse connected. Laboratories, some field work, and cafeterias could not be replaced, but the most common teaching and learning practices could: lectures, readings, tutorials, and assessments, each with its functional and contextual specificities. An experiment of massive innovation and, unfortunately, strongly motivated by circumstances; or at least a generalized novelty.

Not just at university, of course. The stress test was mainly on formal primary and secondary education. Forget about kindergarten no matter how much we insist on its *educational* function (in Spanish it is called "early childhood education", rather than daycare or kindergarten, but not "school", to avoid the pressure for early literacy), its real function is still essentially care, and there is little or nothing to offer at a distance or online. In primary and secondary education, on the other hand, and more so as the years above, the role of the school becomes more and more one to provide information (and knowledge and even wisdom, of course, but always linked to information: lessons, books, notebooks, exercises...), which is precisely what moves best over cables and waves and between different devices. Every school, every school system, made some effort to maintain a certain amount of de-schooled teaching in a purely spatial sense: In the best cases, a more or less faithful replica of in-person activities, such as classes or lessons, tutorials, assessments, even some teamwork; at the very least, some form of information dissemination, whether massive, broadcast or broadcast-like (radio, television, open resources on the Internet), or more focused on individuals or small groups (e-mail, messaging applications, or even voice calls whether on the new or the old telephone). We have even seen examples of what could be considered heroic care and attention, such as teachers visiting the homes of students with whom they have lost contact, and the occasional residual canteen service and even shelter for students in extreme situations. This forced deployment, in which we understandably looked at the best examples, led many people to say that after this experience of *hybrid education* (or teaching, learning, school, university..., and perhaps mixed, fluid, blended, liquid, hypermedia...), everything had changed and nothing would ever be the same again: the hybrid formula is here to stay. Those statements were repeated over and over again, without dwelling much on specifics.

Perhaps that is the key: *it is here to stay.* If you look up that sentence online, "it is here to stay", you will see the insistence –rivaled perhaps only by the predisposition of teleworking being here to stay too. Enthusiasts for the integration of digital technology felt justified in claiming, or wanted to believe, that the forced move to online teaching and learning would have the effect of demonstrating its effectiveness, efficiency, and excellence for all, as did telework enthusiasts. Or perhaps they were not so convinced of the demonstration and, even if unconsciously, wanted to compensate with their enthusiasm for the lack of evidence of the virtues of hybrid innovations, as in an incantation, or their own perception of the perceptions of others in this regard, as in an exorcism. The diagnosis was more than suspicious for an institution and a profession that had so little regard for any major technological innovation. At first, any argument was a good one for evacuating the classrooms, intuitively feared as the worst source of infection, hardly comparable to public transport or mass events, but less dispensable than these, so it was no bad thing that such a harsh measure seemed less so thanks to an alleged success of the hybrid experience. But there was no such success: without failing to appreciate the efforts of institutions, professionals and the community, from some centers that set up replicas quite close to ordinary teaching, which was what it was all about, to the numerous images, as moving as extravagant, of spirited and hard-working educators improvising their first video or sweating pixels (ink could no longer be) to organize and maintain a videoconference, what was actually done was something else. *Emergency remote teaching* (Hodges *et al.,* 2020) was implemented, a very partial and limited copy of ordinary teaching, severely diminished by the limitations of the technology itself (equipment and software), connectivity and digital skills in schools and homes, teachers and students.

As the pandemic began to subside, and the alarm about children's supposed role as super-infectors proved to be unjustified, the situation began to change, slowly and perceptibly. Before the pandemic, in the setting of non-university formal education, the worst that could be said of anyone, especially families, was that they considered school as a kindergarten or a parking lot for children but when some also thought that they saw the writing on the wall with the replacement of teachers by technology (saying that it would be robots, the ultimate nightmare, would be going too far), then they started singing the praises of the essential nature of proximity, the importance of care, etc. The experience of remote teaching in case of emergency, largely a fiasco by the standards applicable in normal times, was seen as a demonstration of the limits of digital technology, not of its possibilities. Particularly at the university, where the institution, faculty and students were considered to be technologically equipped and capable, the adult learners were more or less mature and the teaching and learning activities were more duly information-centered, the experience was better, but not good. Some lecturers, only a few but more than cero (which should have been the case), adopted an evasive attitude; others, more numerous, did not know how to proceed, beyond the usual uploading on the virtual platforms some educational resources, mainly texts and, struggling to use videoconferencing applications. The university's IT services urgently scaled up and reinforced their storage and connectivity capacity and installed cameras in classrooms for the hybrid or limited in-person teaching period, with bizarre performance. In addition, assessment procedures proved difficult and in some cases inadequate, insecure, or conflicted. While on the whole it was much better than isolating oneself and staying home until the pandemic was over, in the end most people were overwhelmed by the improvised and accidental use of a medium they did not master.

The fact that the balance is not very good perhaps explains why, in principle, such stocktaking has not been done. In December 2020, the year of COVID-19, the Conference of Rectors of Spanish Universities presented the report *La Universidad frente a la pandemia* (CRUE, 2020). The text was a perfect example of what is usually called administrative *grey literature*: an imprecise enumeration of a series of measures that would prove the rapid and effective response of universities to the epidemic and the lockdown, all with a certain tone of self-promotion, but without sufficient descriptions or precise figures (except for some on expenditure and investment, which in themselves did not mean much) and without a proper balance sheet. This should have come later, since this publication, as it was stated a dozen times, was only a first "preview of results" in anticipation of the "final report" to be published in mid-2021. However,... this never happened, the CRUE never published this report. In one way or another, before or after, formally or informally, all the universities had to take stock of the lockdown period and the successive variants of the *new normal,* and the university authorities often issued statements about their satisfaction with the efforts made. However, the truth is that in general and with a few exceptions, such the public in-person universities (UAM, UdN, UPC), the logical exhibition of the Spanish Open University UNED and some private universities (which, due to the nature of their offer or their business model, were much more experienced in online teaching and had to replace only partial or even marginal in-person activity), there was no systematic and public stocktaking.

III.THE RETURN TO THE ALREADY MORE THAN OLD NORMALITY

Although, according to the rumor mill, the hybrid university *was also here to stay,* what is certain and logical is that, after a rise during the pandemic of virtual and virtualized teaching (*i.e.,* of degrees designed directly for online teaching and those forced to migrate due to the lockdown or the simple subsequent precautions), what has come is the predictable fall of the virtual and the return to the in-person teaching. To date, there are no reliable statistics on MOOCs, but indicators of the interest in them and indirect indicators of their demand, such as visits to information sites or the stock price of the major providers, seem to show that, after a sharp rise in 2020, there has been a fall to a new valley only slightly above the previous level (Shah, 2023). As for traditional in-person universities, everything seems to be back on track: students are back in the classrooms and lecturers are teaching as they did before the pandemic; perhaps with a slightly higher use of digital resources but only as a support or passive recording of information rather than as a means for collaboration (in virtual groups) and (autonomous) learning, with slightly more intensive use of virtual learning environments (LMS), and undoubtedly in a better position to face another potential pandemic such as the 2020 crisis or other less catastrophic events, such as the Philomena storm in 2021.

Perhaps there is no reason to be surprised. As we said at the beginning, we are talking about a centuries-old institution. There is a tendency to think that the university is at the forefront of knowledge, which seems quite correct, both in terms of its research function (which, however, is increasingly shared with other public organizations and, above all, private companies) and in terms of its vocation to transmit the most advanced knowledge, while the old joke about the monk, who hibernated centuries ago, but who would feel at home if he woke up in a classroom, is repeated with reference to a school, that is, non-university education. But the reality is different: the classroom of today's elementary school or high school may look familiar to a Jesuit, Piarist, or Lasallian monk of the nineteenth century. However, it would not be so familiar to any monk or even less so to a lay teacher who hibernated in the eighteenth, seventeenth or earlier centuries, for the egg-carton classroom we know today, with its group of students of (almost) the same age, who are taught the same thing and at the same level (without almost), is a modern phenomenon that was developed with the universalization of the school system, which was conceived and designed only in the seventeenth century, but was not generalized until the nineteenth and twentieth centuries (Fernández Enguita, 2018). Apart from that, what would be surprising for a monk of the nineteenth century is the diversity in the organization of space and activity (not time) that can be found today in different levels of education or in different schools or classrooms of the same level of education. This is pitiful in relation to what is possible and necessary, but surprising for those who have in mind the idea of a strictly unique model, *the one best system*, or coffee for all. Who would not be surprised by a current classroom would be a university professor who hibernated even before, whether it was Fray Luis de Leon in Salamanca of the sixteenth century (the classroom where he taught is still preserved with the same physical structure), Laurentius de Voltolina in Bologna of the fourteenth century, Constantine the African in Salerno of the eleventh century, or even Hypatia in Alexandria of the fifth century, because the layout was already the same: a scholarly teacher addressing a group of students collectively, from the chair; a dissertation without a book or a lesson with a book, from the one who possesses the knowledge (or the book) to those who do not possess it but demand it and, moreover, are adults, aware of its value, whatever it is and for whatever purpose, and therefore willing, if not always, at least in principle, to make the effort of the only possible way to acquire it.

But we no longer need this model. The university teacher can, in master class mode, introduce a subject, adapt it to the specificity of his students, link it to nearby or current issues, reveal its hidden implications, try to make it attractive, etc., but he no longer has to be the only carrier of all the information and knowledge that the student needs, and even less to be it all the time, live and on stage. With online teaching, it is almost always possible to watch or re-watch recorded lessons at any time. Normal in-person teaching can also be supplemented by recording and replaying lessons, as was often done in the post-lockdown era of reduced presence and blended learning, and as can be done again to facilitate combining study with any other activity. In fact, there are initiatives such as the flipped classroom, based on the traditional master class being delivered digitally to be prepared beforehand by students outside the classroom and regular hours. Many teachers have long provided support material for their lectures, especially presentations with digital slides (but also, and even earlier, summaries, diagrams, graphs, data tables, printed transparencies, etc.) during class (usually on paper), before or after class (more feasible on digital media). However, it should be added that there have been, and still are, teachers who have refused to provide them, even though they use them in their classes, thus forcing students to take notes as if they were purely oral presentations (there are people who theorize about the student's manual note-taking as a mnemonic device, but there are also people who see it as a trick to fill the teacher's time, not to mention a frankly sloppy idea of intellectual property).

There have always been teachers who did not go beyond the textbook, even some who could not even arrive to the textbook. In fact, at least this was an important part of their original function, precisely in the university: *lectio* and *lector*, an etymology that is still present in terms such as *lección* (lesson in Spanish) although the word *lector* (like *lettore* in Italian) has remained to name the native collaborating teachers of a foreign language – although in Catalonia the word has been recovered for doctoral assistants; lecture, lector, lecturer or reader are still fully in use in English; *lesen, Lektor* or *Vorlesung* in German, etc. The words referred to the act and the actor of reading the text contained in a book, which the students generally did not have and could not have. But university teachers, and all the more so with the advent of the textbook, soon took on another function: to integrate into their masterful teaching some or much of what was contained in the text with other external elements, *i.e.* other texts or authors more distant in space, time, or the division of disciplines, their own and others' experiences and reflections, theoretical or practical demonstrations, activities other than reading and writing, communications and collaborations other than the teacher-student interaction, etc. At the end of the day, the teacher was already acting as a *curator* of an *exhibition*, although his material was mainly information records and his exhibition was basically oral, that is, a lesson. Of course, there were also compilations of readings, invited experts, extramural excursions, laboratory exercises, etc., but always with the essential limitation that the basic stage, the classroom, was for speaking, listening, and writing, and the main information support was the book. The digital transformation of information, communication and culture (but not, as of today, of education), available to everyone (at least to all university students) with the *digital gadgets,* or with the underlaying *digital trinity*: personal device, software and connectivity, and particularly powerful for the management of information and knowledge thanks to software as a *meta-medium* or as a medium of all media (those already used in university education and all others, old and new, those that already exist and those that will come), radically changes the scenario for the teacher, which is no longer characterized by abundance but rather by superabundance and overabundance of all kinds of resources, which takes him out of the traditional role of transmitter, even transmitter of the most advanced knowledge (which is already an increasingly demanding challenge in itself), to take her to the role of curator of this dynamic and changing professional capital, to the role of designer of activities, environments, situations, experiences and learning itineraries.

IV. AI AT THE TEACHER'S SIDE AND SERVICE

The world of computer science has always offered and promised to the world of general education to be more than a medium. On top of other promises, such as developing the intellect, paving the way to better employment, fostering creativity, stimulating interest, etc., the promise of smart tutoring has always stood out. Almost half a century ago, Patrick Suppes wrote: "We can predict that in a few years millions of schoolchildren will have access to what Philip of Macedon's son Alexander enjoyed as a royal prerogative: the personal services of a tutor as knowledgeable and attentive as Aristotle. (Suppes, 1966: 207). As a polymath, Suppes' guild was philosopher, in addition to his solid scientific and mathematical training and advanced computer skills, which made him prone to overestimate and idealize, as most do, Aristotle's tutorial relationship with Alexander (see Brunt, 1993; Gómez Espelosín, 2019). Suppes' idea, however, was strongly anchored in a very traditional and transmissive concept of teaching, or a very passive and receptive concept of learning. The computer would be "programmed to follow the history of each student's successes and failures in learning [his successes and failures on successive questions or tasks] as a basis for selecting the new problems and new concepts to which he should be exposed next." Suppes nurtured a larger ambition, specifically that computers would become capable of understanding a student's question in natural language (which would potentially open the door to everything), and a big question mark about how far one would be willing to go with diversification based on ability. But in any case, both the practical power of computers at the time (Suppes was leading an applied project with Richard Atkinson in a group of Palo Alto elementary schools) and the author's apparent pedagogical approach meant that those experiments focused on highly standardized areas (language and mathematics), where customization was limited to a tightly structured curriculum.

Despite the rapid advance of computer science and the unlimited availability of information and knowledge on the Internet, it can be said that, virtually until yesterday, the promise of smart tutoring, syllabus customization, etc., through artificial intelligence remained within the conceptual –and arguably political, inasmuch as they imply a choice about the distribution of power in the educational process– limits of the individualization of teaching, not learning. In short, the teacher would continue to retain full control. The variant in which the pupil or student, after having followed some instruction (coming from the teacher, the book or the computer) answers some questions or does some exercises and, depending on the correctness or incorrectness of his answers, is allowed to advance or is kept at that level or even returned to a previous level, or is referred to explanations adapted according to his errors or shortcomings or even according to the time of the answer; or the variant in which this information does not provoke decisions by the program, but is sent to the teacher who will decide about it (*human in the loop*). Both are similar because they adapt, diversify or personalize the *teaching*. Of course, they may be more flexible than Skinner's programmed teaching and machine books, or even Crowder's branched teaching books, which already did that on paper, but they are always on the side of teaching, wherever it comes from.

In this model, which we could call *docentric,* a greater and better personalization is expected only on the teaching side. It has always existed in the university, but with a clearly limited scope: in the direction of a doctoral thesis in any university –although not always– or in specific and very expensive models, such as the Oxford tutorial or the Cambridge supervision model. Any ambition for a wider extension leads to the hackneyed problem of the student/classroom ratio, whether in the university or in any other part of the educational system. But this is a demonstrably ineffective and inefficient path, even if it attracts the maximum consensus among teachers (as happens with the overall superiority of the master class at university, grade repetition in secondary school or the intensive and morning day in primary school: all groundless). Reducing the student/classroom ratio, at any level of education, is very expensive and produces little or no results, both in comparison with other measures. Although the weakest analyses can receive an unusual response when they say what everyone wants to hear (*e.g.,* Glass and Smith, 1979), most research and meta-analyses have repeatedly concluded that there are no effects or that they are spurious or negligible (Slavin, 1989, 1990; Odden, 1990; Shin and Chung, 2005; Opatrny *et al.,* 2023), especially as long as they remain within the range of what makes economic sense: from thirty students to twenty, to fifteen, to ten... The effects only really appear at the lowest ratios, three or two students and, of course, one, the ultimate personalization. Part of the plausible explanation is that, in reality, the teaching method does not change until these minimum numbers are reached. This has at least two implications: one is that co-teaching, the presence of two or more teachers in the classroom, may be more effective, not because it reduces the ratio (which will be the same in principle if it is part of the accumulation of groups), but because it allows, almost forces, any teacher who is not teaching to deal, in a more personalized way, with the students; the other is that the teacher's ability to teach differently will depend on his or her prior training in this regard and on the precise information he or she has about each student. I will not discuss that training here, but I will discuss the information available and how to use it.

Universities swim in an ocean of data – as does society as a whole, but even more so because their infrastructure includes a good deal of equipment, their public will always be mostly young people who are uniquely receptive to and fully equipped for technological innovation, their operations include a long succession of administrative records (the digital footprint), and their main activities are already largely digitized (though hardly transformed). However, this gigantic arsenal of data and its continuous flow cannot be exploited by itself. The information that is processed for ordinary administrative processes, annual reports or "transparency" policies are far from ideal; this is evidenced by the widespread preference for presenting data in pdf format, *i.e.* in such a way that it can only be read in the format that the competent authority or office wants to read it and to do it in another way requires a considerable amount of time, which for most is a deterrent in itself. Apart from the necessary availability of the raw data (the suitably anonymized *microdata*) for researchers, such data must be easily readable and interpretable to make this wealth of data truly useful to academic decision-makers; in particular to teachers, on their student groups in the short term and their teaching methods in the long term; as well as to intermediate authorities such as head teachers, coordinators of subjects, degree coordinators, etc., and all the more so for the often promised *personalization,* which is supposed to be agile, practically on the fly. In fact, relevant and manageable data have been available for many years now, and even decades, but they have hardly been used. Spreadsheets are now over forty years old (Lotus 1-2-3 was released in 1983, and Excel was incorporated into Office in 1989 for MacOS and 1990 for Windows), but for decades we could see many teachers ignoring them or using them to make lists and tables (for saving and editing, not for calculating). Virtual environments or learning management systems (EVA/LMS) are not mature yet but they have come of age: Blackboard was launched in 1997, Claroline in 2000, Moodle in 2002, Sakai in 2005... They all include a thorough record of the student activity: how much and when they accessed, what they viewed or downloaded, what they handed in or not, how much time they spent on any interactive functions, etc. This poses the usual privacy issues (as does a paper-based exam or a tutorial in an office) and could conceivably lead to a panoptic drive, but system administrators can easily regulate what data and in what format it goes to whom, particularly to teachers and other academic bodies. The point, quite simply, is that no one, or almost no one, is leveraging this information: neither the university authorities nor the lecturers, many of whom are not even aware of its existence.

The organization of the education system, including the university system, has evolved largely for the sake of simplifying information for and by teachers: one single textbook and one lesson, a frontal classroom, strict schedules of one-hour lessons, standardized exams to the extreme of the multiple-choice test on graded paper, grades from zero to ten, the binary division between pass or fail in any subject, course, or degree, grade repetition as the ultimate and often the only adaptive response... Any alternative to these summary procedures that goes beyond the limits of quick thinking (in Kahneman's sense) or intuition adds uncertainty and is time consuming, so it tends to be rejected or reabsorbed. It will not be possible to leverage the growing flow of information if it is not organized and presented in a way that is agile, accessible and easily interpretable by those who have to use it, especially teachers. This implies, on the one hand, a precise selection of what is relevant and what is not, and, on the other hand, sufficient elaboration so that it does not lead to an avalanche of information or to anxiety, so as not to burden the teacher with information that is not very useful or even counterproductive (a certain Spanish university, a leader in many technological applications, introduced a videoconferencing platform with real-time information on the level of attention or interest of the students – how many are paying attention, how many are distracted, etc., measured in real time with facial recognition software... and they had to withdraw it because its main effect was to provoke distraction and anxiety in teachers). However, this is an area that is little or not at all developed in the field of education, despite the fact that in the social sciences there is a very long tradition of symbolic and graphical representation of information, for which it should not be difficult to develop appropriate user interfaces: dashboards for organizational managers, control panels for teachers, and so on. In this field, and particularly in the field of data visualization, we can learn a lot from the financial world (*e.g.* banking applications and stock exchange information), from medicine (the numerical data of an analysis or the graphical visualization of diagnostic imaging for the professional ordering it), from the printed or digital press (the increasingly common infographics), etc.

In short, the university, like the educational system as a whole, needs a double movement. On the one hand, a shift from the teacher to the data, because although the other side of the university's work, research, is completely data-oriented, and the teaching disciplines focus on content, the practice of teaching is not, either in terms of its scope or its procedure, focusing on data, *i.e.* the data of learning (the digital footprint, clicks) and evaluation (traceability, longitudinal and transversal recording) are not used to adapt the learning and teaching processes. The average teacher today already has approximations through exams and other tests and a necessarily very limited dialogue in tutorial sessions, but digitization offers new, incomparably richer possibilities to study aggregate data from any group of students, more representative for any size, and longitudinal data from each individual student, much more detailed than a small number of tests or a very limited tutorial session. Of course, the more holistic elements, non-verbal communication, theory of mind (what the other is thinking), empathy, mirror neurons, etc. will be missing, but we are not talking about replacing, but combining, coordinating and otherwise complementing direct and indirect information, subjective perception and objective data... On the other hand, the algorithms that collect, process and deliver the data must be closer to the user's experience, *i.e.* to the teacher's perspective, to what she really needs to know, or how it will improve her work if she learns it, and to what he can really handle and assimilate, so that the new information is a support and not a nuisance, a plus and not a minus. This requires not only the specific work of the designers and developers of these information algorithms, but also the participation of the users, *i.e.* the education professionals, from the initial design to the final use, and not only by "dreaming a dream" at the beginning and rating it between one and five stars at the end, but by entering into a dialog at all stages of the process, from conception to implementation, in its alpha, beta and stable phases.

Meanwhile, the character of the year was ChatGPT, and it will do it again; or, in more general terms, it will be Generative Artificial Intelligence (GenAI), especially conversational GenAI. First, it gave teachers in their evaluation role cause for alarm, if not panic. The fact that a statistical program, incapable of understanding the meaning of a word, should cause such anxiety says a lot about the prevailing evaluation procedures and their limitations, but in any case, the waters have calmed down in this respect, while various solutions are being experimented with: ethical codes, exams with panoptic surveillance, digital watermarks, new detectors, etc. More discreetly, the GenAI is already making its way into the preparatory work for the lessons, the teacher's back office, as an assistant (performing tasks) and, if we are to believe the technologists, sooner rather than later as an agent (pursuing objectives, setting tasks itself). In general, GenAI is already remarkably efficient in producing what we could call *metatexts*, *i.e.* texts that are produced from a base text: summaries, identification of the most important points, reworking at a lower level of complexity, translation and transcription, outlines, keywords, suggestions and extensions, exposition plans, presentations, etc. The Internet is already full of applications and websites that offer lesson plans, syllabi, different types of exams, etc. based on GPT. In reality, they are and will be versions of GPT that are somewhat more adapted to a specific educational environment, with stricter but not infallible gatekeepers and improved interfaces that are more or less designed for effective mediation (*e.g.,* anticipating possibilities, suggesting requests or prompts...). Time will tell to what extent these aids open up or close down teaching practices, and to what extent teachers with more time, if any, will spend it on more creative teaching.

V. CONVERSATIONAL AI AT THE SERVICE OF THE STUDENT

The great leap that GenAI can and will make in education, however, is for the student. What was a bombastic promise a little more than half a century ago is now beginning to make sense. Conversational algorithms such as ChatGPT, Gemini, and the like, already as they are and even better with additional fine-tuning for more specific knowledge domains, age groups, or use environments, can now hold a conversation of appropriate content and level for any learning objective. They are not on a par with Aristotle, as Suppes ventured, nor do they surpass or replace the teacher, as technologists and technophiles (not to mention technophobes) keep reminding us in an already tiresome preventive litany, but they can replace teachers in the most ordinary and routine discourse, with limitless availability and immeasurably lower cost. If a substantial part of the information and conversation can be entrusted to an algorithm in terms of quantity and with more than sufficient quality, then teachers will be able to focus on the higher-level information and conversation and being the last resource function after cyber-conversation (whose risks of error, hallucinations, bias, etc. are well known), on the one hand, and more importantly, on the design, curation and improvement of learning processes, which have as one of their active resources the teaching intervention itself, from the master class to the personal tutoring, but no longer the only one, just as the textbook or the handwritten notes are no longer the only inactive resources (and, if in some scenario they were not, horrors!).

It could be said that students would have two teachers: a brilliant, creative, absolutely reliable, intuitive and sensitive, etc., in flesh and blood, assigned by the university, but to whom the student unfortunately will not always have access and will only benefit from him with some regularity during his lectures and the student will very occasionally receive his personal attention because the teacher will be very much in demand. On the other hand, the student will also have another teacher at her disposal, maybe called support teacher, made of silicon and other metals and rather mediocre, not very or not at all creative, not always aware of his limits and therefore unreliable, but on the other hand also very hardworking, always available and in the best sense a know-it-all.

In the university setting, where students are adults, responsible and no longer need to worry about grooming, the essential problem of GenAI, as it happens with all digital and non-digital information (including, though to a much lesser extent, teachers and textbooks, despite the filters they have overcome), is the induction of error. It is obvious that in a new ecosystem where, unlike the Gutenberg galaxy and the old audiovisual world, information is first published and then edited, the risk of false data, unfounded conclusions, informational or interpretive bias, deep fakes, conspiracy theories, pseudoscience(s), etc. is omnipresent. Therefore, the temptation, even the intuitive response, is to build a sanctuary of reason where neither frivolity nor unreason can penetrate, but this is simply impossible. It is feasible to try and limit teaching to an unquestionable content and an uncontaminated ritual, like religion with the catechism and the Mass, but this will be useless without the monopoly of information, as the churches have had to learn. But universities have always sought the opposite, to arrive at knowledge through independence of thought and criticism. Both the contemporary world in which students live and the professional world that awaits them at the end of their studies are already flooded, for better or worse, by digital information and artificial intelligence, that is, by information without filters or with inappropriate filters (and, of course, with appropriate ones), by speakers who are not thinkers, by language-generating algorithms that have no idea of what they are talking about, even if they seem to (but also by the results of an increasingly powerful science and an increasingly rich and pluralistic thought). The role of education, all education and especially higher education, cannot be to isolate and protect children and young people from *bad influences*, but to prepare them to live in a world where they exist.

VI. A NEW ORGANIZATIONAL AND MATERIAL ARCHITECTURE

So far this century, there have been many voices of alarm about the skyrocketing costs of higher education (increasingly difficult for families to afford and/or more expensive for the public purse), the inflation of university degrees (with a consequent reduction in the guarantee of access to the most sought-after professions or even of a return on investment in education), or the divorce between academic culture and youth culture, with a special feed(back) from mass media, the digital ecosystem and social media. Each of these bad omens can, of course, be nuanced: costs are rising, but not in the same way for public and private universities; specific higher degrees may be devalued, but the overall gap between having a degree and not having a degree has not stopped growing; and school and academic degrees have positional value anyway, so the differences in value that separate a good education from a not-so-good one are simply shifting upward; university studies may be losing expressive interest for young people, but this does not necessarily mean that university life as a stage of transition and rite of passage is losing interest, nor does it necessarily mean that degrees are losing instrumental value.

What is indisputable, however, is that the student body is changing and will continue to change. Demographic reports on the student body already point to the growing presence of older students with work and family responsibilities. The extension of secondary education, the scourge of grade repetition, the openness of the vocational training system and its alternative pathways, the introduction of the gap year (a one-year break in the long schooling before going to university), the transition from diploma courses to four-year degrees, the widespread generalization of master's degrees, and the access of young people who need to take more time to complete their studies because they need their own source of income: all these factors contribute to increasing the age at which students start their higher education and to prolonging its combination with work and motherhood, as shown by historical and longitudinal data (Ariño and Llopis, 2011; Hauschildt *et al.,* 2015). The number of young people (up to 29 years old) who study (not only at university) and work (to varying degrees) is already around one million, or one in three, according to the Spanish Labour Force Survey. According to the latest data (school year 2021-22) from the Spanish Ministry of Higher Education (Ministerio de Universidades, 2023: Table 1.3), 27% of those enrolled in bachelor's programs and 40% of those enrolled in master's programs are studying part-time, and there is every reason to believe that the long-term trend will be to increase these percentages.

Thus, on the one hand, we have activities and resources that were inseparable from university space and its collectively organized time, but which are now available independently: digital publications that no longer need to be searched for, used, or borrowed from libraries; classes that can be seen and heard outside the classroom; group work and tutorials that can be coordinated and conducted online, and so on. This is not to say that they should necessarily be cut off from these times and spaces, or that they will necessarily benefit from them, or even that they are guaranteed to retain their value, but it should be remembered that the residential and in-person models also have not only high costs, but also clear limitations: of cost, capacity, transportation, and so on. The most promising way forward –although unfortunately there is no simple formula or guarantee of success– is to seek new combinations of online, in-person and residential learning and teaching (the latter being of little relevance in Spain). For the predominant and dominant university model among us, which is the in-person and local model (with a large majority of students attending –but not necessarily studying– full-time at the university; in the traditional morning or, to a lesser extent, afternoon schedule; and residing in the family home of origin), this simply means that the same learning can be offered with fewer regulated hours and on-site. In fact, students have been slowly but progressively reducing their attendance at schools and even more so at classes, except for reasons of punitive control.

On the other hand, the demand for lifelong learning is increasingly shifting to the university. The idea that we should learn something every day, and that no one should go to bed without it, as the Spanish expression says, may predate universities and schools, but the idea of lifelong learning did not. It was born as a proposal for a second chance for those who did not have sufficient basic education (adult education, vocational training), for more specialized and *ad hoc* training in the workplace (continuing education), or simply for cultural or personal development purposes (cultural extension, classrooms for the elderly, university of experience, etc.). All this continues and will continue in various forms, old and new, but the dissemination, intensification and acceleration of technological change raises a different issue. Peter Drucker (1995) pointed out decades ago that the transformation of industrial workers into knowledge workers would be difficult, if not impossible, at least far more difficult than the transformation of peasants or servants into industrial workers (Drucker was obviously not moved by the personal costs of urbanization, wage labor, insecurity, shock, etc. that the process of industrialization without a protective state entailed, but he was right about knowledge or skills). The point is that industrialization, in reality, replaced more complex jobs, though not very formalized or iterative, with simpler ones, as a result of the division and subdivision of industrial labor, but computerization and digitalization do not do such a thing, but bite directly into the informational and cognitive component of work. Some of the new jobs will be low-skilled or unskilled, consisting of not very complex handling of information, which everyone learns in elementary education, or in the complex skills that are so difficult for machines and algorithms, but which all humans already have by *default, i.e.* as a result of biological evolution and mere upbringing. Those who find themselves replaced in complex tasks and jobs and who want to have access to others with comparable qualifications, especially in the perspective of an increasingly longer independent and active life, will have to go through processes of re-qualification, new learning, equally or more complex, which, for this very reason, neither the employer with the best of intentions will often be able to organize, nor society will be willing to take for granted after any accreditation. In other words, an increasing part of the requalification processes will have to be offered and accredited by institutions of proven solvency, and this, despite all conceivable criticisms and objections, will in many cases increasingly mean universities.

This strength is reflected in the evolution of students enrolled in non-official postgraduate courses (*títulos propios* in Spanish), which are more adapted to the retraining needs generated by retraining, innovation, etc. In the last six-year period with data, from 2013 to 2019, they grew by 28% worldwide, much more than the 6% of official courses; within this specific type of education, the non-official postgraduate courses, in-person public universities saw a 16.3% decrease in enrollment, while in-person private courses grew by 32.9% and online private courses by 197.8% (no data are provided for the period, for online public courses) (CRUE, 2023: 180, 388). Although the pandemic was a shock that affected postgraduate courses more (most of them were of one year, maximum two, so it was easier to interrupt them than the four years ones) as well as private universities (since their tuition fees were more expensive, it was more tempting and rational to do so), the general trend seems clear. Graduate education will continue to grow faster than undergraduate education, unofficial postgraduate courses will grow faster than official degrees, private offerings and enrollments will grow faster than public, and online or blended learning will grow faster than in-person and, of course, residential. This new mix of offerings is comparatively easier for private universities, which have to find a niche in the market (compatible with state regulation of the sector) from the moment they are born, but not so for public universities, whose internal continuing education services, which are usually entrusted with all non-official teaching, are rather routine, bureaucratic, and have grown up in the bad school of continuing education for non-teaching staff (continuing education for teaching staff as such almost does not exist).

The obvious redundancy of traditional teaching, the new technological possibilities, the new type of students, the rising costs, the experience of the pandemic, and the new configuration of curricular offerings, all in the context of profound social changes in information, culture, work, and family, will converge to push for the relativization of the prevailing model, inherited from the pre-Gutenberg *lesson* and the post-Gutenberg *manual*, and the questioning of quite a few prevailing practices. In my humble opinion, this can, should and must be done along two lines that in principle converge, or which at least should indeed be aligned. The first, which is on the mind of all those interested in innovation but in different ways, is the combination of learning and teaching in-person and online, in-person and distance, synchronous and asynchronous, group and individual, classroom and collaborative. Not simply *blended* formulas, at least not if they are understood as a juxtaposition of in-person and online activities, but hypermedia scenarios and configurations that allow the combination, simultaneity and seamless transition from one medium to another, between different forms of autonomous, collaborative or structured work.

The second must be a reorganization of space and time, especially toward more flexibility and ubiquity and less presence and regimentation. Although in practice Fridays are falling into disuse in traditional higher education (like Saturdays before them), it is still shocking that there is so much talk about a four-day work week but not about the university week. In short, there is too much time in the classroom and not enough time for individual and collaborative learning. There are too many hours in classrooms for the same reason there are too many chairs in libraries: because they are no longer necessary, much less essential, for access to information and knowledge. On the other hand, there is a lack of physical spaces and means for individual and collaborative work –means of communication and sharing and guidance in the sea of digital resources– and a lack of guidance, curation and tutoring in them. Higher education could easily afford to reduce classroom hours. Scaling up tutoring in the current way would be prohibitively expensive, but doing so with a combination of personal tutoring, smart tutoring based on predictive data analytics (direct and teacher mediated, depending on what for), and dialog with a cool generative AI-based algorithm or robot could be a promising way forward.

This journey has already begun. Chatbots abound in administrative life, and have been in the news as assistants at least since the Jill Watson case (Dede *et al.,* 2018); smart tutoring has not yet delivered what it promised, nor can it be approached without caution, but analytic prediction offers potentially very valuable information for teachers and institutions; conversational AI is already being used in various forms by many teachers and in every imaginable way by students (and by their teachers in the backroom); several universities are already experimenting with hyperhalls (*hiperaulas*: Fernández Enguita, 2018), innovative learning environments and other forms of flexibilization of the use of space and, subsidiarily, time. The university gives a great deal of freedom to the lecturer in his classroom and with his group, but at the same time, its distribution of responsibilities and its very fragmented decision-making mechanisms hinder and slow down any innovation (Fernández Enguita, 2023). Digital transformation benefits from the previous existence of powerful research and management infrastructures but suffers from this fragmentation. Innovations related to spatial and time organization, especially the deployment of blended formulas, tend to grow on the fringes (the training offer for a non-traditional public and in some private universities), but it is a path that could be opened to pre-existing teaching groups, subjects and degrees precisely because of their fragmentation, because of their *loose coupling* (Weick, 1976).

Universities are not the best place to implement a major top-down reform; the closest example is the so-called *Bologna model*, which changed the structure in cycles, but did little and did not even achieve the most basic thing, which is that the teaching load became a common measure and not just a nominal one. Digitalization and digital transformation, in short, whether in the old normality, in the new one, or in the emergence between the two, have generally not gone beyond reproducing what can be reproduced from in person environment, but in the digital one, often exacerbating all its components of transmission, unilateralism... in other words, the characteristics of traditional pedagogy, and leaving behind, at least for a while, the best previous innovation, which was not much, but at least there was something. But the growing power of personal infrastructure and equipment, in particular the increasingly developed synergy of the more and more developed digital *trinity* of device-software-connectivity, and above all the interactive, dialogic element of generative AI, which was previously practically absent, are now forcing the institution to choose between trying to ignore them and being overwhelmed by them (as distraction, as plagiarism, as parallel learning, as alternative knowledge...) or increasingly integrating them into its regular activity. Its captive audience has allowed the university, in its teaching dimension, to be protected from the digital transformation, but the external pressure and the internal forces are already too strong, especially with the irruption of GenAI. Being an institution facilitates, through decoupling (Di Maggio and Powell, 2012), the creation of small spaces for innovation, even radical innovation, although this is also something that hinders its expansion and often the necessary scale. We hope that the internal flexibility, combined with the external storm, will allow us and make us move in the new direction.

BIBLIOGRAPHY

Ariño Villarroya, A., and Llopis, R. (2011). *¿Universidad sin clases?: Condiciones de vida de los estudiantes universitarios en España (Eurostudent IV).* Secretaría General Técnica.

Auletta, K. (2012). Get rich in the U. *The New Yorker,* 30, 38-47.

Blaschke, L. M. (2012). Heutagogy and lifelong learning: A review of heutagogical practice and self-determined learning. *The International Review of Research in Open and Distributed Learning, 13*(1), 56-71.

Brunt, P. A. (1992). *Studies in Greek history and thought.* Oxford University Press.

Carey, K. (2016). *The end of college: Creating the future of learning and the university of everywhere.* NY: Riverhard.

Carnevale, A. P., Schmidt, P., and Strohl, J. (2020). *The merit myth: How our colleges favor the rich and divide America.* The New Press.

Christensen, C. M., and Eyring, H. J. (2011). *The innovative university: Changing the DNA of higher education from the inside out.* Wiley.

Christensen, C. M., Horn, M. B., Caldera, L., and Soares, L. (2011). *Disrupting college: How disruptive innovation can deliver quality and affordability to postsecondary education.* Innosight Institute.

Christensen, C. M., Horn, M. B., and Staker, H. (2013). *Is K-12 Blended Learning Disruptive? An Introduction to the Theory of Hybrids.* Clayton Christensen Institute for Disruptive Innovation.

Cope, B., and Kalantzis, M. (2009). *Ubiquitous learning.* University of Illinois.

Cronin, J. M., and Horton, H. E. (2009). Will Higher Education Be the Next Bubble to Burst? *Chronicle of Higher Education, 55*(37).

CRUE. (2020). *La Universidad frente a la pandemia. Actuaciones de Crue [sic] Universidades Españolas ante la COVID-19*. Conferencia de Rectores y Rectoras de las Universidades Españolas. https://bit.ly/41S8zBq, (accessed 2 February 2024).

DEDE, C., RICHARDS, J., and SAXBERG, B. (Eds.). (2018). Jill Watson. *Learning engineering for online education: Theoretical contexts and design-based examples.* Routledge.

DOWNES, S. (2008). Introducing EduPunk. https://bit.ly/3S3z6Zk (accessed 2 February 2024).

DRUCKER, P. F. (1995). *The age of social transformation.* Centre Canadien de Gestion, Ottawa.

ESPELOSÍN, F. J. G. (2019). Aristóteles, Alejandro y la 'politeia' griega. *Gerión, 37*(2), 343-362.

FERNÁNDEZ-ENGUITA, M. (2018). *Más escuela y menos aula: la innovación en la perspectiva de un cambio de época.*

FERNÁNDEZ-ENGUITA, M. (2022). Que la pandèmia no us confongui. *Observatori de l'educació local -Anuari 2022,* 18-23. Collecció Eines, Sèrie Educació 12. https://bit.ly/3O5lB86 (accessed 2 February 2024).

FRANK, R. H. (2016). *Success and luck: Good fortune and the myth of meritocracy.* Princeton University Press.

GHADIRI, K. (2014, June). Developing and Implementing Effective Instructional Strategems in STEM Paper presented at 2014 *ASEE Annual Conference & Exposition,* Indianapolis, Indiana. https://doi.org/10.18260/1-2--20282

GHADIRI, K., QAYOUMI, M. H., JUNN, E., HSU, P., and SUJITPARAPITAYA, S. (2013). The transformative potential of blended learning using MIT edX's 6.002 x online MOOC content combined with student team-based learning in class. *Environment, 8*(14), 14-29. https://bit.ly/4clyMri (accessed 2 February 2024).

GROOM, J. (2018). The Glass Bees. Bavatuesdays 25/5/08. https://bit.ly/47AxUkV (accessed 2 February 2024).

HASE, S., and KENYON, C. (2000). From andragogy to heutagogy. *UltiBASE In-Site,* dic. https://bit.ly/3A4dy2B (accessed 2 February 2024).

HAUSCHILDT, K., GWOSC, C., NETZ, N., and MISHRA, S. (2015). *Social and Economic Conditions of Student Life in Europe: Synopsis of Indicators. Eurostudent V 2012-2015.* Bertelsmann.

HERNÁNDEZ ARMENTEROS, J., PÉREZ GARCÍA, J. A., FURIÓ PÁRRAGA, B., HERNÁNDEZ CHICA, J., and SALINAS GONZÁLEZ, L. (2023). *La universidad española en cifras, 2019/2020.*

Hess, A. (2017). Harvard Business School professor: Half of American colleges will be bankrupt in 10 to 15 years. *CNBC,* 15/11. https://cnb.cx/3xoTexa (accessed 2 February 2024).

Hodges, C. B., Moore, S., Lockee, B. B., Trust, T., and Bond, M. A. (2020). The difference between emergency remote teaching and online learning. *EduCause Review.* https://bit.ly/3B8la4q (accessed 2 February 2024).

Horn, M. (2018). Will half of all colleges really close in the next decade. *Forbes,* 13/12.

Markovits, D. (2019). *The meritocracy trap.* Penguin UK.

Ministerio de Universidades. (2023). *UNIV base. Estadística de Estudiantes.* Número de estudiantes en las universidades españolas. https://bit.ly/437z2Mh (accessed 2 February 2024). https://bit.ly/4cI0N2e (accessed 2 February 2024).

Modic, S. J. (1997). Peter Drucker: Seeing things as they really are. *Forbes,* 62, 2: 5. https://bit.ly/41L03Eq (accessed 2 February 2024).

Opatrny, M., Havranek, T., Irsova, Z., and Scasny, M. (2023). *Class Size and Student Achievement: A Modern Meta-Analysis.* https://bit.ly/3J7bxcU (accessed 2 February 2024).

Pappano, L. (2012). The Year of the MOOC. *The New York Times, 2*(12).

Pardo Kuklinski, H., and Cobo, C. (2022). Expandir la universidad más allá de la enseñanza remota de emergencia. Ideas hacia un modelo híbrido post-pandemia. *OPENAIRE*. https://bit.ly/3WYxD6b (accessed 2 February 2024).

Piscitelli, A., Gruffat, C., and Binder, I. (2012). *Edupunk aplicado: Aprender para emprender.* Fundación Telefónica.

Powell, W.W., and DiMaggio, P. J. (2012). *The new institutionalism in organizational analysis.* University of Chicago Press.

Rama, C. (2021). *La nueva educación híbrida.* UDUAL.

Rivard, R. (2013). Measuring the MOOC dropout rate. *Inside Higher Ed,* 8.

Saleh, A., and Sanders, H. (2014). The wolf in sheep's clothing: The Matthew effect in online education. *Revista Internacional de Sociología de la Educación, 3*(1), 26-50.

SANDEL, M. J. (2020). *The tyranny of merit: What's become of the common good?* UK: Penguin.

SHAH, D. (2023). 2022 Year in Review: The "New Normal" that Wasn't. The Report, Class Central. https://bit.ly/3TOsihQ (accessed 2 February 2024).

SLAVIN, R. (1990). Class size and student achievement: Is smaller better? *Contemporary education, 62*(1), 6.

SLAVIN, R. E. (1989). Class size and student achievement: Small effects of small classes. *Educational Psychologist, 24*(1), 99-110.

SUPPES, P. (1966). The uses of computers in education. *Scientific American, 215*(3), 206-223.

WEICK, K. E. (1976). Educational organizations as loosely coupled systems. *Administrative Science Quarterly, 21*(1), 1-19.

WEISE, M. R., and CHRISTENSEN, C. M. (2014). *Hire Education: Mastery, Modularization, and the Workforce Revolution.* ERIC.

WOOD, P. W. (2011). The higher education bubble. *Society, 48*(3), 208-212.

THE HUMANITIES IN THE 21ST CENTURY UNIVERSITY

Juan Luis SUÁREZ

Abstract

This article on the humanities in the 21st century university begins with an analysis of enrolment trends in North American universities, with a particular focus on universities in the province of Ontario, Canada. The picture that emerges is one of a marked decline in demand for humanities programs at most universities, including my own Faculty of Arts and Humanities at Western University. The final sections of the article offer a diagnosis of the current situation and an analysis of the expected impact of Generative Artificial Intelligence on humanistic offerings, which should be seen as an opportunity and lever to make the necessary changes as shown in the decline in enrolment to make the programs more attractive for current and future students. In the final part, I trace some possible trajectories for the new humanities of the 21st century, using my faculty as a case study of this transformation. The humanities are desperately needed to shed light on current global changes, to provide young students with points of reference for their lives, and to begin a transformation that will sooner rather than later confront all university disciplines.

Keywords: Humanities, 21st Century, innovation, transformation, new degrees, multidisciplinarity.

JEL classification: I21, J24.

I. INTRODUCTION

This article aims to be a realistic, serious and optimistic reflection on the current status of the humanities in our universities, as well as on the avenues that are opening up for these disciplines in the universities of the coming decades. More than ever, universities are part of an economic and social context that affects them and from which they must draw to renew their social mission in the 21st century. This context is characterized by the uncertainty felt by families whose children are planning to go to university, by the strong international competition between universities, which forces them to differentiate and develop, and by the intrusion of generative artificial intelligence into intellectual, creative and research processes that have hitherto been the domain of various university disciplines, including the humanities.

This text begins with an analysis that includes a description of the historical origins of the humanities (Section II), an assessment of enrolment trends and student growth in the Ontario, Canada, university system over the past decade (Section III), an explanation of the context and status of the humanities at the University of Western Ontario (Section IV), and a hopefully realistic diagnosis of the overall situation.

Section V focuses on the disruption caused by generative artificial intelligence and how it affects not only the creation and dissemination of knowledge generated in universities, with an emphasis on the learning process rather than research activities, but also the specific skills that this technology can replace. Considering that, for several decades now, undergraduate programs have been partly oriented towards the training of certain skills that students acquire as a steppingstone to the labor market, the assessment of what can be replaced by generative artificial intelligence and the new opportunities that lie behind this disruption are two of the most urgent tasks for the humanities and the rest of the university programs.

In Section VI, the evaluation of the possibilities that open up with the emergence of generative artificial intelligence is analyzed, which must be considered as the lever to activate changes that the humanities had to make anyway.

Finally, Section VII starts from the specific scenario of the Faculty of Arts and Humanities to outline a path of innovation and evolution that, taking advantage of the constraints imposed by the context and the great opportunities for renewal that generative artificial intelligence will create, will lead to the creation of the humanities of the 21st century. The transformation of the humanities is not only about the content and skills taught in the curricula, but rather about the way of thinking and articulating the intersection between the human and the skills that will make humanities present in today's labor market. In this sense, I believe that the new humanities are more necessary than ever. My aim is for the example presented here to serve as a guide and a beacon of hope.

II. THE CONTEXT

The context of the humanities in the 21st century is marked by three main factors: their own history, the digital transformation of the human condition, and the transition to a university based on the development of skills and the professionalization of its degrees.

The origins of the humanities, or the humanistic disciplines, must be traced back to Humanism. This task, as Francisco Rico pointed out, is not easy and can be undertaken by looking at both words and things. By "words", Rico was referring to the origin of Humanism in the nineteenth century –far from the *studia humanitatis* associated with the Renaissance renewal of European universities– and to the layers of interpretation with which this origin has covered our understanding of the phenomenon. Thus, its origin as a term is linked to the creation of "an educational project of the early nineteenth century and only later applied retrospectively, tentatively, to the framework of a then little-studied Renaissance" (1993, p. 12). Rico relates this birth to some characteristics that have accompanied our collective interpretation of the phenomenon up to the present day: an interpretation which includes issues as diverse as human rights, human sciences, specifically human values or humanitarianism, and other social and political movements more or less firmly linked to humanism (p. 12). Perhaps the most interesting aspect of this journey is the fact that the disciplines, the humanities, predate the identification of the intellectual movement known as "Humanism", and that this historical decoupling can be used in the 21st century to develop a humanities whose practice will subsequently lead to the formulation of a new humanism of the digital age.

When he speaks of "things", Rico is referring to the effects of an "ideal of renewal" that flourished in many fields and whose success has perhaps been one of the causes of its various declines throughout history, including this crisis in which humanism and the humanities find themselves in the 21st century. This history of humanism can be seen in the light of one of its disciplines: philology, elitist and specialized, but also part of the history of elementary education, whose essential practices of writing and reading being available to all as a source of education, humanization and citizenship, have clear origins in the

Renaissance. In this way, Rico arrives at a definition of humanism that can serve, even if only partially, as a guide for talking about the humanities in our own time:

> "...it is legitimate to call *humanism* a historical tradition that is perfectly defined, a line of continuity of men of letters who transfer certain knowledge from one to another and feel that they are heirs to the same legacy and, however controversial it may often be, also linked to each other. (...) That this line starts from Petrarch's *"reflorescentis eloquentiae prínceps"* and that only *"post Petrarcham emerserunt litterae"*, is a conviction shared by Bruni and Flavio Biondo as well as by Erasmus, Luis Vives and Scaliger. So it would not even be an exaggeration to say that humanism was in many points the process of transmission, development and revision of Petrarch's great lessons (p. 13)".

The Petrarchan genealogy has many and very rich branches in its historical transit to the present day, although it is the focus on language and, specifically, on grammar and eloquence, which constitutes the key innovation of the humanities in its break with the university models of the Middle Ages. Rico describes this by echoing the main idea that "the foundation of any culture must be sought in the arts of language (...); the idea that classical language and literature (...) must be the gateway to any doctrine or endeavor worthy of esteem, and that correctness and elegance of style (...) are an inescapable requisite (...); the idea that the language and literature of the classics (...) are the gateway to any doctrine or endeavor worthy of esteem, and that correctness and elegance of style (...) are an inescapable requisite of all intellectual activity; the idea that the *studia humanitatis* thus conceived, by reviving Antiquity, will succeed in bringing about a new civilization" (p. 18).

Nothing has been more affected by the digital transformation of the human condition than language.[1] Thus, the transmission of traditions such as the Petrarchan and, more generally, the humanist traditions were the first to be affected by the dimension of change brought about by the digitalization of the objects of cultural transmission, bringing to life McLuhan's famous phrase about the medium being the message (1994, p. 7).[2] In this way, the digitalization of cultural transmission vertically, or from the past, and horizontally, or within the same generation, has meant an exponential change in the way culture is of practiced and understood, the foundation of which the humanities have placed

[1] Only the "scientific" ability to modify human behavior through digital technologies has been similarly impacted.

[2] "In a culture like ours, long accustomed to splitting and dividing things as a means of control, it is sometimes a bit of a shock to be reminded that, in operational and practical fact, the medium is the message." (McLuhan, 1994).

in the language arts. With the digitalization of books, texts, images and videos, and with the networking OF the participants in any global or local culture, the hierarchy of cultural sources, and their order of priority –as we would say in legal theory –, the possibility of establishing and distributing a single or majority tradition whose practice could be universal in those same cultures, has been definitively altered. On the other hand, this torpedo of digitalization on the waterline of the humanities[3] ended up even more aggressively reaching the linguistic foundation of these disciplines, first by displacing the privileged role of classical and vernacular languages –that relationship between sublime language and intellectual activity– towards programming languages; later by affecting the use of spoken and written language through social media and networks (Mcgulloch, 2019) and, more recently, by the mass distribution of the products of generative artificial intelligence (hereafter, AI) which has brought to the table both the importance of language in AI production (Bender *et al*., 2021) and the possibility of eliminating or reducing the friction that humans encounter in learning and using, by speaking and writing, that language that was considered to be the basis for the humanization of individuals and the creation of high culture by societies.

Finally, the digital transformation of the human condition would be complete when almost all the major elements of human life were to be presented to us and we began to experience them digitally. The digitalization of human life would thus become "the object of the greatest engineering workin human history: the digitalization of reality."[4]

In this context of permanent and very rapid digital transition, the humanities also find themselves in a university besieged by successive waves of change and disruption brought about by digitality. The transition to a new kind of university has been underway for several decades, but the acceleration of the digital transformation of the human condition and the announcement of our entry into a new industrial revolution (Schwab, 2016) have only accelerated developments in this direction. The transformation carried out at Arizona State University to create a university based on broadening access regardless of the social and economic background of future students, the constant innovation of academic organization according to design techniques and the commitment to

[3] For a historical overview of the history of humanist thought beyond its university trajectory to recent post-humanisms, see Sarah Bakewell (2023).

[4] "Digitalization does not take place only in devices and systems (that is how it began) unless by systems we mean systems of reality, nor does it take place only in the field of information, since there is no separation, no distinction between digital information and reality. In digitalization processes, digital information is reality. Therefore, the human condition, as we currently understand it, is the digital condition". (Suárez, 2023).

multidisciplinary centers and programs, seems to remain one of the benchmarks for a new university that is able to reconcile the highest possible level of access to the university regardless of the economic situation of the student, with competitiveness and innovation in the creation of knowledge and the strategic use of distance learning in a hybrid model.[5]

To understand these changes, it is best to look at what is happening now or is about to happen, rather than at the changes we have seen in recent decades. To do this, we use the analysis of Michael D. Smith (2023), who links the changes taking place in higher education to the three types of scarcity that have defined and constrained university education for centuries. For Smith these would be access, instruction and credentials.

The digital revolution and the acceleration of the pandemic have coincided to demonstrate the possibilities of a higher education in which barriers to access for economic, social or geographical reasons no longer make sense. Technological possibilities have promoted teaching models that distance themselves from, and even threaten, the traditional model of face-to-face universities, allowing a huge range of learning modes and types of knowledge to be taught in this way. The transformation in the abundance[6] of access and instruction is accompanied by a third element: credentials. Credentials are certifications of the knowledge and skills acquired by a learner, *i.e.* of their abilities or *skills*, regardless of whether they have been acquired as part of a university degree. Many large companies now offer their own credential programs, both for their employees and for the general public,[7] without the need for a prior degree, thus widening both access and learning opportunities for a larger number or different population than can attend traditional universities.

In addition to increasing the supply of education, credentials also decouple the degree, *i.e.* the diploma that universities continue to issue as one of their main assets, from the actual skills that any student can acquire

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5 "…the Fifth Wave in American higher education–a league of colleges and universities, spearheaded initially by a subset of large-scale public research universities, unified in their resolve to accelerate positive social outcomes through the seamless integration of world-class knowledge production with cutting-edge technological innovation and institutional cultures dedicated to the advancement of accessibility to the broadest possible demographic representative of the socioeconomic diversity of our nation." (Crow and Dabars, 2020).

6 The analysis follows the idea that digitality is an economy of abundance, although it should be specified that after digital abundance at certain stages of value creation in any field also comes the construction of new gateways that allow, in this case digital platforms, to control both the access and the flow of this abundance.

7 For example, Google through Coursera.

without going through the full cycle and the investment of time and money that a university degree requires. For Smith, credentials help to change the system of signals on which the labor market is based, complementing and, perhaps in the future, replacing the weaker signal that a university degree sends out with the stronger and more specific signal that these credentials send out about what a candidate for a specific job knows and can do. And while, as Smith points out, there are many academic fields in which it is difficult and inappropriate to apply a credential system, credentials are an effective way of retraining certain workers, sending a clear signal to the market about what they can do, and widening access to education for traditionally marginalized or vulnerable populations.[8]

In their analysis of six new universities or university start-ups founded in different parts of the world in recent years, Penprase and Pickus (2023) identify some of the major problems associated with university education in the United States, among which they point to "a growing perception of the liberal arts as outmoded and irrelevant to the challenges of the twenty-first century" (p. 2). It is important to note, however, that while the association and even identification of the liberal arts with the humanities is commonplace, the same authors argue for a liberal arts-based definition of education that is broad and holistic and that seeks to prepare workers and citizens to think and learn independently.[9]

It is these liberal arts and sciences education that would provide certain competitive advantage and meet a need in the global and technological societies of the 21st century. The reasons for this position would be the changing and uncertain nature of work and the knowledge economy, the increasing complexity of the challenges we face both nationally and globally, and the trend towards an increasingly confrontational world due to hyper-individualism and the decline of religious norms almost everywhere (pp. 25-6)

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8 In the context of universities in Ontario, Canada, the provincial government describes micro-credentials as follows: "Micro-credentials are rapid training programs offered by postsecondary education institutions across the province that can help you get the skills that employers need. Micro-credentials help people retrain and upgrade their skills to find new employment. Available from https://www.ontario.ca/page/micro-credentials-ontarios-postsecondary-schools

9 "It includes a set of common courses or classes in a breadth of disciplines as well as the development of intellectual competencies that go beyond specific disciplinary content. The liberal arts purposefully inculcate problem-solving and analytical skills, the ability to listen and communicate, and the capacity to integrate and make meaning out of contending intellectual and cultural perspectives. (…) Liberal arts and science education strives to prepare graduates to make wise contributions to technologically dynamic and culturally diverse societies. *This approach contrasts most directly with the dominant method of education globally, which is highly specialized or technical and explicitly vocational in orientation.*" (Penprase and Pickus, 2023, p. 16).

In this context, the emphasis on the arts of language and literature, the link with a tradition that allows the reinvention of a social or national project around culture, and the value of intellectual activity *per se* in the university context, have lost the weight they had not only in the Renaissance, but even since the beginning of the 21st century, and especially since the revolutionary digital convergence of mobile phones and social media around 2007, the year of the launch of the first iPhone.

III. THE ONTARIO UNIVERSITY SYSTEM, CANADA

To illustrate the dilemma faced by humanities curricula and departments in universities around the world, we use the case of the province of Ontario, Canada, and conclude with the specific case of Western University.

Ontario has 23 "publicly assisted" universities, a designation that refers to what used to be considered public universities, but which the provincial government changed at the same time as it changed the funding model.[10] These universities remain accountable to the Ministry of Colleges[11] and Universities in a context where the weight of private universities is almost non-existent. The Ontario government directly funds universities through an annual grant,the value of which is calculated based on the number of students enrolled and certain other quality criteria.[12] It should be noted that in 2017, the government decided to limit the number of domestic students[13] they would fund through this grant, thus halting the growth in student numbers as a source of growth in university budgets in that year. In addition, Ontario also sets the tuition fees that universities can charge their domestic students, except for some professional programs for which there is some local autonomy in setting prices. In terms of tuition fees, the current provincial government reduced tuition fees for all programs by 10% to maintain them at 2019 prices until now.[14] In this context, for more than a decade, universities have been redoubling their efforts to fill the

[10] The Ontario Government's expenditure budget –which has the responsibility for university education, but not for research, which is the responsibility of the Federal Government– devotes 39.3% to the health sector, 16.8% to education (primary and secondary), and 9.4% to Children, Social and Community Services. In addition, Other Programs cover 19.4%. The university sector receives 5.9% of Ontario's expenditure budget.

[11] *Colleges* refers, in the Canadian context, to vocational training and trades.

[12] The government's goal is to move to a funding model less dependent on the number of students enrolled and more based on performance indicators, up to a total of 60% of the grant.

[13] This group is made up of students from Ontario plus students from other provinces and territories in Canada (with different enrolments).

[14] At the time of writing this paper Ontario had not set a position on what it would do in the 2024-2025 budget with respect to tuition or how it would respond to the Blue-Ribbon Panel on Postsecondary Education Financial Sustainability Report, available at: https://files.ontario.ca/mcu-ensuring-financial-sustainability-for-ontarios-postsecondary-sector-en-2023-11-14.pdf

budget gap left by the loss of state funding, whether through grants, research funding, internal services, especially at residential campuses, the development of undergraduate and, especially, postgraduate professional programs. One of the most important new sources of funding from 2019 onwards, in line with the country's immigration policy, is the enrolment of international students, mainly from Asia and especially China. However, the post-pandemic scenario has led to a significant decline in this source of income or, in other cases, to a freeze in its growth. In addition, the saturation of an international student market that already had very experienced players in countries such as Australia, the United Kingdom and the United States, and the role of international university rankings in student preferences, make this a highly competitive market. Finally, the climate of geopolitical tensions and realignments in groups of allies has, at various times, particularly affected Canada's relations with some of the countries that have contributed the most international students to Ontario universities, such as India, Saudi Arabia and China. Lastly, in terms of budgetary policy, all universities have attempted to reduce operating expenditures on the largest line item, faculty salaries, by freezing new positions, incentivizing retirements, and eliminating programs and degrees that were not financially sustainable.

According to the Higher Education Quality Council of Ontario,[15] 164,966 students applied for admission to one of the province's 23 publicly assisted universities in the 2022-2023 school year. Of these, 92,419 were from Ontario high schools, while 72,547 were from outside Ontario. These figures are consistent with what appears to be a steady and controlled increase since the 2012-2013 school year (141,222, of which 49,592 were from outside the province).The majority of these students are non-Ontario students, including international students, whose absolute numbers and weight in the system have increased significantly over the past decade.[16]

In terms of total undergraduate enrolments, Ontarian universities had 410,829 students in 2020-2021, of which 63,363 were international students.

According to the report, "from 2008 to 2021, the panel reported, university Nominal Operating Grants in the province fell from $8,514 to $8,350 per student", without taking into account the inflation per student. On this case, see: https://cupe.ca/government-appointed-panel-confirms-massive-university-underfunding-ontario; https://universityaffairs.ca/news/news-article/will-ontario-answer-calls-for-increased-postsecondary-funding-and-tuition/).

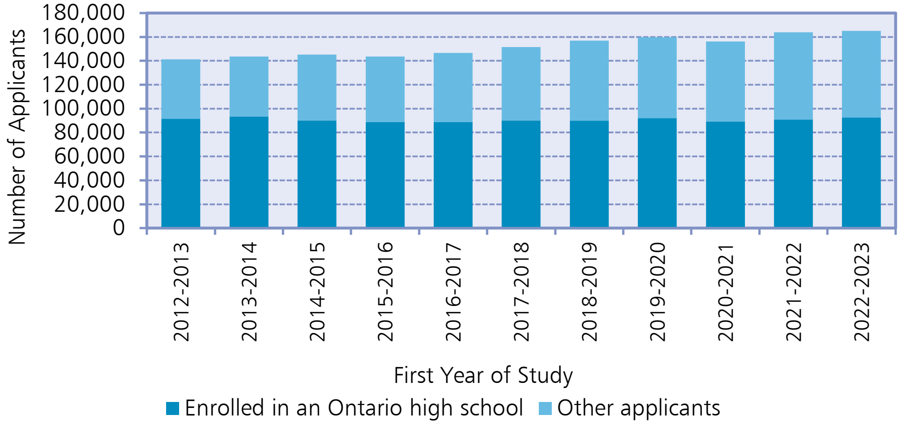
According to the president of the Council of Ontario Universities, there would be some 20,000 domestic students not funded by the provincial government (at a loss of $175 million per year for the universities) and at least ten universities would have projected structural deficits in their upcoming budgets. On this case, see https://globalnews.ca/news/10213696/ontario-universities-funding-request/

[15] Heqco.ca. It is an agency of the Government of Ontario.

[16] The only public university created in the last few years is Ontario Tech University, founded in Oshawa in 2022, with just over 10,000 students enrolled in 2021.

FIGURE 1

UNIVERSITY OF ONTARIO: APPLICATIONS, UNDERGRADUATE DEGREES, BY APPLICANT STATUS[17]



Status of applicant	*2012-2013*	*2013-2014*	*2014-2015*	*2015-2016*	*2016-2017*	*2017-2018*	*2018-2019*	*2019-2020*	*2020-2021*	*2021-2022*	*2022-2023*
Enrolled in an Ontario high school	91,630	93,392	90,171	88,629	88,798	90,219	89,851	91,896	89,317	90,859	92,419
Other applicants	49,592	50,239	55,110	54,920	57,726	61,337	67,074	67,728	66,738	72,894	72,547
Total	141,222	143,631	145,281	143,549	146,524	151,556	156,925	159,624	156,555	163,753	164,966

Source: Ontario University Application Centre.

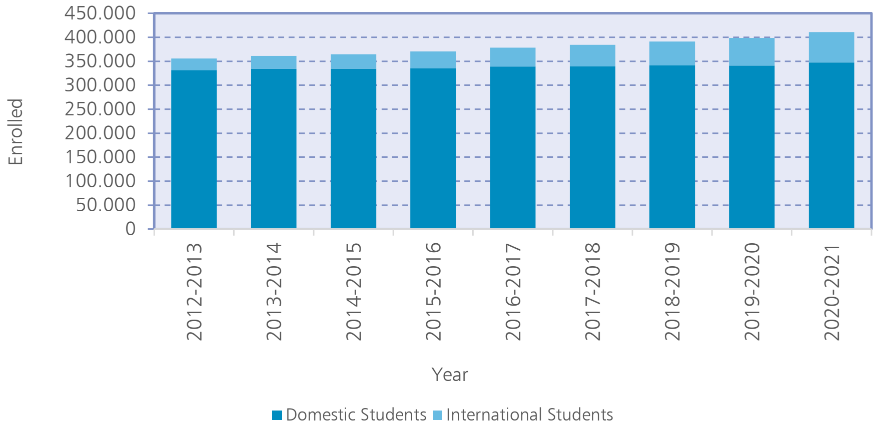
Again, the total increase of students in the province's universities is around 15.4% over the last decade, while that of international students is close to 160% over the same period.

The figures for master's and PhD students are similar. The increase from 2012-2013 to 2020-2021 was 33.1%, for a total of 69,518 postgraduate students across the province, of which almost 20,000 were international in the academic years 2019-2020 and 2020-2021.

[17] See: https://heqco.ca/data-and-resources/quick-stats/1-1-number-of-applicants-to-ontario-university-undergraduate-programs/

FIGURE 2

ONTARIO UNIVERSITIES: FULL-TIME ENROLMENTS, UNDERGRADUATE DEGREES, BY DOMESTIC/INTERNATIONAL STATUS AND FIELD OF STUDY[18]



	2012-2013	*2013-2014*	*2014-2015*	*2015-2016*	*2016-2017*	*2017-2018*	*2018-2019*	*2019-2020*	*2020-2021*
Domestic Students	331,613	334,244	334,107	335,594	339,025	339,717	341,340	341,096	347,466
International Students	24,356	26,842	30,555	34,908	39,171	44,301	50,003	57,184	63,363
Total	355,969	361,086	364,662	370,502	378,196	384,018	391,343	398,280	410,829

Source: Ontario Ministry of Colleges and Universities.

Thus, in 2021-2022 alone, Ontario universities awarded 183,157 undergraduate degrees, of which 12,191 were to international students. In the case of postgraduate studies, the number of degrees awarded reached just over 60,000 in 2020, of which 17,301 were awarded to international students.

When we analyze the enrolments and graduates' data from the different fields of study,[19] we observe the following conclusions regarding the humanities. In terms of enrolments in related programs, there has been a consistent and

[18] See: https://heqco.ca/data-and-resources/quick-stats/2-2-undergraduate-enrolment-in-ontario-universities/

[19] HEQCO uses Statistics Canada's *Classification of Instructions Programs (CIP)*. In some universities, in addition to the disciplines under the Humanities label, the disciplines of "Visual and Performing Arts, and Communication Technologies" could be considered to correspond to a version of the humanities. However, in other cases, there has been a process of specialization and distinction of disciplines that has led to the creation or maintenance of separate faculties, *e.g.* Music, or Information and Media Studies.

sustained decline in the humanities, from 51,907 enrolments in 2012-2013, with few international students, to 35,383 enrolments of Canadian students in 2020-2021, a decline of 28.6% in the domestic market. This was partially offset by the presence of 7,254 international students (42,637 in 2020-2021), but without returning to the 51,907 of 2012-2013. For postgraduate programs, the deterioration is smaller but also steady, from 3,969 students in 2012-2013 to 3,635 (613 international) in 2020-2021.

The number of students graduating with a humanities degree in this period decreased from 16,802 in 2012-2013 to 11,182 in 2021-2022 (33,448%). In postgraduate programs, the number fell from 1,147 to 938 (including 61 international students) in 2021-2022.

This means that while the total number of undergraduate students in Ontario has increased by 38.4% over the past decade, the number of undergraduate students enrolled in humanities programs has decreased by almost 17.86%. In relative terms, humanities departments and faculties now directly serve only 10.37% of all undergraduate degree demand in the province, down from 14.58% in 2012-2013.

IV. THE HUMANITIES AT WESTERN UNIVERSITY

Western University was founded in 1878 in London, Ontario. Bishop Isaac Hellmuth envisioned a university with four faculties (Arts, Theology,[20] Law and Medicine), a number that has grown to twelve[21] today, with a total enrolment of approximately 36,000 students in 2023 and a goal of reaching 50,000 within the decade. There are two characteristics of Western University that are key to understanding its history and the context of the humanities in this type of university in the 21st century. One is that Western is a residential campus, meaning that a large proportion of the student population is not from London and that the university is committed to housing all first-year students in its own halls of residence.

The commitment to provide accommodation plays several roles in the context of the university: it presents the mission of the university in terms of the overall "student experience", which is a fundamental part of the brand, and it provides a source of income through the services offered to students, which extend to upper year students and graduates, albeit to a lesser extent, in all services except accommodation. On the other hand, in the academic

[20] *Divinity*, in the language of American universities.

[21] There are also two university colleges (Huron and King's) affiliated with Western, as Brescia University College has been absorbed by the university under an agreement signed in 2023.

organization of the University, the so-called "Professional Faculties", *i.e.* those that offer regulated programs and/or programs that can only be accessed after a minimum of three years, have had a qualified weight since their creation and now even more so due to the number of students they serve. Thus, of the twelve faculties that make up the campus, only Arts and Humanities, Social Sciences, Natural Sciences and Information and Media Studies are not considered professional, although some of them offer professional degrees to meet specific labor market needs. Engineering, Law, Business, Health Sciences, Medicine, Education and Music[22] are professional faculties and their composition and enrolment are closely linked to labor market needs, economic policy and the relevant professional bodies and associations.

In academic terms, the regulations approved by the University Senate require all undergraduate students to enroll, if possible, in their first year, in courses that will enable them to fulfil the "breadth requirement", which includes the completion of one credit[23] in each of the three categories "Arts and Humanities", "Sciences and Engineering" and "Social Sciences and Interdisciplinary Studies". This requirement is compulsory, regardless of the degree being studied, and is designed to give students access to other areas of knowledge beyond their specific discipline.

Another important element to consider in assessing the future of the humanities in the 21st-century university, as we will see in the case of Western below, is the graduation requirement known as the "essay course requirement". To understand this requirement, it is important to know that Western offers seven types of degrees[24] and that, depending on which degree students choose, they must complete the essay or writing course requirement to graduate. Honors Bachelor degrees (all four-year degrees) and Bachelor degrees (both four-year and three-year in duration) require students to complete two credits in courses with a significant writing component or in essay courses.[25]

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[22] The twelfth faculty is the one that regulates and partly administers the Graduate and Postdoctoral Studies, although it does not teach, as this is done by the respective faculties.

[23] This credit translates into two one-semester courses (0.5 credits) or one full-year course (1 credit). On this case, please see https://www.uwo.ca/arts/counselling/your_degree/breadth_requirements.html

[24] Western offers the following types of degrees: Honors Bachelor Degree (4 years) Honors Specialization; Honors Bachelor Degree (4 years) Double Major; Bachelor Degree (4 years) Specialization; Bachelor Degree (4 years) Major; Bachelor Degree (4 years) Double Major; Bachelor Degree (3 years) Major; Bachelor Degree (3 years) Double Minor.

[25] University Senate recommendations for these courses include "An essay course must normally involve total written assignments (essays or other appropriate prose composition, excluding examinations) as follows: Full course (1000 to 1999): at least 3000 words; Half course (1000 to 1999): at least 1500 words; Full course (2000 and above): at least 5000 words; Half course (2000 and above): at least 2500 words, and must be so structured that the student is required to demonstrate competence in essay writing to pass the course." On this case, please see https://www.uwo.ca/univsec/pdf/academic_policies/registration_progression_grad/coursenumbering.pdf

In budgetary terms, Western operates on a model of faculty autonomy, which means that each faculty has an operating budget[26] that depends on three factors: the number of students enrolled in its programs (which is the most important element); the number of students it teaches even if they are not enrolled in its programs, *i.e.* those who pass through a faculty's courses to fulfil its breadth or essay course requirements; and the number of postgraduate, master's or PhD students in research programs.[27] This budgetary model entails a number of consequences that affect all disciplines to varying degrees and that have proved particularly dangerous for the humanities.

On the one hand, budgetary autonomy implies local responsibility in the faculties themselves and their financial health depends to a large extent on the attractiveness of their degrees to students (and their families) in terms of a direct relationship with a profession or skills that will place the student in an advantageous or competitive position in the labour market. This is an argument based largely on the family's return on investment in the university and the needs of the economy for certain types of professional profiles.

On the other hand, this budgetary autonomy becomes an obstacle in cases where the economy sends out signals that direct students towards training areas that are far removed from the degrees offered by a faculty. In this case, the Faculty of Arts and Humanities remains a paradigm of the difficulty or inertia of adapting to the demands of the market. In certain cases, a prolonged trend of declining enrolments automatically generates a deficit that is difficult to correct in the short and medium term, since the item of expenditure on lecturers' salaries is practically untouchable in the case of tenured lecturers.[28] This budgetary imbalance can only be corrected through retirement or collective bargaining and hinders the ability to invest in these faculties in order to create new courses; to renew the professorial skills map by recruiting young professors; or to retrain tenured professors, which is complicated by the degree of specialization in the training of a professor who must also have a high level of research performance.

If, on the one hand, the inclusion of breadth requirements and essay course requirements open up opportunities internally for those degrees that are less able to adapt to market demands, on the other hand, these same

[26] The capital budget operates under other rules, while the research budget depends, largely but not exclusively, on grants that individual researchers can win in national competitions governed by each of the three sectoral research agencies of the Federal Government; some provincial grants; contracts with companies; and, where appropriate, grants for laboratory infrastructure and equipment, etc.

[27] Post-graduate professional programs are funded exclusively by student tuition fees.

[28] The so-called *tenure* of academic careers in North American universities.

requirements lead to quite aggressive competition between departments and faculties to win and keep a large segment of this internal market. In some cases, this service is the only justification for offering traditional degrees that would otherwise be difficult to justify in terms of current enrolment. On the other hand, the requirement for essay courses should, in principle, give an advantage to liberal arts degrees, which have always included elements such as excellence in reading and writing as features of the "liberal arts" paradigm of education in American universities. However, many of the Science and Social Science programs offer such opportunities among their courses because in order to comply with this requisite they can use the "lab reports", that are common for students in many of the sciences in the later years of their programs, or cumulative participation in debate fora, or the essays typically produced in a literature course on Shakespeare or Cervantes. The erosion of this relative advantage has become dramatically more pronounced since the launch of OpenAI's flagship product, ChatGPT, in 2023, which many students saw as a digital tool that should be included in their professional expertise to write texts and thus to fulfil the above-mentioned requirements.[29] As we will see below, the introduction of ChatGPT and other similar products has not only become a budgetary threat to degrees that depend in one way or another on the essay requirement at Western University, but has also provoked an existential crisis in the very foundations of the humanities,[30] which, as Rico (1993) pointed out, are based on reading and writing skills that are developed through interaction with specific authors and canonical works of the culture being studied.

With regard to students enrolled in humanities programs, we have a set of public data covering at least a decade.[31] In this case, the number of programme enrolments in the Faculty of Humanities has decreased from 1,149 in 2013-2014 to 870 students[32] in 2022-2023, a decrease of 24.28%. This decrease is reflected in all categories, be it first-year enrolments[33] (from 213 to 202), three-year enrolments (from 124 to 20) or four-year enrolments (from 797 in 2013-2014 to 634 in 2023-2024).

Looking at the data by department, the decline has occurred in all of them, with a few isolated exceptions in the middle of the series that do not significantly

[29] For the time being, their use is not recommended, and the university leaves it up to each lecturer to decide whether or not to prohibit them in their own courses.

[30] On the other hand, the irruption of this technology is presented as a new opportunity for the renaissance of the humanities, as in the case of Christian Madsbjerg (2017).

[31] Western Databook 2023. Available at https://www.uwo.ca/ipb/databook/ Office of Institutional Budgeting and Planning, Western University

[32] These data refer to students enrolled from the first year to the fourth year. Data available at: https://www.uwo.ca/ipb/databook/04/auartb04.html

[33] Those students who have declared their Faculty of origin upon arrival at the university.

affect the downward trend in the faculty's enrolments. Thus, Classics Studies[34] has gone from 126 to 78; English Literature and Writing from 582 to 420,[35] French from 254 to 132; Gender, Sexuality and Women's Studies from 110 to 113 (with a peak of 165 in the 2017-2018 academic year); Languages and Cultures from 152 to 80; Philosophy has fallen from 174 in 2013-2014 in several years of the series, but has managed to recover and had 174 students again in 2022-2023; Visual Arts from 257 to 189.

It should be noted that these figures refer to the three or four years of study, which means that the number of students enrolled in some of these programs varies from around 20 to just over 100 in the case of English Literature and Writing, the largest programme.

Meanwhile, the total number of students enrolled at Western University over the five-year period from 2018-2019 to 2022-2023 has increased from 33,356 (counted as full-time equivalents) to 38,013.[36]

TABLE 1

Academic Unit/Enrolled students	*2013-2014*	*2022-2023*	*Difference (%)*
Faculty of Arts and Humanities	1,149 (797)	870 (634)	-24.28
Classical Studies	126	78	-38.08
English and Writing	582	420	-27.8
French	254	132	-48.03
Gender, Sexuality, Women	110	113	+2.72
Languages and Cultures	152	80	-47.36
Philosophy	174	174	0
Visual Arts	257	189	-26.45

[34] These data include all students enrolled in programs in the respective departments.

[35] The Department of Film Studies disappeared as an independent academic unit in 2014-2015 and its members were integrated into other departments, primarily English Literature.

[36] In brackets, students enrolled in four-year degrees

In the most recent academic year, the data show that the Faculties of Social Sciences, Natural Sciences, Health Sciences, Medicine, Engineering and Business are at the top of the table in terms of most demanded degrees, while Law, which is a second level programme, *i.e.* you need to have completed a degree before, is slightly up, and the Faculties of Education, Information and Media Studies, Arts and Humanities and Music have experienced very significant declines that threaten their financial sustainability and academic mission.

One of the peculiarities of the academic organization of Western University is that degrees such as Geography, Anthropology and History occupy separate departments in the Faculty of Social Sciences. Their affiliation to this faculty is due to internal historical reasons, although in terms of the categorization of its disciplines, History is usually assigned to Arts and Humanities. In the case of Western University, History had 171 students in 2022-2023, which is significantly less than the 312 in 2013-2014.[37]

TABLE 2

Faculty	*2013-2014*	*2022-2023*	*% of the entire university in 2022-2023*
Business	1,278	1,573	5.1
Education	2,149	3,013	9.8
Engineering	1.502	2,618	8.5
Health	3,170	3,958	12.9
Information and Media	935	885	2.88
Law	530	555	1.8
Medicine	2,438	3,045	9.9
Music	512	413	1.3
Science	4,503	6,036	19.6
Social Sciences	6,691	7,716	25.1
Arts and humanities	**1,149**	**870**	**2.8**
Total	24,857	30,682	100

[37] These figures include postgraduate students, which were 5,911 in 2018-2019 and 6,646 in 2022-2023, but not students at Western-affiliated university colleges, some of whom take courses at the university and whose programs can sometimes compete with those in the Arts and Humanities. The data can be found at https://www.ipb.uwo.ca/documents/2023_five_year_enrolment_comparison.pdf

In any case, the Faculty of Arts and Humanities indeed serves less than 3% of the students enrolled in programs at the university. On the other hand, it provides a considerable general service as it offers the courses necessary for all students at the university to fulfil the B breadth requirement (1 credit in Arts and Humanities courses) and it helps many students to complete their essay course credits. Additionally, the graduate programs of this faculty have maintained considerable vitality, especially at the PhD level, while the master's programs (all of which are on research and none of them are professional) have also seen a significant reduction in the number of students enrolled.

V. DIAGNOSIS

The trajectory of the humanities at Western University follows what could be considered the general pattern of Canadian and American universities, which entails a gradual and, so far, inexorable decline in enrolments in the humanities. The decline began, with variations across countries, more than thirty years ago,[38] accelerated since the 2008 financial crisis, and is expected to continue, given the existential and economic uncertainty that the combination of the pandemic and the advent of generative AI has brought to the generations now reaching their university age.

The case of the humanities at Western University has some peculiarities that cannot be extrapolated to other political, economic and cultural contexts, where either legislation, the role of the university in a particular context, its institutional history, or the economic or cultural pressures give rise to different scenarios. However, these specificities are very instructive because they draw attention to the subtle self-regulatory mechanisms of the higher education market that should be considered in each case. Of course, many of the debates about the declining role of the humanities around the world have to do with the history of universities, the cultural heritage of these disciplines, the ideological controversies of recent years, but also the pressures of a global economy in permanent digital transition since at least 2007, as well as the more recent geopolitical reorganization of the world's major countries into three or four sometimes conflicting and sometimes coordinated groups. However, we must not lose sight of the fact that these ideological considerations have a specific impact in each context and in each university, and that understanding the mechanisms of their interaction at the local level is key to making a diagnosis and being able to propose solutions.

[38] All departments in the Faculty of Social Sciences have experienced significant declines in enrollment over the past decade, with the exception of Psychology, which maintains more than healthy activity, and Management and Organization Studies, which has been growing every year for more than a decade.

When comparing the case of the humanities at Western with the rest of the province of Ontario, it is clear that while at the provincial level the humanities still account for just over 10% of enrolled students, at Western this percentage is only 2.8%. It is true that there may be some variability in these figures depending on whether or not certain departments are part of the Faculty of Arts and Humanities, which at the provincial level may fall into the same category according to Statistics Canada's Classification of Instructional Programs (CIP). However, it is also clear that all programs within the Faculty of Arts and Humanities (with the exception of Philosophy and Gender, Sexuality and Women's Studies) have experienced significant declines in enrolment, and that these declines have been fairly consistent over the past decade.

Looking at the data for the programs attached to the largest faculty in terms of student numbers at Western University (Social Sciences), we see that Anthropology, Economics, Political Science, Sociology, Geography and History have also experienced significant declines in recent years, and that only Psychology,[39] with over 1,000 students, and Management and Organizational Studies, with over 3,000 students, have managed to grow and present a healthy picture. There is a fundamental difference between Psychology and Management and Organizational Studies, which is that Psychology has a much higher enrolment than any other social science degree and a large percentage of its students are international. If we look at these data for the University as a whole, only the Science and Psychology programs would manage to stay stable and grow in a local context, where all other growth is only in programs that are regulated (*e.g.* Engineering, by their own professional bodies) and/or have higher prices than the rest of the "normal" or "traditional" programs. In other words, only those programs that present themselves to the market as "special", "regulated" or "select", *i.e.* "professional", and therefore offer a competitive advantage to their students, manage to stay stable or grow. This is a process of "professionalization" of university education, aimed at shortening as much as possible the distance between university education and professional insertion in an elite labor market, which offers these professionalized workers a certain security and stability at the beginning of their careers.

This selective feature of the "professional" programs in some cases seems to mean higher tuition fees compared to other programs (*e.g.* HBA students at the School of Business pay more than 20,000 Canadian dollars for each of the two courses they take, which are third and fourth year); the direct link to a specific career opportunity (Engineering or Law); or the adaptability of Management students (at Western they are in Management and Organizational Studies in

[39] The fall of the Berlin Wall may have marked a moment when Western ideology based on the humanistic reformulations of the 20th century and the concepts of freedom and personal autonomy were left without an ideological rival and thus lost one of its most important social functions since World War II.

the Faculty of Social Sciences and in the School of Business) to manage and lead organizations, companies and perhaps institutions of all kinds. The question that arises in this context is whether, by promoting an internal market of competition between degrees, the university has possibly created a category of premium or luxury degrees, *i.e.* a degree that would give students some advantage when entering a market that, despite Canada's relatively prosperous context in the concert of nations, is still perceived as unstable and highly uncertain. Only the growing science disciplines[40] deviate from this analysis, perhaps because they are now embracing the traditional role of the humanities as providers of the general knowledge necessary for the economy and society.[41]

The promise of security and stability seems to be one of the additional but necessary elements of any university degree in a context that teenagers, and apparently their parents, perceive as based on uncertainty about the future, constant disruption, economic vulnerability, youth mental health crisis, the recent pandemic and, in the case of Canada, a housing market that is very difficult to access (Wells, 2024). In other words, a future context in which the only fixed variable seems to be uncertainty itself, and for which there seem to be no useful or convincing philosophical or anthropological explanations.

It is fair to say that providing these explanations should be one of the tasks of the humanities, and that, at least in part, the co-generation of a new worldview about the present situation could be one of the useful and attractive elements of humanities programs in the university of the 21st century. However, this is not happening and there are several reasons for this. On the one hand, the humanities –largely because this is how current lecturers have been trained– still respond to a model of the world in which the book, and in many cases the book on paper, is the artefact around which the generation of meaning and reality revolves. This is due to historical reasons linked to the origins of the humanities in the Renaissance and their co-evolution with the printing press and the book market in later centuries.

Another element that contributes to the difficulty of realizing the full potential of the humanities in a period of transition or crisis is that students arrive at university coming from secondary school having had little prior exposure to the methods, tools and questions of the humanities. These changes also bring with them a constant message on the benefits of the sciences and on how humanities belong to the realm of entertainment, or what can be done in one's spare time (Wells, 2024). In addition to the ideological consequences of these changes in secondary education and in the social

[40] Psychology has historically enjoyed large enrollments at Western, and interest in neuroscience, as well as continued investment in infrastructure and research in this area, have had the desired effect.

[41] In some cases, certain undergraduate degrees serve as a gateway to medical school.

perception of the humanities themselves, this means a significant reduction in the number of potential secondary school students choosing one of the humanities degrees, even in the case of combined degrees. In other words, the size of the funnel with which these programs now begin, in terms of the number of secondary school students entering university, is in itself very small.

Finally, neither the universities nor the humanities lecturers themselves have had re-skilling or up-skilling programs that would allow them to reorient their degrees, the problems they address, or the way they do so, in a way that would be more attractive to students seeking skills and clear and direct links to the labor market. There are notable exceptions, but these have not yet brought about the expected change, at least in teaching, though perhaps more so in research. In the field of digital humanities, the University of Victoria in the province of British Columbia established a Digital Humanities Summer Institute (DHSI) in 2001, which has served as a training platform on many aspects of digital humanities for a large number of faculty and graduate students from around the world. These intensive, week-long, hands-on programs on topics ranging from text encoding[42] and digital pedagogy to Natural Language Processing with Python, programming with R, databases for humanists, critical digital humanities, race and social issues, pedagogy for the digitally oppressed, feminist and queer digital humanities, the semantic web, and deep learning for humanists. The DHSI operates according to a model of humanistic practice based on open digital scholarship, *i.e.* the creation and dissemination of digital knowledge in an open and inclusive way. Thus, one of the keys in its design and, in part, its success, is that the courses offered each year are proposed by interested parties and their actual implementation depends on their acceptance by future participants. This digital humanities reskilling initiative has been so successful that in recent years similar initiatives have also been created in North America, Europe and Asia in association with the DHSI at the University of Victoria.[43]

The digital humanities offer a possibility for the renewal of the humanities in the 21st century university, especially because of its potential for teacher retraining. However, it faces a number of challenges, such as being associated in some areas of the humanities themselves with the neoliberal university model that administrative elites are trying to impose unilaterally on North American

[42] According to a recent study, the number of students enrolled in U.S. computer science and information technology programs will increase by 41 percent between 2018 and 2023, while enrollment in liberal arts programs will decrease dramatically. For more on this case, see https://www.nytimes.com/2024/02/14/opinion/ai-economy-jobs-colleges.html?searchResultPosition=1

[43] It still is one of the star courses in 2024 because it is linked to different methodologies, in this case digital methods (XML, Extensible Markup Language) and Philology and literary analysis of texts, in this case digital or digitalized. Available at: https://dhsi.org/on-campus-courses2024/. In the summer of 2024, the DHSI offers a total of 43 courses over a two-week period.

campuses. The digital humanities, in this analysis, would be an unacceptable imposition that would contribute to accelerating the decline of the traditional humanities. On the other hand, the impact of institutions such as the DHSI, or of the digital transition of the capitalist economy itself around the world, does not seem to have spurred a digital transformation of humanities departments and faculties almost anywhere.

This digital transformation would involve redesigning programs based on market signals about the skills that students need (rather than redesigning them based on the traditional and necessary elements of the disciplines themselves); retraining a large number of teachers in these areas, with an emphasis on those who still have a large part of their careers ahead of them; and aligning skills and disciplines to eliminate the mismatch between new skills and techniques (see the titles of the courses offered by DHSI),and the names, techniques and methods of the traditional humanities (Literature, History, Philosophy, and Classical and Modern Languages).

In the meantime, as this digital transformation takes place or not, the current situation remains alarming. According to Rob Townsend, Director of Humanities, Arts and Cultures at the American Academy of Arts and Sciences, this is an "existential tipping point" (Wells, 2024) for a large number of departments that are already clearly facing their demise.[44] Not even the elite American universities, whose students until recently had to take some form of Liberal Arts course as a mark of distinction and success, seem to be spared this process of decline. According to Townsend, in 2020 only 4% of undergraduate degrees in the United States were in one of the key traditional humanities disciplines – English Literature, History, Philosophy or Foreign Languages. According to Statistics Canada, the picture is similar in Canada, where enrolment in the humanities has declined by 50% over the past 30 years, despite an overall increase in university enrolment. Data from the Higher Education Strategy Associates' 2023 report, cited by Ira Wells, confirms all the above: in Canada, enrolments in the humanities fell by 27% in the decade from 2010-2011 to 2020-2021, in contrast to substantial increases in the social sciences and business, and huge leaps in Health Sciences, Engineering and Science (2024).

[44] The global network of partner projects in its DH Training Network includes DH Downunder; Digital Mitford Coding School; DHSI@MLA; DHSITE@Ottawa; DH@Guelph; HILT; DH@Oxford; DH@Leipzig; DH Beirut; EDIROM DH; and ZIM@Graz. In addition, the group has collaborated on the creation of a Canadian Certificate in Digital Humanities, which is open to students from Canadian universities who receive a number of credits at their universities or have credits taken at DHSI recognized. However, most of the attendees and users of DHSI and the DH Training Network are faculty, not students, in the Humanities who are trying to adapt their skills to the new situation at their universities. Available from: https://dhsi.org/dh-training-network/

VI. THE EMERGENCE OF ARTIFICIAL INTELLIGENCE

The emergence of generative AI in discussions about the future of the 21st century university did not take long after the release of OpenAI's free versions of ChatGPT and Dalle-2 at the end of 2022 with their immediate global adoption in the first quarter of 2023.

Beyond the actual meaning of the term "intelligent" when applied to these tools, the fact is that the accessibility and ease of use of these products has brought to light a number of vulnerabilities that affect not only the humanities disciplines, but indeed some of the fundamental tasks associated with university teaching and learning. These vulnerabilities relate to earlier discussions and calculations about the disappearance of certain professions and a large number of jobs across a large segment of the labor market due to the massive use of robots and AI systems. For example, Brynjolfsson and McAfee already pointed out in 2014 that in order to properly understand the impact on society and the economy of digital technologies –software, hardware and network, the latter perhaps the most important because of its multiplier effects–, it is necessary to keep in mind its three main characteristics, namely that it is exponential, digital and combinatorial (p. 37). However, in discussing the impact of digital machines on the labor market, they favored a position in which they would complement and amplify what workers can do. This would be the best strategic option for a number of reasons:

> "Effective production is more likely to require both human and machine inputs, and the value of the human inputs will grow, not shrink, as the power of machines increases. A second lesson of economics and business strategy is that it's great to be a complement to something that's increasingly plentiful. Moreover, this approach is more likely to create opportunities to produce goods and services that could never have been created by unaugmented humans, or machines that simply mimicked people, for that matter. These new goods and services provide a path for productivity growth based on increased outputs rather than reduced inputs."[45] (Brynjolfsoon and Mcafee, 2014, p. 182).

The complementarity of machines to humans also seems to be a complementarity in the opposite direction, thus the value of workers' inputs would be higher in contexts "augmented" by the respective machines. This brings us to an unavoidable stop in the context of university education, namely,

[45] Public acceptance of this reality is often associated to the publication in *The New Yorker* of an article by Nathan Heller entitled "The End of the English Major" on February 27, 2023. https://www.newyorker.com/magazine/2023/03/06/the-end-of-the-english-major

to determine what are those value-added inputs that machines cannot replace, at least for the time being, although, as the new wave of generative AI has shown, they are very good at imitating. If we accept the link between value-added inputs in the workplace and the definition of the human condition in a fully digitalized environment, I think we may have a first clue as to what one of the main functions of the humanities in 21st century universities might be.

This would require starting from one of the original questions of humanism: what makes us truly human? In the Renaissance, it was answered based on the exploration of human dignity but, in the context of a technological revolution that affects all spheres of life on the planet, the determination of this sphere was very aptly posed by Chris Anderson (2008), then editor of *Wired*, in his article on "The End of Theory: The Data Deluge Makes the Scientific Method Obsolete," in which he concludes that the great question this poses relates to the need to determine what is truly human about human beings in we see them in the mirror of AI.

The humanities claim the right to teach what makes us human through the content and tools that each of them –History, Literature, Philosophy and Languages– has developed over time. This right now has a sense of urgency, as the definition of what is inherently human takes place in the context of digital and AI technologies that have transformed nearly every aspect of the human condition. The difficulty lies in the fact that, in order to reach a conclusion, the humanities have to negotiate a set of answers that would be valid at the intersection between the delimitation of the human condition and its expression in skills that can be subtracted from and complement the productive activities of machines. That is to say, the value proposition for training which is located at this intersection must be appealing in terms of the enrolments that the corresponding university degrees can attract. There is no possibility, at least not in the university of the 21st century, perhaps more so in the media, in essay writing and research, of a purely descriptive proposal outside the university market and the labor market, in the middle of which we have all university degrees, including those on humanities. The solution for the humanities to have a future must take account of both spheres: humanity in the labor market marked by digitalization and generative AI.

In this sense, the emergence of OpenAI in 2023 has highlighted some possibilities considering the violence used to present certain risks and opportunities for the mortally wounded humanities.

In terms of risks, the generative capacity to produce text, images and now high-quality video is a frontal assault on two skills that are fundamental to much of higher education, but particularly to the humanities: content creation and writing. Content creation was largely removed from the specificity of the humanities at the beginning of the 21st century because it was difficult for these degrees to undergo a digital transformation commensurate with the scale of the revolution we have been experiencing at least since the launch of the iPhone in 2007. As a result, this space for digital content creation has been taken over by information and media technology programs, which have often been placed institutionally outside humanities departments. However, writing, or the production of texts, is a specialty of the humanities, stemming from humanistic foundations, not only in terms of the efficient production of quality texts, but above all in terms of the process of humanization that the practice of writing produces in the student.

At present, it is very difficult to convince students who have not had much contact with reading and writing practices and who have an instrumental and pragmatic view of learning that it is preferable to write an essay, a short story or a marketing text without the help of ChatGPT. The values of efficiency, productivity and objectivity supposedly associated with these technologies prevail over the growth of one's own language, the development of a unique style and the moral benefits of this intellectual endeavor. Even when the personal skill at stake is creativity and its nurturing, it is difficult to make a case for young people to learn in a way that is not based on complementarity and augmentation between the learner and the machine, at least. Is writing –and reading, a practice which is essential for the development of writing skills– not one of the skills that lie at the intersection of humanity and digital technologies[46]? What are the contributions or input that would add human value, and therefore economic value, to the skills learned in the 21st century university?

Well, the arrival of OpenAI in our lives has entailed not only risks, but also some possible avenues that, in this case, can help to open and colonize this space at the intersection between humanity and the economic value of the skills it promotes.

Some of these possibilities have already begun to have a positive impact on humanities degrees, though not fully or effectively. The first of these involves the world of ethics, *i.e.* Philosophy degrees, and the long series of questions that need to be answered concerning the intrusion of AI into all kinds of productive, labor and institutional processes, including issues of intellectual property, data and algorithmic bias, human, corporate and machine responsibility, discrimination, compressed definitions of efficiency, the insertion of moral values into processes of quality, equity and justice, etc. In order to be able to answer these questions and intervene effectively in the real world of companies

[46] On doubts about productivity gains thanks to the introduction of generative AI tools, see Simon Johnson and Daron Acemoglu (2023).

and institutions, it is necessary to have acquired certain skills that concern both digital technologies and the human elements of interacting with them, as well as the social and institutional systems that we have built to practice certain shared human values in our societies (Suarez and Varona, 2021).

Another possibility concerns the definition and development of human creativity: what makes it unique and, more importantly, why it is necessary for the development of full-fledged humanity, and how it can be coordinated with "machine creativity" to create a virtuous circle between workers and machines (Still and D'inverno, 2016). It should be noted that much of the humanist way of doing is based on learning from and imitating the classics or prominent figures and works of the past. In many cases, this devotion to the past and the need to imitate what we consider to be irreplaceable landmarks of our cultural history has led to the elimination of the creative development that in theory should follow the learning of the classics. For example, only two of the humanities degrees at Western University –Studio Art and Writing– are based in whole or in part on the development of students' creative skills. The polarization between the development of creativity as a fundamental part of the development of the self and its exclusive attribution to the geniuses of each human discipline, in what should be a continuum from one extreme to the other, has prevented the proper exploitation of this skill as the foundational basis of the humanities in the 21st century. However, once it is presented as a set of practices accompanied by values that can be improved and are fundamental to access the self, regardless of the professional field in which they are activated, the results in terms of enrolments in such courses with students from all faculties are undeniable. Human creativity as a skill, its exploration as a human quality, its value as a tool for personal and professional adaptation in an uncertain environment, and the open horizon in its possible combinations with generative AI systems are some of the elements that point to its key role in the new humanities.

Thirdly, generative AI products have brought to light another pressing need that the humanities in the 21st century could address by adopting a new curriculum created at the intersection of human and market skills. This is the design and management of hybrid systems in which humans and AI coexist in productive, creative, educational, service and entertainment contexts. This challenge starts with defining what is truly human and how it can be nurtured and used in such contexts, and at the same time taking into account how AI products work best in their interactions with humans. This would lead to a detailed reflection and deepening of what it means to develop human-centered AI (Shneiderman, 2022) and, in practical terms, to developing the knowledge and skills to think and act within complex systems in which evolution and hybridity are two of their main features. In this case, the ability to design as well as to manage, direct and govern these systems, which will soon be present in many previously exclusively human domains, will be part of these new value-added skills that have to emerge at the intersection of humanization and generative AI.

Some of these possibilities have already been suggested by experts on the "future of work". In particular, Anees Raman and Maria Flynn[47] wrote a short essay in February 2024 in which they succinctly but emphatically summarized the findings of their report "Preparing the Workforce for Generative AI. Insights and Implications".[48] Entitled "When Your Technical Skills Are Eclipsed, Your Humanity Will Matter More Than Ever", the paper argued that the skills that would best withstand the presence of generative AI systems, were not the technical or data-driven skills, but rather what they called "people skills", which would be more durable than the former because they would serve to anchor these AI systems. These people skills would include effective communication, the development of empathy, critical thinking, collaboration, innovation and adaptability. Given that generative AI can or will be able to, once the systems are designed and trained with the appropriate data, perform skills –more than 500 according to the report– that until now have seemed to be protected or belonging to engineers, lawyers, financial specialists, etc., the authors ask what are our most important skills as human beings and propose a necessary revaluation of skills that have until now been associated with the humanities. They point to the development of interpersonal relationships, negotiation skills, leadership and the motivation of work teams.

Beyond the specific skills, it is true that some of them relate to humanistic studies because traditionally humanistic studies would naturally develop these skills as part of the educational process with classical authors and texts, through reading and writing. However, the university context today, as we have seen in the numbers and trends of Ontario universities, is not characterized by an emphasis on educational processes or the training of the individual –not to say that they do not occur in parallel– but by an insistence on the development of professional skills that will place students in an advantageous position when they enter the labor market and, in the longer term, on the path of economics and uncertainty in which they will live for the rest of their professional careers. In other words, we are faced with a 21st-century university which, without having completely lost its identity as an educational institution, and in which research capacity seems increasingly to be a key competitive element, has decided to move closer to the "training provider model" proposed by Raman and Flynn.

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[47] I leave aside the use of generative AI to correct and mark student work, a task which is almost always cited among the activity's teachers like least but if it is separated from the basic functions of teaching, it still seems to cause an identity crisis.

[48] Respectively from LinkedIn and Jobs for the Future. See https://www.linkedin.com/posts/linkedin-economic-graph_preparing-the-workforce-for-generative-ai-activity-7100171643439734786-197u

The key question for the humanities in the twenty-first century, then, seems to be whether they will be able to move toward a model in which they provide not only education but also training, and in which the mix of these two components occurs at the intersection of the distinctive essence of humanity and the skills needed to thrive economically in hybrid systems and contexts. To answer this question, some elements of a potential strategy for this transformation are formulated using the case of the Faculty, Arts and Humanities, at Western University.

VII. POSSIBILITIES AND SOLUTIONS IN A TRADITIONAL UNIVERSITY: WESTERN UNIVERSITY

The use of a specific case is important for two reasons. The first one has to do with the fact that the challenge of the humanities in the university of the 21st century is a problem of radical transformation, which is digital in many respects, not so much because it has to respond to the current paradigms of the digital humanities, but because the transition is occurring at the same time asthe human condition is becoming digital and the economy is not stopping its path towards digitalization, now through generative AI. This transformation is partly conceptual and ideological, affecting the raison d'être of the humanities and requiring a reassessment of their history and a rethinking of their mission, but if we stick to the ideological dimension, the exercise of transformation will most likely result in an exercise of critique of the digital economies and societies.

Transformation must be practical, effective, and responsive to the specific conditions of each institution because the threat to the humanities at this point is not ideological, but rather a threat to the survival of its disciplines, departments, and jobs associated with them. With 4% of undergraduate degrees in the United States in 2020 and 2.8% of enrollment at Western, the situation entails a clear existential risk. These institution-specific conditions respond to their budgetary model, the needs and capabilities perceived by their students, and the fact that this radical transformation is not starting from scratch. That is, in the humanities, most universities have many lecturers with specific training, degrees from the past, and an organization into departments that responds to traditional models of the humanistic disciplines.

As in many cases of transformation in the digital economy, it is almost easier to start from scratch, without prior commitments or legacies, that is, as a start-up, than to face a transition from what already exists and has a deep history and inertia that is difficult to reverse. This should not serve as an excuse or make us lose sight of the fact that, despite the advantages of starting almost without obligations, some universities, such as IE University, have decided that the humanities are a key pillar of their future strategy, and as a result have just created a School of Humanities with two degrees,[49] while their students in all the other schools are required to enroll in a number of humanities courses to obtain their respective degrees.

In the case of Arts and Humanities at Western University, the faculty has seven departments that basically offer the four disciplines of the North American Liberal Arts tradition –Literature, Philosophy, Languages and History (embedded in the above disciplines)– with a degree of specialization that responds to earlier times when the market allowed for a much more diverse offer thanks to the greater number of students enrolled in the faculty's programs. Preserving the knowledge and experience acquired in these disciplines is key to any kind of transformation. Additionally, allowing those professional identities associated with traditional humanities practice should continue to develop, both for teachers and students, as long as the corresponding programs are financially viable.

It is more than likely that this reorganization, as a defensive maneuver, will require a simplification in order to adapt the existing teaching resources to the decreasing number of students enrolling in these courses. The reorganization per se is rather challenging because of the identity and identification processes involved in belonging to a separate discipline and a specific human group for many years. However, the reorganization is not an end in itself, but a means to an end of preserving the knowledge, resources and skills embedded in the faculty, albeit adjusted to a scale that does not threaten budgetary stability and sustainability in a context, as we have seen, of budgetary autonomy and accountability at the faculty level.

The need to adjust the scale must also be considered in the reorganization, not of the departments, but of the degrees offered, which are currently too many for the number of students. On the other hand, the proliferation of similar degrees poses a problem in terms of the positioning of the humanities "brand" for a potential market of students who do not see the differences between programs and who seek to integrate into their CV some valuable skills for the digital labor market. In this context, it would not be too complicated to create some common courses, offered in all faculties, around generative AI and its relations with humanity and/or ethics. This is the basis –more common, simplified and sustainable– on which the next levels of a strategic plan for the renewal and transformation of the humanities would be built.

[49] The report, published in August 2023 is based on the work of the LinkedIn Economic Graph. Microsoft, which is the lead investor in OpenAI is also the owner of LinkedIn. The methodology used in the report is based on both a series of questions to ChatGPT and the use of LinkedIn user tags.

The second level of transformation focuses on the creation of new degrees based on the following principles: all these degrees must be multidisciplinary (beyond the interdisciplinarity existing within the humanities themselves); skills-oriented; accessible to the existing teachers who wish to undertake them as part of their transformation; sensitive to the digital transformation of the economy and society; and their success and sustainability must be empirically proven by enrolment figures. In this sense, and regardless of the use of the brand "digital humanities", the real need is to digitalize the humanities, *i.e.* their methods, tools and ways of working and learning, and not necessarily their content, in other words, to bring the humanities closer to society on the common ground of digitalization. To this end, and given the existing resources, the necessary investments in teaching staff and infrastructure would be made in Immersive Experience Design[50] and, in a second stage, in Design and Management of Future Systems, at the pace of the corresponding benchmarks and performance marks, *i.e.* certain KPIs in enrolment numbers and student employability. Both degrees, presented here as examples only, would have the characteristics to facilitate a transition from traditional humanities to digital humanities, with a focus on Systems Design and Management skills.

The first degree, on the one hand, responds to the resources already existing in the faculty, both in terms of staff, courses (in a minor in Digital Humanities), and research infrastructure, in the form of a laboratory for immersive experiences. This degree allows to start from the reflection on the human experience –in multiple aspects, such as historical, philosophical, gender, or digital– and to focus the study programme on the acquisition of practical skills for the design of immersive experiences of different types, from the purely physical –for the design of user experiences–, to those based on video and sound, virtual reality, extended reality, etc. The confluence of digital and experience seems to be one of the next frontiers that digitality is determined to conquer, both in terms of the design of new tools –glasses, brain implants or spaces organized by screens, as in Sphere in Vegas– and in the development of spatial computing and the adoption of business models in many industries based on entertainment and user experience, whether this experience is digital, analogue or hybrid.

The second degree responds to some of the needs and niches identified by Kimbrough and Carpanelli in their report on professions that would be augmented, disrupted, or would stay isolated by the wave of digital transformation driven by generative AI. Both Kimbrough and Carpanelli and Raman and Flynn point to the need to manage and lead teams, systems, and spaces where workers will have to coexist not only with each other but also with AI and robots. This requires a basic knowledge of how AI works,

[50] *Bachelor in Humanities and Dual Degree in Business Administration and Humanities.* See: https://www.ie.edu/school-of-humanities/

machine-human interactions and ethics, as well as skills related to emotional intelligence, conflict resolution, negotiation, oral communication and interpersonal relations. All of this would be included in a degree in which design and the skills related to its practice, as in the previous degree, play the role of a means for digital transformation.

Also based on existing resources and skills but that would have to be developed exponentially, the second area of transformation would be created around people skills. Using some of the resources and knowledge present in both the traditional or first strategic level degrees and the new degrees, and as stated in the previous cases also with the consequent controlled investments, the next degree would be People Skills,[51] a tentative name taken from previous reports, which would take advantage of the need to complement the technical skills –writing or data analysis– that are common in the early stages of many careers with those that generative AI would struggle to replicate and that "come with longer professional experience, such as leadership and negotiations".[52] The goal would be to start earlier with the learning and to develop these skills as a distinct feature of students who would enroll in this program, either exclusively or as part of dual degrees.

Finally, the third area of development is based on the resources and knowledge available in the various departments and on the unavoidable need to deal with human-induced changes on Earth, which will require the development and use of specific skills in all sectors of the economy and society. Thus, a degree in Anthropocene Studies, based on the paradigm of complex systems and methodologies associated with research on "planetary boundaries" (Rockström *et al.*, 2009), could also be presented based on some resources already existing in the faculty, such as the area of climate change and gender, which uses methodologies more aligned with social sciences than with the humanities. The aim is that graduates of this program will be able to access positions in companies that are currently committed to sustainability, emissions and climate change, but will go beyond this and, thanks to the academic approach indicated, will be able to differentiate themselves from the inertia already created around some of these concepts. In addition, these graduates could also be destined for some of the Ontario and Canadian economic sectors identified in the introductory graphs on GDP composition, such as Public Administration or Health and Education.

51 The introduction of similar programs, for example in Interactive Design, has resulted in high enrollment success at universities such as Eafit in Colombia.

52 The name or brand of the degree has to reflect its objective, which is to prepare students for the evolution and future of work.

The transformation of the humanities is not only about content and skills, but rather about how we reflect upon and articulate the intersection between the human condition and the skills that make that human condition present in today's labor market. This requires that the transformation also take place in the field of teaching and learning, which, despite the digital invasion and the threat of generative AI, is still very much centered –in almost all university disciplines– on the exercise of giving a lecture –more or less modified with PowerPoint presentations and with the introduction of some additional dynamizers– and the assessment of the student's ability to repeat or replicate the content offered to them. However, both the creation of content (the lecture) and the repetition of content (the exam or essay) are two of the things that generative AI already does most effectively and convincingly. On the other hand, a misunderstanding of digitalization has led to the proliferation of digital devices in classrooms, so that while the teacher is lecturing, students are looking at their screens doing many other things –shopping, communicating, socializing, entertainment, etc.– while paying relatively little attention to what is happening in the classroom. This is a monumental waste of everyone's time that undermines the economic and social value of university learning and raises questions about the value proposition offered by universities, especially in an age and time when similar content is ubiquitous and easily accessible on many digital platforms.

Beyond the social and economic value that degrees from prestigious universities still retain, the only factors that currently distinguish university learning from other forms of digital content production and consumption are the intellectual authority of the teacher, the use of research as a tool for innovation in what is taught, and the shared experience of learning in a specific time and place, *i.e.* the learning experience that must be designed to produce the desired effects and goals, including the student's own perception and subsequent recollection of their learning in that unique and unrepeatable context.

In tactical terms, the precarious situation of humanities degrees and the disruptive impulse of generative AI suggest two directions. One is that the format of the proposed degrees –perhaps not all, but certainly those at the second strategic level– should be organized as double degrees, so that they can be taken by students who currently abound in faculties of Science (especially in pre-medicine), Business, Health Sciences, and Management and Organization Studies (in Social Sciences).

Where there is sufficient market demand to offer these new degrees separately as four-year programs, it should be considered to offer them as professional programs, so that they are marketed and branded as programs that bridge the gap between university and the new world of work, take on the air of exclusivity that works so well in the growing university-wide programs, and have a clear focus on the development of relevant skills. The degree in People Skills[53] would be particularly well suited to this.

Finally, the Ontario Ministry of Colleges and Universities has mandated that these institutions respond to the need for businesses and workers to adapt their skills and develop following the economy in an uncertain future. To this end, it has created a still incomplete framework for the delivery and acquisition of very practical "micro-credentials" or mini-modules that would be used for the purposes outlined above. In addition to the general uncertainty surrounding various aspects of this proposal, which affects all institutions and disciplines in a similar way, it would appear that the humanities, as they currently stand, would have considerable difficulty in fulfilling their part of this program. However, once the foundations for the delivery of the People Skills degree and skills are developed and established, they could, with appropriate investment, be redirected to meet the dire need that exists in almost all key professions in the Ontario economy, such as construction, to improve human relations and conflict resolution skills among workers.

The retraining of humanities lecturers, along the lines of the reskilling and upskilling that is taking place in many other professions, and the consequent investment necessary to face the reinvention proposed here with guarantees of success and some degree of security, would be the final pillar of this mini strategic plan for the creation of the humanities in the university of the 21st century.

VIII. CONCLUSIONS: THE HUMANITIES IN THE 21ST CENTURY

In the university context, the humanities have suffered a steady setback in recent decades so, as we enter the third decade of the 21st century, many departments and programs are now facing the existential dilemma of extinction. To preserve a tradition that is fundamental to the life of universities and that connects Western societies to their humanistic roots, the humanities must undergo a radical and accelerated transition to preserve the minimal building blocks of traditional degrees. To do so, the transition must take place in the context of a reconceptualization of what it means to learn and teach in a context of complete digitalization and the intrusion of generative AI. Moreover, the humanities need to frame their mission in terms of answering the following

[53] *"Preparing the Workforce for Generative AI," page 11. See at: https://www.linkedin.com/posts/linkedin-economic-graph_preparing-the-workforce-for-generative-ai-activity-7100171643439734786-197u*

question: how to practice a new 21st century humanities at the intersection between defining what makes us human today and the skills to display that human condition in a digitalized and hybrid economy and labor market? In that answer, contextualized as it is in the case of the Faculty of Arts and Humanities at Western University in Canada, lies the future or the demise of a tradition that has articulated the intellectual, social, and cultural life of the West for the past 600 years and for which, at least for the moment, there seems to be no replacement. From its inception, this tradition has embraced the idea that "the literary education given in humanism cannot be closed to any objective, either in theory or in practice" (Rico, 1993, p. 19).

BIBLIOGRAPHY

ANDERSON, C. (2008). The end of theory: The data deluge makes the scientific method obsolete. *Wired magazine, 16*(7).

BAKEWELL, S. (2023). *Humanly Possible. Seven Hundred Years of Humanist Freethinking, Inquiry, and Hop.* Penguin.

BENDER, E. M., GEBRU, T., MCMILLAN-MAJOR, A., & SHMITCHELL, S. (2021). On the dangers of stochastic parrots: Can language models be too big? In *Proceedings of the 2021 ACM conference on fairness, accountability, and transparency*, marzo, 610-623.

BRYNJOLFSSON, E., & MCAFEE, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies.* WW Norton & Company.

CROW, M. M., & DABARS, W. B. (2020). *The fifth wave: The evolution of American higher education.* Johns Hopkins University Press.

JOHNSON, S., & ACEMOGLU, D (2023). *Power and Progress: Our Thousand-Year Struggle Over Technology and Prosperity.* UK: Hachette.

KIMBROUGH, K., & CARPANELLI, M. (2023). *Preparing the Workforce for Generative AI. Insights and Implications.* LinkedIn Economic Graph (August 23, 2023).

MADSBJERG, C. (2017). *Sensemaking: The Power of the Humanities in the Age of the Algorithm.* UK: Hachette.

MCGULLOCH, G. (2019). *Because Internet: Understanding the New Rules of Language.* Riverbeds Books.

McLuhan, M. (1994). *Understanding Media. The Extensions of Man.* The MIT Press

Pickus, N., & Penprase, B. (2023). *The New Global Universities: Reinventing Education in the 21st Century.* Princeton University Press.

Rico, F. (1993). *El sueño del humanismo. De Petrarca a Erasmo.* Alianza.

Rockström, H., Steffen, W., Noone, K., Persson, Å., Chapin, F. S., Lambin, E. F., ... & Foley, J. A. (2009). A safe operating space for humanity. *Nature, 461*(7263), 472-475.

Schwab, K. (2016). *The Fourth Industrial Revolution.* Crown Publishing.

Shneiderman, B. (2022). *Human-Centered AI.* Oxford UP.

Smith, M. D. (2023). *The Abundant University.* The MIT Press.

Still, A., & D'inverno, M. (2016). A history of creativity for future AI research. In *Proceedings of the 7th Computational Creativity Conference (ICCC 2016)*, Université Pierre et Marie Curie, June, 147-154.

Suárez, J. L. (2023). *La condición digital.* Trotta.

Suarez J. L., & Varona. D. (2021). The Ethical Skills We Are Not Teaching: An Evaluation of University Level Courses on Artificial Intelligence, Ethics, and Society. In *A Report to the Social Sciences and Humanities Research Council Knowledge Synthesis Grants Program.*

Wells, I. (2024). Why business needs the humanities: Focusing on STEM degrees has its own economic cost . *The Globe and Mail.* January 27. https://www.theglobeandmail.com/business/commentary/article-humanities-stem-degrees-business-economy/

PART II

Demand for University Studies, Research and Productivity

THE DEMAND FOR HIGHER EDUCATION IN THE FACE OF TECHNOLOGICAL PROGRESS AND ARTIFICIAL INTELLIGENCE

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Juan José GANUZA
Manu GARCIA
Carlos VICTORIA

Abstract

This article explores the impact that technological change and artificial intelligence may have on the demand for university studies, using Spanish data. It begins with a retrospective analysis of the evolution of demand over the last three decades. Then, based on the academic literature that analyzes the degree of exposure of each occupation to technological change and the employability patterns of different university degrees, three indexes are developed for each degree: RTI index (Routine Task Intensity), index of exposure to Artificial Intelligence (AI) and index of software exposure. These indexes, based on the exposure to technological change of the different university degrees, are very informative in order to explain both the job prospects and the expected salary of their graduates. The indexes can be used to improve the design of university courses and also as indicators of which degrees are likely to be in greater demand in the future. Finally, using microdata from the Community of Madrid enrollment process, where students indicate their preferences, another indicator is designed to rank degrees according to unsatisfied demand.

Keywords: University, technological change, artificial intelligence and demand.

JEL classification: I20, I23, I29.

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I. INTRODUCTION

We are witnessing one of the greatest transformations of the educational and productive systems in history. This is due to technological change, especially digitalization and artificial intelligence. New technologies will dramatically affect pedagogical tools and change the demand and supply of education, especially in universities.

This paper focuses on the latter dimension, exploring the demand for university studies in Spain in the context of technological change. The aim of the article is twofold: on the one hand, to obtain a picture of the current university system; on the other hand, to identify the potential problems and opportunities that technological change can generate, in order to extract recommendations for improving educational policies. In addition, following Conde-Ruiz *et al.* (2024b), a gender perspective is also mainstreamed in the analysis to show the current gaps that exist between men and women in higher education and the potential consequences for employability and salaries in the face of technological change.

The starting point is a descriptive analysis of the evolution of demand over the last three decades. The data show interesting aggregate results. Firstly, Spain is one of the European countries with the highest percentage of young people with a university degree. The figure is even more positive for women. Similarly to the countries around us, women in Spain are in the majority in university studies. In terms of fields of knowledge, there has been a decrease in the relative demand for engineering and architecture studies and an increase in studies related to health sciences.

Demand for higher education differs significantly between men and women. There are no significant differences in social sciences and humanities, but there is an important gap in engineering and architecture, where men are over-represented, and in health-related fields, where women are in the majority. In the case of the natural sciences, although there are no significant overall differences, when the degrees that make up this field are analyzed in detail, the previous pattern reappears: the proportion of women is higher in health-related sciences and lower in STEM fields (Science, Technology, Engineering and Mathematics). The main conclusion of this analysis shows, through a detailed study of one hundred university degrees, that there is no convergence in the demand for higher education studies between the two genders and that there has been no significant progress in reducing the gender gap in STEM studies over the last twenty years.

The second part of the article focuses on the study by Conde-Ruiz *et al.* (2024a), which analyzes the degree of exposure of university degrees to technological change. The methodology used by Conde-Ruiz *et al.* (2024a) consists in linking two sources of information that have not been previously analyzed together: the employability patterns of different university degrees and the degree of exposure of each occupation to technological change. The result of combining the correspondence between degrees and occupations with indexes of automation and exposure to software and artificial intelligence of different occupations, is a set of groundbreaking indexes that measure the degree of exposure of university degrees to technology.

In particular, university degrees can be ranked based on three occupational indexes: Routine Task Intensity (RTI), Artificial Intelligence Exposure Index and Software Exposure Index, which have very different interpretations. RTI measures the risk of an occupation being replaced by technology because there is a high percentage of routine tasks. By ranking college degrees using employability patterns and this routinization index, we can identify the occupations most threatened by technology. College degree rankings based on technology exposure indexes (either to software or artificial intelligence) have a different interpretation because they identify occupations that require technology integration, but this may be complementary to college education. For example, degrees with a high value of this index, such as Industrial Technology Engineering, Statistics or Mining and Energy Engineering, should reinforce in their curricula the methodological aspects that help to incorporate these technologies.

The article shows that these indexes can explain to a large extent the degree of employability of university degrees, as well as the expected wage differences. Nevertheless, Conde-Ruiz *et al.* (2024a) show, using the evolution of university entrance grades in the Community of Madrid, that demand is not responding to the potential threats that technological change poses to some university degrees. From a gender perspective, Conde-Ruiz *et al.* (2024b) show that women are overrepresented in those degrees that, according to the indexes developed by Conde-Ruiz *et al.* (2024a), are more threatened by technology.

Although we are talking about the demand for university studies, the reality is that the studies pursued are often conditioned by the supply of degrees. In other words, it is possible that a student wants to study a degree but they cannot do it because there are not enough places available. In this sense, we created an excess demand ratio from microdata from the Community of Madrid that contains information on where the student was admitted and also the complete profile of preferences (up to twelve options) in relation to the choice of degree. This indicator can be useful to identify where it is most necessary to increase university supply.

The article is divided into six sections. Section two presents the descriptive study of the evolution of the demand for university degrees over the period

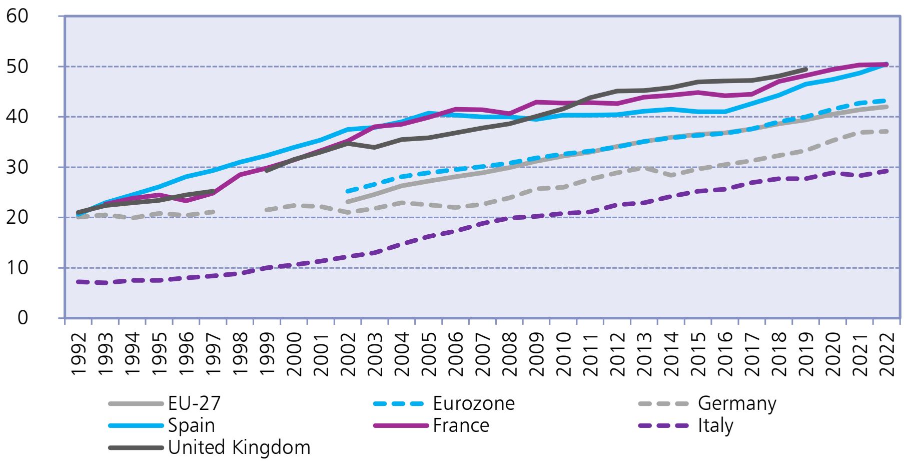
1985-2023. Section three presents the indexes we created to measure the level of exposure of university degrees to technological change. Section four uses the indexes of exposure to technological change to explain several labor market variables (the degree of labor market placement of the different degrees and their expected wage). Section five uses microdata on student preferences to analyze capacity constraints in the public supply of university degrees. Finally, section six presents conclusions and policy recommendations and thus concludes the article.

II. EVOLUTION OF THE DEMAND FOR UNIVERSITY DEGREES: 1985-2023

This section presents and analyzes how the demand for higher education has evolved over the past decades. The first question to be analyzed is how the percentage of young people between 25 and 34 years of age with a university degree has changed. Figure 1 shows the evolution of this indicator for Spain, the euro area average and various European countries. The first conclusion is that there is a general pattern in which the demand for university studies has increased steadily in all countries over the last three decades. In the case of Spain, the percentage of young people (25-34 years old) with tertiary education has risen from around 20% to 50%, placing it at the top of the list, along

FIGURE 1

PERCENTAGE OF POPULATION (25-34 YEARS OLD) WITH TERTIARY EDUCATION



Note: Tertiarty Education (ISCED 5-8) includes Higher Vocational Education.
Source: Eurostat.

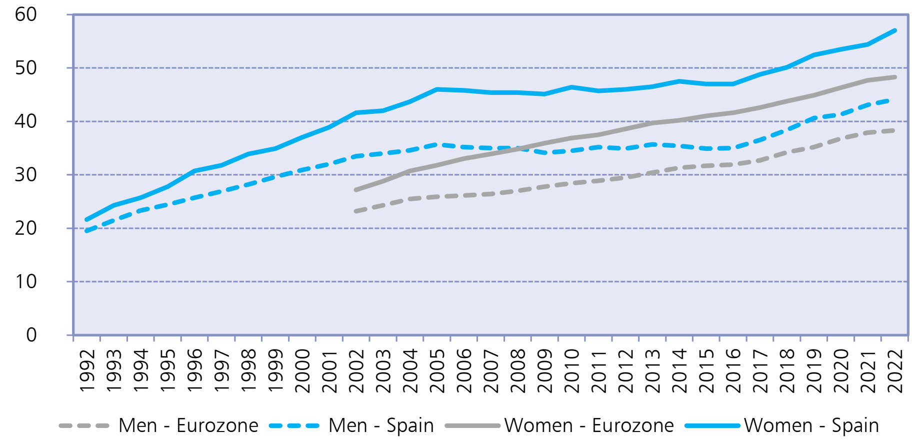
with France, amongst countries in our context and well above the euro area average, although it does not reach the levels of Luxembourg (64%) and Norway (60%) in Europe or Canada (73%) and South Korea (76%) in the world (OECD (2021)). It should be noted that university degrees also include third-cycle vocational degrees.

Spain has, therefore, a leading position within the Eurozone regarding the percentage of university students. This data is difficult to interpret. On the one hand, it can be seen as a source of competitive advantage for Spain, since general higher education can provide the tools to adapt to a changing labor demand, and this can be especially important in periods of technological uncertainty. But, on the other hand, this conclusion entails two important nuances. First, the alternative to a high rate of university graduates could also be high-quality vocational training with a high level of labor market insertion. This seems to be the case in Germany. On the other hand, if labor supply does not evolve in the same direction as its demand, and graduates do not find qualified jobs, overqualification may generate much dissatisfaction and friction in the labor market, instead of being a source of competitive advantage.

The difference in the evolution of the demand for university education by gender is also analyzed. Figure 2 shows the indicator of the percentage

FIGURE 2

PERCENTAGE OF POPULATION (25-34 YEARS OLD) WITH TERTIARY EDUCATION, BY GENDER



Note: Tertiarty Education (ISCED 5-8) includes Higher Vocational Education.
Source: Eurostat.

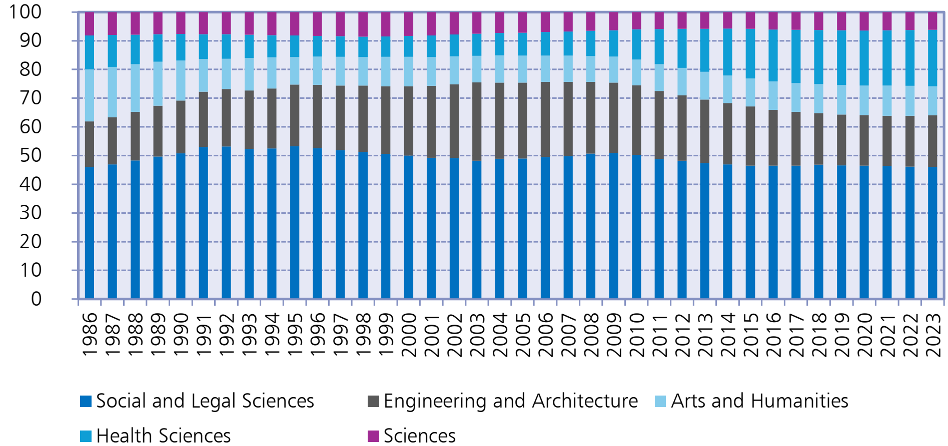
of people between 25 and 34 years of age with tertiary education out of the general population, for women and men. A positive gender gap is observed, *i.e.* there are more women at university than men. This gap occurred mainly in the 1990s, coinciding with the increase in university enrollment. This pattern is not exclusive to Spain and is also seen in the Eurozone countries. This result is also confirmed by the OECD reports (2021 and 2023), which indicate that a possible explanation could be that the benefit of obtaining a university degree in Spain is higher for women than for men. For example, in terms of employability, the difference between having a high school or university education is very small for a man (6% unemployment compared to 5%), while it is significant for a woman (dropping from 9% unemployment to 6%).

The specific demand for university degrees in Spain is discussed below. Figure 3 shows how the distribution of enrolled students by discipline of knowledge has changed.

The most in-demand degrees are in the area of social sciences, with a market share of close to 50 percent. The sciences and humanities have a smaller but almost stable market share over time. However, engineering and architecture greatly reduced their market share after the economic crisis

FIGURE 3

DISTRIBUTION OF ENROLLED STUDENTS (UNDERGRADUATE AND/OR 1ST AND 2ND CYCLE), BY DISCIPLINE OF EDUCATION



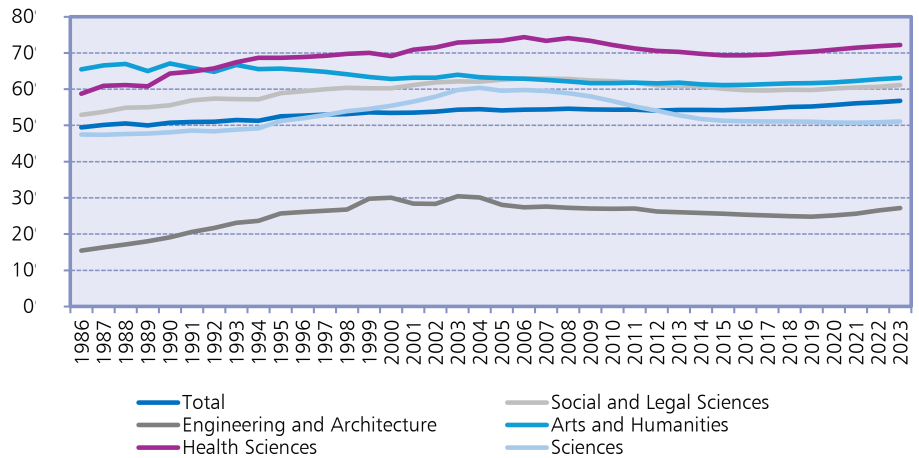
Source: Integrated University Information System, SIIU (General Secretariat of Universities).

and have not recovered it.[1] The space left by engineering has been taken over by health sciences. The increase in demand for health sciences can be explained both by the increase in demand associated with a higher level of development and also aging, as well as by the development of new disciplines associated with technological change.

Despite this, the demand changes by areas of knowledge and has evolved differently between the two genders. Figure 4 shows the evolution of female university students by disciplines of knowledge.

FIGURE 4

PROPORTION OF FEMALE STUDENTS OVER THE TOTAL NUMBER OF STUDENTS ENROLLED (UNDERGRADUATE AND/ OR 1ST AND 2ND CYCLE), BY BRANCH OF EDUCATION



Source: Integrated University Information System, SIIU (General Secretariat of Universities).

The most marked inequalities between genders are seen in health sciences, which are highly feminized areas of education, as well as in engineering and architecture, where the representation of women has been stagnant at below 30% since the late 1990s. The data seem to show that there are no significant gender differences in sciences, but reality is more complex. Table 1 shows the university degrees in the area of science knowledge ranked by the representation of women. The same initial pattern is seen here: women are overrepresented in degrees such as Biomedicine, that are close to the health sciences, while they are underrepresented in degrees such as Physics or Mathematics.

[1] This evidence follows Sofoklis and Megalokonomou (2019), who calculated the impact of unemployment on the demand for university studies with data from Greece. Job opportunities for engineers and especially architects were reduced in the economic crisis of 2008-2014 proportionally more than other professional profiles.

TABLE 1

PERCENTAGE OF WOMEN IN THE TOTAL UNDERGRADUATE ENROLLMENT (AREAS OF STUDY IN THE "SCIENCE" AREA)

Company	*2015-2016*	*2016-2017*	*2017-2018*	*2018-2019*	*2019-2020*	*2020-2021*	*2021-2022*	*2022-2023*
Geography and Land Use Planning	28	29	29	28	27	27	26	27
Physics	26	25	26	27	27	27	28	28
Mathematics	38	38	38	37	36	35	36	36
Geology	41	41	41	40	40	41	40	39
Statistics	43	43	45	45	46	46	46	45
Environmental Sciences	47	48	48	48	49	49	49	50
Chemistry	53	53	53	54	54	54	54	55
Marine Sciences	55	58	56	57	58	56	57	58
Biotechnology	60	60	61	61	61	62	62	63
Biology	62	62	62	62	62	62	63	63
Biochemistry	65	65	65	66	66	68	69	70
Biomedicine	77	76	75	75	76	76	77	79

Source: Integrated University Information System, SIIU (General Secretariat of Universities).

Table 1A in the Annex shows in detail the representation of women in one hundred university degrees.[2] The general conclusion is similar to Figure 4: women are overrepresented in degrees related to health, social work and teaching, which we could call the "care economy". In social sciences and humanities, although there are divergences in representation, these are generally smaller. Finally, in STEM degrees, with the exception of those degrees related to health, women are significantly underrepresented. To give a sample of this pattern, Table 2 show a selection, taken from the general analysis of all degrees, of the fifteen courses in which women are most represented and those fifteen in which they are least represented.

The gender gap for STEM studies is not a Spanish anomaly. The OECD report (2023) shows that, to a greater or lesser extent, this gap occurs in all developed countries. However, it is worrying that, despite efforts to promote STEM studies among girls and female teenagers, there has been no significant progress in the last two decades. Moreover, it is important to note that, as Hanushek *et al.* (2015) and Rebollo-Sanz and De la Rica (2022) show, given that the labor market values mathematics skills, this gap in STEM profiles may at least partly explain the gender wage gap. Moreover, as discussed in the next section, job opportunities in STEM studies are less threatened by technological

[2] "Field of study", in the taxonomy of the Integrated University Information System (SIIU).

TABLE 2

FIELDS OF STUDY WITH THE LOWEST AND HIGHEST PERCENTAGES OF WOMEN COMPARED TO THE TOTAL NUMBER OF STUDENTS ENROLLED IN UNDERGRADUATE PROGRAMS

Company	*2015-2016*	*2016-2017*	*2017-2018*	*2018-2019*	*2019-2020*	*2020-2021*	*2021-2022*	*2022-2023*
Automotive Engineering	8	7	6	6	5	4	5	5
Sports Management	8	7	6	6	5	4	5	5
Computer Engineering	10	10	11	10	11	11	12	12
Mechanical Engineering	13	13	13	13	14	14	14	14
Computing	12	12	12	12	13	13	14	14
Software and Application Development	11	11	12	12	12	13	14	14
Electrical Engineering	13	14	14	14	15	15	15	15
Industrial and Automatic Electronics Engineering	14	14	15	15	16	16	16	16
Electronics Engineering	16	17	17	17	17	17	18	19
Video Game Development	12	12	12	13	13	14	17	19
Other Engineering	14	13	14	14	15	17	17	20
Prevention and Occupational Safety	14	13	14	14	15	17	17	20
Naval and Oceanic Engineering	19	19	20	20	20	21	21	22
Physical Activity and Sports	19	19	20	20	20	21	21	22
Telecommunication Engineering	21	20	21	21	21	22	22	22
Modern and Applied Languages	78	79	79	79	79	80	80	78
Performing Arts	80	77	77	79	79	79	77	78
Biomedicine	77	76	75	75	76	76	77	79
Design	73	74	75	75	76	77	78	79
Translation and Interpreting	80	80	81	81	81	80	80	80
Conservation and Restoration	78	77	76	77	78	80	81	80
Nursing	78	77	76	77	78	80	81	80
Social Education	81	81	81	81	81	81	82	82
Social Work	81	81	81	81	81	81	82	82
Pedagogy	83	83	83	83	84	83	84	84
Occupational Therapy	83	83	83	83	84	83	84	84
Protocol and Events	88	89	89	88	86	86	87	88
Speech Therapy	88	89	89	88	86	86	87	88
Early Childhood Education	93	93	93	93	92	92	91	91
Gender Equality	90	87	87	80	95	95	95	96

Note: The fifteen fields of study with the lowest and highest percentage of women compared to the total number of students enrolled in the 2022-23 school year

Source: Integrated University Information System, SIIU (General Secretariat of Universities).

changes than those associated with other types of studies, so the wage premium for STEM studies may rise, and that is likely to increase the wage gap between men and women in the near future.

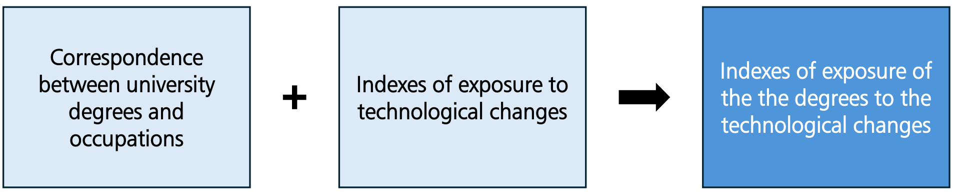
III. UNIVERSITY DEGREES IN THE FACE OF TECHNOLOGICAL CHANGE

This section analyzes the degree of exposure of university degrees to technological change. Two sources of information are used for this purpose. On the one hand, papers that assign indexes to the different occupations measuring how exposed those occupations are to technology. On the other hand, information on the occupations to which the different students access to depending on the degree studied.

In other words, in the first stage, each university degree is related to the different occupations. In a second stage, the information on the degree of exposure of each occupation to technological changes is used. Finally, each university degree is assigned an index of exposure to technology. Figure 5 shows, schematically, the calculation process for these indexes.

FIGURE 5

METHODOLOGY FOR OBTAINING THE EXPOSURE INDEXES OF UNIVERSITY DEGREES TO TECHNOLOGICAL CHANGES



Source: Created by the authors.

1. Correspondence Between University Degrees and Occupations

To obtain the correspondence between occupations and university degrees, data from the 2019 *Labor Market Insertion Survey of University Graduates (EILU,* in Spanish) are used. This statistical operation of the Spanish Statistics Agency aims to provide information on the employment situation of the group of university graduates, as well as the various aspects of their labor market insertion process (access to the labor market). In particular, it includes information on the cohort of graduates in the 2013-2014 academic year, with a sample of, approximately, 31,500 people (1st and 2nd cycle and graduates).

An important aspect is that it includes information on the occupation, using a two-digit CNO code,[3] in which the graduates of the different degree programs work (if applicable). From this information, it is possible to calculate the distribution of occupations for each university degree, that is, what percentage of the graduates of each degree program are working in a given occupation.[4]

2. Index of Exposure of the Occupations to Technological Changes and AI

The academic literature (see Dorn, 2015; Acemoglu and Restrepo, 2022; Autor, 2019; Autor and Dorn, 2013 and Conde-Ruiz and Ganuza, 2023, among others) tries to anticipate which occupations will be most affected by the new digital economy. To this end, they argue that technological change will not have a large differential impact on workers according to their levels of education, but rather according to the content of the tasks carried out in their occupations (Task Biased Technological Change). Thus, three types of tasks are distinguished: routine, abstract and manual tasks. Routine tasks involve the repetition of predetermined processes (as in car assembly lines or administrative tasks). Abstract tasks are those that involve problem solving, intuition, persuasion and leadership skills, as well as creativity. Manual (non-routine) tasks are those that require personal interactions, adaptability, visual recognition and language. It seems clear that routine tasks are easy to perform by automation technology, while abstract and manual tasks are much more difficult. The former because they are clearly complementary to technology and the latter because they are too expensive to be replaced by it. With this argument, a classification of the main tasks in each occupation is made. The most widely used database is O*NET (Occupational Information Network), which gives a direct correlation between tasks and occupations.

RTI (Routine Task Intensity) Index. Within this methodology, we used the synthetic measure of routine task intensity constructed by Lewandowski *et al.*

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[3] Royal Decree 1591/2010, of November 26, 2010, approving the National Classification of Occupations 2011. https://www.boe.es/eli/es/rd/2010/11/26/1591

[4] The *Survey of Labor Market Insertion of University Graduates (EILU)* offers information on degrees at two CNO-11 digits. For example, economists would be included in code 28 "Professionals in social sciences: Economists; Sociologists, historians, psychologists and other professionals in social sciences (geographers, anthropologists, archaeologists, philosophers, professionals in political sciences...); Priests of different religions". See Conde-Ruiz *et al.* (2024a) for the complete list of EILU CNO-11 codes.

(2022) and Schotte *et al.* (2023).[5] A specificity of this approach is that, as opposed to O*NET-based analyses, it does not assume that the task content in a given country is identical to the contents used in the United States. Therefore, its main advantage is that it allows us to distinguish between differences in task content among workers who have the same occupation but live in different countries. This makes it possible to use the specific estimated data from Spain.

In particular, the authors construct country-specific metrics of routine task intensity at levels 1 and 2 of the ISCO-08[6] (International Standard Classification of Occupations) classification for several countries, based on data from three surveys (Lewandowski *et al.,* 2022). For those countries for which survey data are not available, an econometric estimation is used (Schotte *et al.,* 2023).

From the questions in the various surveys, they create a synthetic measure of the relative intensity of routine tasks according to the levels of routine cognitive, analytical non-routine cognitive and personal non-routine cognitive tasks, excluding manual tasks. Finally, the RTI is standardized from its average and standard deviation in the United States.

Thus, occupations with a higher content of non-routine tasks (analytical and personal) will have a lower value of this metric, while those occupations with a higher content of routine tasks (cognitive) will have a higher level. It is, therefore, a measure of the routine aspect of the occupation and thus of the ability to be replaced by technology.

Artificial Intelligence and Software Exposure Index. On the other hand, Webb (2020) identifies which tasks can be automated by a particular technology and constructs a metric of occupations' exposure to that technology based on information contained in their patent texts and their correlation to the tasks performed in different occupations. Specifically, occupation descriptions from O*NET and patent data from Google Patents Public Data are used. These indicators are available for the different occupations at 3-digit ISCO-08 from Albanesi *et al.* (2023).

The occupations least exposed to *software* would be those with a high manual component and which are not easy to "algorithmize", as well as those

[5] A brief description of how the indexes is created can be found in the Annex.

[6] The ISCO-08 classification (International Standard Classification of Occupations) is the International Labor Organization's occupational classification system. It is structured into major groups (1 digit), major subgroups (2 digits), minor groups (3 digits) and unit groups (4 digits).

with a high interpersonal component. Artificial intelligence, on the other hand, affects different occupations, and by its very nature, it is not possible to know, *a priori,* the impact it may have or whether it will be positive or negative. All this makes the interpretation of these two indexes substantially more complex than the RTI.

In short, the routine task intensity (RTI) and technology exposure (artificial intelligence and software) indexes described above are available at a 2-digit and 3-digit disaggregation level, respectively, from ISCO-08. The correspondence between ISCO-08 and CNO-11 is not exact, which would entail that certain adjustments need to be made when calculating the indexes for occupations.[7]

To perform the analysis of the response of university degrees to technological changes we need indexes that measure the intensity of the latter, mainly based on the different types of tasks (routine/non-routine, manual/cognitive). However, as seen above, indexes along these lines have been calculated in the literature for different occupations, but not for degrees. This is partly because the linkage between tasks and occupations is straightforward from standardized international classifications (O*NET or ESCO, the multilingual European classification of skills, competencies, qualifications and occupations), while the correlation between both and degrees is in a very early process.[8]

Once all the occupations have been classified with each of the three indexes mentioned above (RTI, artificial intelligence exposure index and software exposure index), these indexes can be assigned to each university degree according to the occupations in which the students of each degree end up working. For each of the metrics, they are calculated as the weighted average of the indexes of the different occupations in which their graduates work, using as weights the distribution of occupations calculated from the data of the *Survey of Labor Market Insertion of University Graduates.*

As noted above, the RTI has a simple interpretation: the higher it is, the greater the risk that the occupation will be replaced by technology. Therefore, those degrees with a higher RTI run the same risk, as it would indicate that recent graduates in that degree would be being hired in occupations that are going to be threatened by technology.

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[7] For example, while when an ISCO group corresponds to several CNO groups, the value can be imputed to them, when a CNO group is composed of several ISCO groups, the arithmetic average has been calculated. On the other hand, the Albanesi *et al.* (2023) data are aggregated from 3 to 2 digits. Specifically, the 123 3-digit groups are aggregated into 40 2-digit groups, using the arithmetic average.

[8] See, for example: https://esco.ec.europa.eu/en/about-esco/escopedia/escopedia/qualifications-and-esco

3. Ranking of University Degrees According to the three Technological Indexes by Occupations

Ranking According to the Routine Task Intensity Index. As noted above, the RTI index has a simple interpretation: the higher the RTI, the greater the risk of the occupation being replaced by technology. Therefore, those degrees with a higher RTI are at the same risk, as it would indicate that recent graduates in that degree would be being hired in occupations that are going to be threatened by technology.

First, we analyze the degrees with the lowest RTI, *i.e.,* those whose graduates work in occupations with lower technological risk. Table 3 shows the 15 degrees with the lowest RTI,[9] among which are mainly engineering of various types, mathematics, physics and architecture. In addition, Table 4 shows the 15 degrees with the highest RTI (those whose graduates work in occupations with high technological risk): Tourism, Management and Public Administration, Finance and Accounting or Nautical and Maritime Transport. However, some of the careers do not seem, *a priori,* to be related to occupations in which there is high routinization, such as Marine Sciences or Tourism, which would lead one to think that they may be capturing labor insertion into occupations in which this risk does exist, reflecting the phenomenon of over-qualification.

Ranking according to software or AI exposure rates. Tables 5 and 6 discuss degrees with low and high technology exposure indexes, respectively (all university degrees are in the Annex). It is relevant, in line with what has been

TABLE 3

DEGREES WITH LOW VALUES OF THE RTI INDEX

Computer Engineering
Computing
Software and Application Development and Multimedia Engineering
Mathematics
Aerospace Engineering
Telecommunication Engineering
Physics
Materials Engineering and Textile Engineering
Industrial Technology Engineering
Architecture and Urban Planning and Landscaping
Sound and Image Engineering
Electronics Engineering
Biomedical and Health Engineering
Power Engineering
Primary Education

Sources: Created by the authors with data from Schotte *et al.* (2023) and *Labor Market Insertion Survey of University Graduates 2019.*

[9] Table 2A in the Annex shows the complete list of degrees and the values of the three indexes.

TABLE 4

DEGREES WITH HIGH VALUES OF THE RTI INDEX

Information and Documentation
Marine Sciences
Modern and Applied Languages
Criminology
Humanities
Human Nutrition and Dietetics
Fine Arts
Labor Sciences
Geography
Horticultural and Landscape Engineering
Nautical and Maritime Transport
Art History
Finance and Accounting
Management and Public Administration
Tourism

Sources: Created by the authors with data from Schotte *et al.* (2023) and *Labor Market Insertion Survey of University Graduates 2019.*

described above, that those degrees more exposed to technology, based on these indexes, do not seem to be related to occupations with a high risk of being automated, but rather to occupations highly complementary to technology (engineering, architecture or statistics), which points to the need to acquire skills that allow this complementarity. As for the careers with the lowest exposure indexes, they are mostly in the fields of education and arts and humanities.

TABLE 5

DEGREES WITH LOW VALUES OF TECHNOLOGY EXPOSURE INDEXES

AI (Webb)	*Software (Webb)*
Early Childhood Education	Spanish Languages and Dialects
Primary Education	Primary Education
Spanish Languages and Dialects	Early Childhood Education
English Language	Literature
Pedagogy	Protocol and Events
Management and Public Administration	English Language
Literature	Music and Performing Arts
Music and Performing Arts	Pedagogy
Other Teachers	Translation and Interpretation
Classical Languages	Classical Languages
Other Foreign Languages	Other Foreign Languages
Archaeology	Archaeology
Finance and Accounting	Social Education
Modern and Applied Languages	Other Teachers
Protocol and Events	Management and Public Administration

Sources: Created by the authors with data from Albanesi *et al.* (2023) and *Labor Market Insertion Survey of University Graduates 2019.*

TABLE 6

DEGREES WITH HIGH VALUES OF TECHNOLOGY EXPOSURE INDEXES

AI (Webb)	*Software (Webb)*
Electronics Engineering	Statistics
Geomatics Engineering, Surveying and Mapping	Mining and Energy Engineering
Computing	Mechanical Engineering
Telecommunications Engineering	Industrial and Automatic Electronics Engineering
Computer Engineering	Aerospace Engineering
Industrial Chemical Engineering and Environmental Engineering	Food Science and Technology and Food Engineering
Civil Engineering	Power Engineering
Industrial and Automatic Electronics Engineering	Naval and Oceanic Engineering
Electrical Engineering	Telecommunication Engineering
Mechanical Engineering	Nautical and Maritime Transport
Power Engineering	Sound and Image Engineering
Naval and Oceanic Engineering	Electronics Engineering
Industrial Technology Engineering	Software and Application Development and Multimedia Engineering
Architecture and Urban Planning and Landscaping	Computer Engineering
Aerospace Engineering	Computing

Sources: Created by the authors with data from Albanesi *et al.* (2023) and *Labor Market Insertion Survey of University Graduates 2019.*

4. Discussion of the Results

The interpretation of the results obtained, as well as the economic policy implications that we can infer, are as follows: on the one hand, it is important to remember that the index assigned to each university degree has been created by looking at the occupations to which the students who have studied them have access and that, therefore, the information on the programs or contents of each degree has not been used; on the other hand, as will be seen below, the interpretation is very different depending on the index used.

The ranking of university degrees using the routinization index indicates that those careers with a lower index are training workers in occupations that, as they have a high percentage of routine tasks, will most likely be replaced by technology. As can be seen in Table 4, (or in Table 2A in the Annex, where all fields of study are shown), the careers most threatened by technology would be: History, Information and Documentation, Marine Sciences, Modern and Applied Languages, Criminology, Humanities, Human Nutrition and Dietetics, Fine Arts, Labor Sciences, Geography, Horticultural and Gardening Engineering, Nautical and Maritime Transportation, Art History, Finance and Accounting, Management and Public Administration, and Tourism. All these careers will certainly have to adapt their curricula to provide their students with training that will enable them to find occupations that are not at risk of automation. On the other hand, careers with a low routinization index are careers that are training workers in occupations with a low percentage of routine tasks and, therefore, have less risk of disappearing due to the advance of technology.

The ranking of university degrees using technology exposure indexes (either software or artificial intelligence) has a different interpretation. If they have a high index, it means that students taking these degrees enter occupations that are either exposed to software or exposed to artificial intelligence. For example, if we look at the software exposure index, the following university degrees have a high index: Industrial Technology Engineering, Statistics, Mining and Energy Engineering, Mechanical Engineering, Industrial Electronics and Automation Engineering, Aerospace Engineering, Food Science and Technology and Food Engineering, Energy Engineering, Naval and Ocean Engineering, Telecommunications Engineering, Nautical and Maritime Transport, Sound and Image Engineering, Electronics Engineering, Software and Applications Development and Multimedia Engineering, Computer Engineering and Computer Science.

If we look at the AI exposure index, the degrees with a high index would be: Software and Applications Development and Multimedia Engineering, Biomedical and Health Engineering, Electronics Engineering, Geomatics Engineering, Surveying and Cartography, Computer Science, Telecommunication Engineering, Computer Engineering, Industrial Chemical Engineering and Environmental Engineering, Civil Engineering, Industrial Electronic and Automatic Engineering, Electrical Engineering, Mechanical Engineering, Energy Engineering, Naval and Oceanic Engineering, Industrial Technologies Engineering, Architecture and Urban and Landscape Planning, and Aerospace Engineering. In this case, it is not necessarily negative to have a high index (software or artificial intelligence), as it will depend on whether such technology is complementary or substitutive to the student's competencies. For example, it seems clear that many engineers or architects use certain software to perform their tasks. The risk here is whether the functionalities of such software are complementary to the training being given to students or, on the contrary, substitutive. If university training is complementary to the advancement of technology, students pursuing such degrees are not at risk in terms of the occupations they will perform in the future. In any case, all careers with high rates of exposure to technology (software or artificial intelligence) should update their contents and curricula, paying special attention to technological progress.

IV. THE LABOR MARKET INSERTION OF UNIVERSITY GRADUATES AND THEIR EXPOSURE TO TECHNOLOGICAL CHANGES

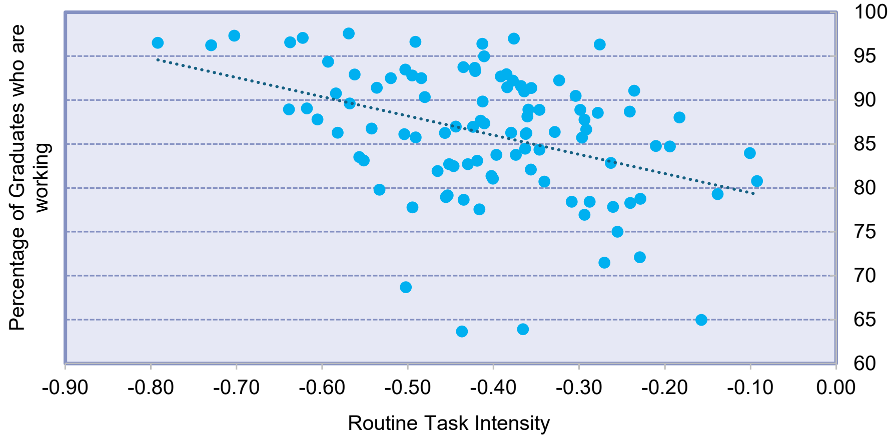
In this section we analyze the possible correlation between our indexes of intensity of routine tasks and exposure to technology (artificial intelligence and software) with certain characteristics of the degrees: the percentage of graduates who are working and the percentage of graduates affiliated to Social Security as employees who are in the top two quintiles of the contribution bases.[10]

1. Analysis of Labor Market Insertion

The following graphs show the relationship between the three indexes calculated for each university degree and their labor market insertion, measured as the percentage of graduates of each degree who are working. They show that the relationship is negative in the case of RTI, indicating that those degrees where students end up in occupations with a lower percentage of routine tasks have a higher percentage of graduates working. In the

FIGURE 6

LABOR MARKET INSERTION AND INTENSITY OF ROUTINE TASKS

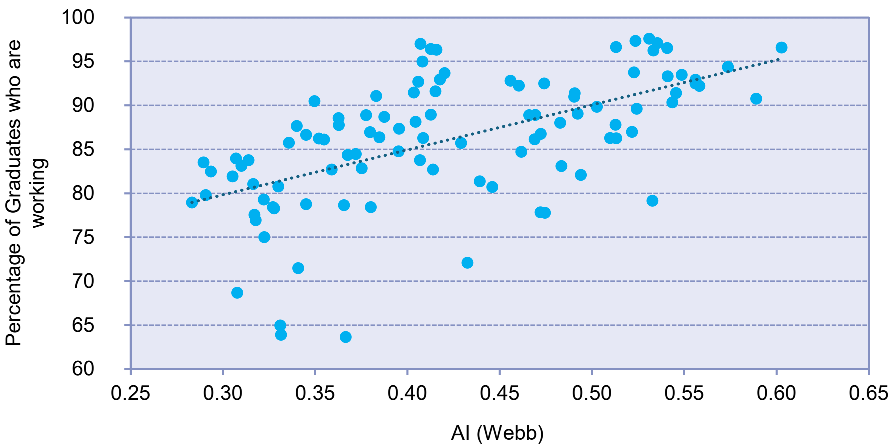


Sources: Schotte *et al.* (2023) and *Labor Market Insertions Survey of University Graduates 2019.*

[10] This metric is used as an approximation of the salary level.

FIGURE 7

LABOR MARKET INSERTION AND EXPOSURE TO ARTIFICAL INTELLIGENCE

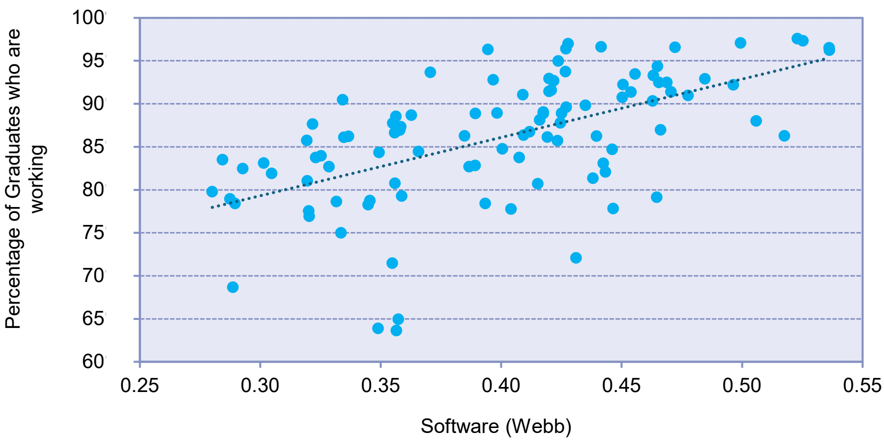


Sources: Albanesi *et al.* (2023) and *Labor Market Insertion Survey of University Graduates 2019.*

case of exposure to technology, the relationship is positive, indicating that those degrees with greater exposure to both software and AI have a higher percentage of graduates working.

FIGURE 8

LABOR MARKET INSERTION AND INTENSITY OF ROUTINE TASKS



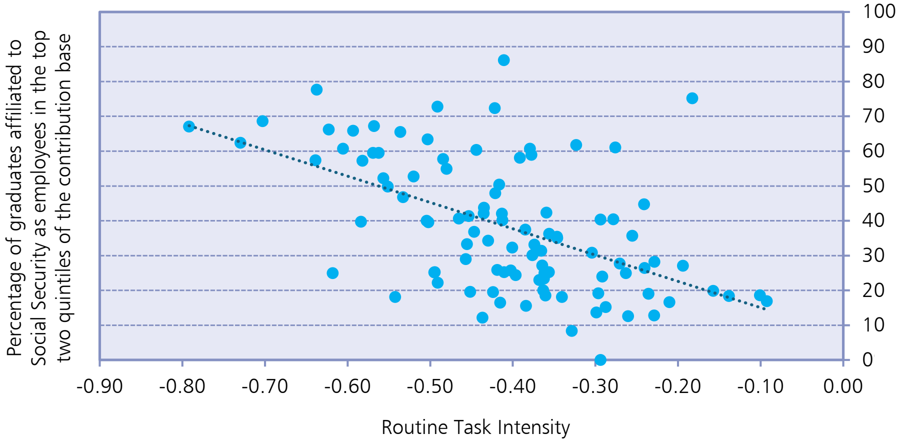
Sources: Albanesi *et al.* (2023) and *Labor Market Insertions Survey of University Graduates 2019.*

2. Analysis of Salaries Received by Employees

Finally, we show the relationship between the indexes and a metric related to salary, measured as the percentage of graduates of each degree, affiliated to

FIGURE 9

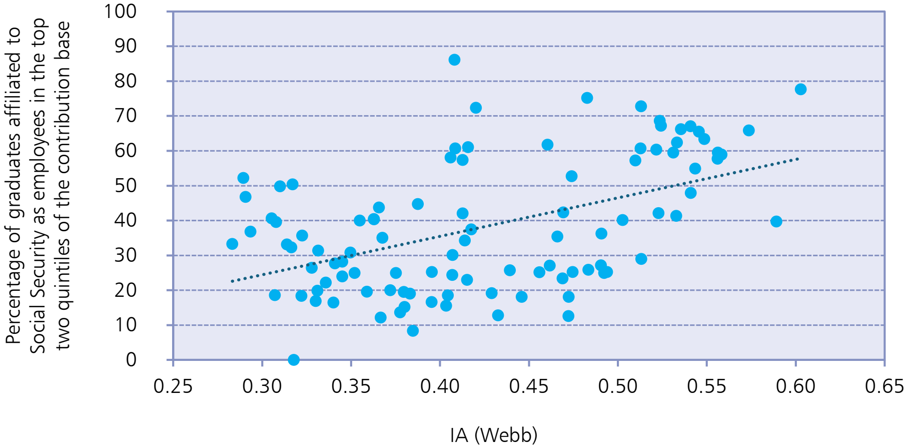
CONTRIBUTION BASE AND INTENSITY OF ROUTINE TASKS



Sources: Schotte *et al.* (2023) and *Labor Market Insertion Survey of University Graduates 2019.*

FIGURE 10

CONTRIBUTION BASE AND SOFTWARE EXPOSURE

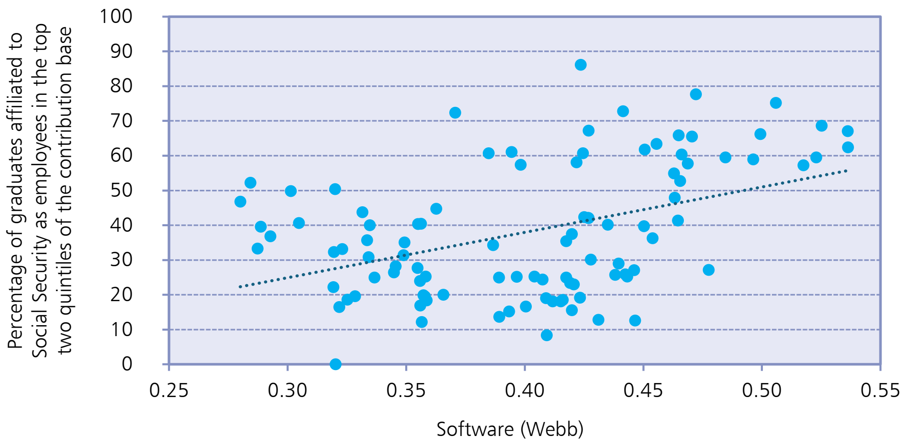


Sources: Albanesi *et al.* (2023) and *Labor Market Insertions Survey of University Graduates 2019.*

Social Security as employees, in the top two quintiles of the contribution bases. These show that the relationship is negative in the case of RTI, indicating that those degrees where their students end up working in occupations with less routine tasks have a higher percentage of graduates in the top quintiles, while in the case of exposure to technology, the relationship is positive, showing that those degrees with greater exposure have a higher percentage of graduates in these quintiles.

FIGURE 11

CONTRIBUTION BASE AND SOFTWARE EXPOSURE



Sources: Albanesi *et al.* (2023) and *Labor Market Insertions Survey of University Graduates 2019.*

3. Analysis of the Impact of the Exposure of University Degrees to Technological Changes on the Demand

Given the correlation between the indexes of the exposure of university degrees to technological changes and the labor market insertion, it would be expected that these indexes are a signal about the future evolution of the demand for university degrees. However, according to Conde-Ruiz *et al.* (2024b), the demand is not yet reacting to the potential exposure of degrees to technological changes. This article draws this conclusion after analyzing the correlation between the increase in the university entry grades and the number of enrollments between the years 2013-2014 (the year in which the participants in the survey finished university) and 2021-2022 (the last year available for university entry grades) and the different indexes that have been designed. The relationship between the indexes of the intensity of routine tasks and exposure to technology (artificial intelligence and software) with the variation of the entry grade is very weak and there seems to be no correlation between these indexes with the growth or decrease in the number of students over the period.

V. CAPACITY RESTRICTIONS IN THE PUBLIC PROVISION OF UNIVERSITY DEGREES

Finally, we constructed an excess demand ratio for the degrees from very detailed microdata on admissions in the universities of the single district of the Community of Madrid. The database contains information on the degree to which the student was admitted, the school year of admission (from 2013-2014 to 2021-2022), the university where the student was admitted, the university access itinerary and the complete profile of preferences (up to 12 options) in relation to the degree.[11]

The information offered by this database is richer than what can be obtained from the analysis of the number of admissions and the cut-off score of each degree because these variables are highly conditioned by the number of places available. For this same reason, the analysis of student preferences can be very useful for making decisions about which degrees should be invested in to increase the number of places. Using the data for the school year 2021-2022, we have carried out a first exploitation of the database to identify the capacity restrictions of the public provision of the universities by calculating the excess demand ratio. This ratio is defined as the quotient between the number of people who have chosen a degree as their first choice in the ranking and the number of students who have finally been admitted to this degree. Thus, the ratio indicates how many students would have wanted to study a certain degree for each student who has managed to do so. Given this definition, the ratio can be greater or less than one, with the degrees with a higher ratio having a higher unsatisfied demand.

Table 3A in the Annex shows this index for most of the 100 degrees analyzed above. Table 7 shows the 15 degrees with the highest excess demand ratio index. That is, the 15 degrees most in demand by students as their first choice with respect to the number of students admitted to it.

[11] Conde-Ruiz *et al.* (2024c) details the application system for university entrance in the Community of Madrid, where students have to indicate a ranking of their desired degrees. The article shows that, if students were acting rationally, these rankings should correspond to their true degree preferences. However, the same article analyzes whether there may be behavioral biases that lead students to eliminate unfeasible desired options from the rankings.

TABLE 7

DEGREES WITH HIGH VALUES OF THE EXCESS DEMAND INDICATOR

Career	*Excess Demand Ratio*
Biotechnology	3.41
Industrial Design and Product Development Engineering	3.19
Design	3.13
Medicine	2.68
Biochemistry	2.19
Veterinary Science	2.04
Industrial Organization Engineering and Nanotechnology	1.83
Criminology	1.66
Dentistry	1.50
Advertising and Public Relations	1.48
Physical Activity and Sports	1.45
Biomedical and Health Engineering	1.44
Aerospace Engineering	1.34
Physics	1.34
Architecture and Urban Planning and Landscaping	1.24

Note: The index is calculated as the ratio between the number of people admitted to a given degree program and the number of people who have made this their first choice in the ranking. It does not include double degrees or degrees from affiliated centers.

Source: Created by the authors with data admission microdata from the universities of the single district of the Community of Madrid.

For example, for each student enrolled in Biotechnology, there were more than three students who, although it was their first choice, were unable to take it. This is a preliminary analysis, so it would be interesting, in future research, to analyze the cross information between the degrees and to be able to generate more precise indicators, using, for example, in which degrees students who were not able to enroll in their first choice have ended up enrolling.

VI. CONCLUSIONS AND POLICY RECOMMENDATIONS

This article has analyzed the demand for university studies in an environment characterized by technological uncertainty and the irruption of artificial intelligence. Our analysis provides empirical results from which important policy recommendations can be drawn. Two main conclusions emerge from the descriptive analysis of demand in recent decades. The first relates to gender differences: women are overrepresented in health-related studies and, more generally, in all studies that can be included in the care economy, while they are underrepresented in science, engineering and architecture degrees. The low proportion of women in STEM fields is worrying because it has not changed in the last two decades and because, given the advantages of STEM studies in terms of job placement and future salaries, it may be behind the gender gaps observed in the labor market and may even tend to widen them. The second conclusion is that we should focus on quality rather than quantity: Spain is a relative leader in Europe in terms of the number of university students, so efforts should be focused on improving the quality of higher education and its interaction with the labor market.

To achieve this goal, it is important to understand how different university degrees and their job opportunities will be affected by technological changes and artificial intelligence. For this purpose, three indexes (Routine Task Intensity Index [RTI Index], Artificial Intelligence Exposure Index, and Software Exposure Index) have been constructed for each of the degrees, and they have shown to be very informative in explaining both the job opportunities of the various degrees and the expected salary of their graduates. These indexes allow us to discriminate between different programs and to rank them according to their level of exposure to technological changes, thus helping us to improve the design of programs in order to adapt them to the technological changes we are facing.

In particular, programs whose students work in jobs with a higher intensity of routine tasks (with a high percentage of these tasks) are the ones most at risk of having their job opportunities reduced by the replacement of new technologies and should be redesigned or, in the extreme, their provision reduced. On the other hand, programs whose students end up working in jobs with high rates of exposure to artificial intelligence and software have a very different interpretation: they are not necessarily threatened by technological change, but their curricula should be redesigned to take advantage of complementarities with technologies.

The methodology and the indexes obtained are a first step in understanding the degree of exposure of university degrees to technological changes, but it is important to be aware of the various limitations of our analysis. First, the indexes used to measure the threats and complementarities of different professions with technology may change in the coming years as technologies, especially artificial intelligence, evolve. On the other hand, university degrees are analyzed in aggregate and we do not take into account the university that teaches it or the characteristics of the students, or even their specialties. In other words, the employability pattern of a degree (and therefore, the indexes that could be obtained) may vary depending on the university that teaches it, the specialty that has been chosen or simply whether the degree has been taught in English.

Finally, the article also attempts to guide possible investments to expand university provision. To this end, the first step is to identify the degrees with the greatest unsatisfied demand. To this end, using microdata from the admissions process of the Community of Madrid where students reveal their preferences, those degrees where the ratio of excess demand is highest (the ratio between students who have chosen that degree as their first choice and students who have enrolled) are indicated. These degrees would, *a priori,* be candidates for investment to increase the number of places available.

BIBLIOGRAPHY

Acemoglu, D., and Restrepo, P. (2022). Demographics and Automation. *The Review of Economic Studies,* 89.

Albanesi, S., Dias da Silva, A., Jimeno, J. F., Lamo, A., and Wabitsch, A. (2023). New technologies and jobs in Europe. *Documento de trabajo,* Nº 2322. Banco de España.

Autor, D. (2019). Work of the Past, Work of the Future. *AEA Papers and Proceedings 2019* (NBER wp 25588).

Autor, D., and Dorn, D. (2013). The Growth of Low-Skill Service Jobs and the Polarization of the US Labor Market. *American Economic Review, 103*(5), 1553–1597.

Conde-Ruiz, J. I., and Ganuza, J. (2022). Economía Digital en Tiempos de Pandemia. *Papeles de Economía Española,* 173, 200-223.

Conde-Ruiz, J. I, Ganuza, J., Garcia, M., and Victoria, C. (2024a). *Technological Change and Higher Education,* mimeo.

Conde-Ruiz, J. I, Ganuza, J., Garcia, M., and Victoria, C. (2024b). *AI and Digital Technology: Gender Gaps in Higher Education,* CESifo Economic Studies, 2024, ifae020*,* https://doi.org/10.1093/cesifo/ifae020

Conde-Ruiz, J .I, Ganuza, J., Garcia, M., and Victoria, C. (2024c). *Costly Preference's Distortion for Preserving Self Image in Allocating Competitive Mechanisms,* mimeo.

Dorn, D. (2015). The Rise of the Machines: How Computers Have Changed Work. *UBS Center Public Paper,* 4.

Hanushek, E., Schwerdt, G., Wiederhold, S., and Woessmann, L. (2015). Returns to skills around the world: Evidence from PIAAC. *European Economic Review,* 73, 103-130.

Lewandowski, P., Park, A., Hardy, W., Du, Y., and Wu, S. (2022). Technology, Skills, and Globalization: Explaining International Differences in Routine and Nonroutine Work Using Survey Data. *The World Bank Economic Review, 36*(3), 670–686. https://doi.org/10.1093/wber/lhac005

OECD. (2023). *Education at a Glance 2023: OECD Indicators.* Paris: OECD Publishing. https://doi.org/10.1787/e13bef63-en

Rebollo-Sanz, Y. F., and De la Rica, S. G. (2022). Gender gaps in skills and labor market outcomes: evidence from the PIAAC. *Review Economics Household,* 20, 333–371. https://doi.org/10.1007/s11150-020-09523-w

Schotte, S., Park, A, and Lewandowski, P. (2023).The global divergence in the de-routinisation of jobs. In C. Gradín, P. Lewandowski, S. Schotte, and K. Sen, *Tasks, Skills, and Institutions – The Changing Nature of Work and Inequality* (pp. 33-51). Oxford University Press. https://global.oup.com/academic/product/tasks-skills-and-institutions-9780192872241?prevNumResPerPage=20&prevSortField=1&sortField=8&resultsPerPage=20&start=0&lang=en&cc=gb#

Sofoklis, G., and Megalokonomou, R. (2019). Which degrees do students prefer during recessions? *Empirical Economics,* 56, 2093–2125.

Webb, M. (2020). *The Impact of Artificial Intelligence on the Labor Market.* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3482150

ANNEX

- *Routine Task Intensity Index (RTI)* (Lewandowski *et al.*, 2022; Lewandowski *et al.*, 2023)

This index is first calculated by Lewandowski *et al.* (2022) for 47 countries using three surveys: the OECD's Programme for the International Assessment of Adult Competencies (PIAAC), the World Bank's *Skills Toward Employment & Productivity (STEP) and the Chinese Urban Labor Survey (CULS).*

To make the index as consistent as possible with existing metrics in the literature, US PIAAC data are used to maximize consistency with Acemoglu and Autor's (2011) O*NET-based task metrics. In particular, questions harmonized in PIACC and STEP whose content is similar to the questions used by Acemoglu and Autor (2011) are first identified. Subsequently, the combinations of questions (and groups of questions) that most correlate with the O*NET-based occupation metrics for the U.S. No questions on physical tasks are used because there is only one question on this issue.

The non-routine cognitive analytical task metric is based on questions about problem solving, reading news, reading professional journals, problem solving, and programming. The non-routine cognitive interpersonal task metric is based on supervising others and making presentations. The routine cognitive task metric is based on (or lack of) ability to change the order of tasks, completing forms, and (or lack of) giving speeches or making presentations. For each item, values are considered (to be yes or no).

Each metric for each task is standardized so that the mean equal to 0 is the U.S. mean and the standard deviation 1 is the U.S. mean.

Finally, a synthetic measure of routine task intensity at the worker level is created as the difference of the logarithms of the routine cognitive task level and the mean of the analytical and personal non-routine tasks:

$$RTI = \text{In}\left(r_{cog}\right) - \text{In}\left(\frac{nr_{analytical} + nr_{personal}}{2}\right)$$

Subsequently, in Lewandowski *et al.* (2023), regression based RTI predictions are obtained for countries that do not have the necessary survey data (including Spain).

- *Indexes of Exposure to Technologies (AI and Software)* (Webb, 2020)

To assess the exposure of occupations to a given technology, Webb (2020) uses patent texts to identify what the technology can do and then quantify the extent to which each occupation involves performing similar tasks. For patents, he uses public data from Google Patents. In particular, the fields he uses are the title, abstract, and the Cooperative Patent Classification codes (which indicate the subject matter to which the patent relates).

TABLE 1A

PERCENTAGE OF WOMEN IN THE TOTAL UNDERGRADUATE ENROLLMENT

	2015-2016	*2016-2017*	*2017-2018*	*2018-2019*	*2019-2020*	*2020-2021*	*2021-2022*	*2022-2023*
Pedagogy	83	83	83	83	84	83	84	84
Early Childhood Education	93	93	93	93	92	92	91	91
Primary Education	67	67	68	67	68	68	67	69
Social Education	81	81	81	81	81	81	82	82
Audiovisual, Image and Multimedia	50	50	50	50	52	53	55	58
Design	73	74	75	75	76	77	78	79
Fine Arts	67	69	70	72	73	74	75	77
Art History	69	69	68	69	69	69	70	69
Conservation and Restoration	78	77	76	77	78	80	81	80
Performing Arts	80	77	77	79	79	79	77	78
Music	46	47	48	48	48	48	48	49
Religion and Theology	19	18	18	15	17	17	24	25
Archaeology	56	55	53	53	51	52	53	52
History	33	32	32	32	32	33	34	34
Philosophy	36	36	37	38	38	39	39	39
Humanities	60	61	61	61	62	63	63	62
English Language	73	73	73	74	74	74	75	75
Classical Languages	66	64	64	65	65	66	67	66
Other Foreign Languages	73	74	74	74	75	76	77	76
Translation and Interpreting	80	80	81	81	81	80	80	80
Spanish Languages and Dialects	71	71	71	71	71	72	72	73
Literature	70	71	71	71	71	72	74	78
Modern and Applied Languages	78	79	79	79	79	80	80	78
Economy	39	38	38	38	38	39	38	39
Public Policy and Management	41	39	39	39	41	42	44	46
International Relations	68	69	69	69	69	69	69	69
Psychology	74	74	75	75	76	76	77	77
Social and Cultural Anthropology	61	62	61	62	63	63	62	62

TABLE 1A *(continued)*

PERCENTAGE OF WOMEN IN THE TOTAL UNDERGRADUATE ENROLLMENT

	2015-2016	*2016-2017*	*2017-2018*	*2018-2019*	*2019-2020*	*2020-2021*	*2021-2022*	*2022-2023*
Criminology	59	60	60	60	61	61	60	60
Cultural Studies and Management	68	68	67	68	68	69	69	71
Geography	25	27	25	26	27	28	28	25
Gender Equality	90	87	87	80	95	95	95	96
Sociology	53	53	54	55	57	59	59	60
Other Social and Legal Sciences	48	43	47	42	50	52	51	52
Communication	57	58	60	61	61	62	62	63
Journalism	62	61	61	60	59	57	56	55
Information and Documentation	67	66	65	65	65	63	61	61
Financial and Actuarial	49	47	39	40	38	33	31	32
Finance and Accounting	50	50	49	48	48	47	46	46
Administration and Business	47	46	46	46	46	46	46	46
Labor Relations and Human Resources	62	62	62	62	63	64	64	65
Management and Public Administration	53	53	53	53	55	55	56	55
Marketing	51	52	52	52	53	53	53	55
Protocol and Events	88	89	89	88	86	86	87	88
Advertising and Public Relations	70	71	72	73	74	75	76	77
Trade	50	50	49	48	48	48	48	47
Law	55	56	56	57	57	58	59	60
Biology	62	62	62	62	62	62	63	63
Biochemistry	65	65	65	66	66	68	69	70
Biotechnology	60	60	61	61	61	62	62	63
Biomedicine	77	76	75	75	76	76	77	79
Environmental Sciences	47	48	48	48	49	49	49	50
Chemistry	53	53	53	54	54	54	54	55
Marine Sciences	55	58	56	57	58	56	57	58
Geography and Land Use Planning	28	29	29	28	27	27	26	27
Geology	41	41	41	40	40	41	40	39
Physics	26	25	26	27	27	27	28	28
Other Sciences	59	63	64	62	61	65	61	60
Mathematics	38	38	38	37	36	35	36	36
Statistics	43	43	45	45	46	46	46	45
Software and Application Development	11	11	12	12	12	13	14	14
Video Game Development	12	12	12	13	13	14	17	19
Multimedia Engineering	20	20	21	20	20	21	22	26
Computing	12	12	12	12	13	13	14	14
Industrial Chemical Engineering	47	46	46	47	47	47	47	47
Environmental Engineering	51	51	49	48	47	49	49	48

TABLE 1A *(continued)*

PERCENTAGE OF WOMEN IN THE TOTAL UNDERGRADUATE ENROLLMENT

	2015-2016	*2016-2017*	*2017-2018*	*2018-2019*	*2019-2020*	*2020-2021*	*2021-2022*	*2022-2023*
Power Engineering	29	28	28	27	27	26	26	26
Electrical Engineering	13	14	14	14	15	15	15	15
Computer Engineering	10	10	11	10	11	11	12	12
Sound and Image Engineering	25	25	27	26	28	29	30	30
Telecommunication Engineering	21	20	21	21	21	22	22	22
Industrial and Automatic Electronics Engineering	14	14	15	15	16	16	16	16
Electronics Engineering	16	17	17	17	17	17	18	19
Industrial Design and Product Development Engineering	47	47	47	47	48	49	50	51
Industrial Technology Engineering	23	23	24	24	24	25	26	26
Mechanical Engineering	13	13	13	13	14	14	14	14
Aerospace Engineering	23	23	24	24	25	25	26	26
Automotive Engineering	8	7	6	6	5	4	5	5
Naval and Oceanic Engineering	19	19	20	20	20	21	21	22
Industrial Organization Engineering	25	26	27	27	28	30	29	30
Nanotechnology	37	40	40	41	41	41	38	38
Other Engineering	14	13	14	14	15	17	17	20
Food Science and Technology	69	68	68	67	67	67	66	66
Oenology	50	50	51	51	51	50	49	47
Food Engineering	61	64	62	63	63	63	66	66
Materials Engineering	24	25	25	29	33	36	38	37
Textile Engineering	52	50	63	73	70	63	65	64
Mining and Energy Engineering	26	26	27	27	24	24	24	24
Architecture	49	49	50	50	52	53	55	57
Geomatics Engineering, Surveying and Mapping	31	31	29	28	28	26	29	26
Urban Planning and Landscaping	57	52	62	40	43	41	40	39
Technical Architecture	38	38	38	39	39	40	42	44
Civil Engineering	29	29	29	28	28	29	29	30
Agricultural and Agri-Food Engineering	36	36	34	33	33	33	33	33
Agricultural, Livestock and Rural Engineering	33	32	31	31	30	32	31	31
Horticultural and Landscape Engineering	31	39	26	27	16	21	23	23
Forestry and Forestry Engineering	26	27	25	25	26	26	28	27
Veterinary Science	72	73	74	75	76	77	77	78
Dentistry	59	60	61	62	63	63	65	66
Medicine	66	66	67	68	69	69	70	71

TABLE 1A *(continued)*

PERCENTAGE OF WOMEN IN THE TOTAL UNDERGRADUATE ENROLLMENT

	2015-2016	*2016-2017*	*2017-2018*	*2018-2019*	*2019-2020*	*2020-2021*	*2021-2022*	*2022-2023*
Nursing	80	80	81	81	81	82	82	82
Biomedical and Health Engineering	59	59	59	61	62	63	63	64
Optics and Optometry	72	73	73	74	74	74	76	76
Physiotherapy	49	48	48	48	47	47	48	48
Speech Therapy	90	91	91	91	91	91	90	91
Human Nutrition and Dietetics	74	73	73	73	72	73	73	72
Podiatry	67	67	65	67	68	71	73	74
Occupational Therapy	83	83	84	85	85	85	86	85
Pharmacy	70	70	70	71	71	71	72	72
Other Health Sciences	54	57	54	50	53	53	53	51
Social Work	82	82	82	82	83	83	84	84
Gastronomy and Culinary Arts	43	43	45	43	45	46	47	48
Hotel Management	65	65	66	68	63	63	66	64
Physical Activity and Sport	18	18	18	19	20	20	21	22
Sports Management	13	11	9	6	7	8	8	9
Tourism	67	67	67	67	67	67	67	66
Prevention and Occupational Safety	24	21	19	17	19	18	21	20
Military Education	10	12	13	15	21	27	29	28
Protection Of Property and Persons	18	19	23	26	27	29	28	26
Nautical and Maritime Transport	19	20	21	20	21	22	22	23
Ground Transportation Service	27	28	28	27	25	25	26	28
Air Transportation Services	33	30	29	27	29	31	31	34

Note: Fields of study without students enrolled in any of the courses are not included.

Source: Integrated University Information System (SIIU). General Secretariat of Universities.

TABLE 2A

ROUTINE TASK INTENSITY INDEX AND INDEX OF EXPOSURE TO TECHNOLOGIES. DEGREES

		Routine Task Intensity	*AI (Webb)*	*Software (Webb)*
11101	Pedagogy	-0.47	0.31	0.30
11201	Early Childhood Education	-0.46	0.28	0.29
11301	Primary Education	-0.56	0.29	0.28
11401	Other Teachers	-0.37	0.31	0.32
11901	Social Education	-0.42	0.34	0,32
21101	Audiovisual, Image and Multimedia	-0.40	0.41	0.41
21201	Design	-0.36	0.47	0.42
21301	Fine Arts	-0.23	0.43	0.43
21302	Art History	-0.16	0.33	0.36
21401	Conservation and Restoration	-0.44	0.37	0.36
21502	Music and Performing Arts	-0.55	0.31	0.30
22201	Archaeology	-0.29	0.32	0.32
22202	History	-0.27	0.34	0.35
22301	Philosophy	-0.37	0.33	0.35
22901	Humanities	-0.24	0.33	0.34
23101	English Language	-0.45	0.29	0.29
23102	Classical Languages	-0.40	0.32	0.32
23103	Other Foreign Languages	-0.42	0.32	0.32
23104	Translation and Interpreting	-0.49	0.34	0.32
23201	Spanish Languages and Dialects	-0.53	0.29	0.28
23202	Literature	-0.50	0.31	0.29
23901	Modern and Applied Languages	-0.26	0.32	0.33
31101	Economy	-0.29	0.36	0.36
31201	Public Policy and Management	-0.35	0.37	0.35
31202	International Relations	-0.43	0.41	0.39
31301	Psychology	-0.45	0.36	0.33
31401	Social and Cultural Anthropology and Culture Studies and Management	-0.50	0.35	0.33
31402	Criminology	-0.24	0.39	0.36
31404	Geography	-0.21	0.40	0.40
31406	Sociology and Gender Equality	-0.36	0.37	0.37
32101	Communication	-0.40	0.44	0.44
32102	Journalism	-0.42	0.38	0.36
32201	Information and Documentation	-0.26	0.38	0.39
41201	Financial and Actuarial	-0.42	0.42	0.37
41202	Finance and Accounting	-0.14	0.32	0.36
41301	Administration and Business	-0.28	0.36	0.36
41302	Labor Sciences	-0.23	0.35	0.35
41303	Management and Public Administration	-0.10	0.31	0.33

TABLE 2A *(continued)*

ROUTINE TASK INTENSITY INDEX AND INDEX OF EXPOSURE TO TECHNOLOGIES. DEGREES

		Routine Task Intensity	*AI (Webb)*	*Software (Webb)*
41401	Marketing	-0.38	0.41	0.38
41402	Protocol and Events	-0.31	0.33	0.29
41403	Advertising and Public Relations	-0.41	0.40	0.36
41601	Trade	-0.30	0.35	0.33
42101	Law	-0.44	0.37	0.33
51101	Biology	-0.34	0.45	0.42
51201	Biochemistry	-0.49	0.47	0.40
51202	Biotechnology	-0.54	0.47	0.41
51901	Biomedicine	-0.50	0.46	0.40
52101	Environmental Sciences	-0.30	0.43	0.42
53101	Chemistry	-0.42	0.48	0.44
53201	Marine Sciences	-0.26	0.47	0.45
53202	Geography and Land Management	-0.29	0.38	0.39
53203	Geology	-0.36	0.49	0.44
53301	Physics	-0.62	0.49	0.42
54101	Mathematics	-0.64	0.41	0.40
54201	Statistics	-0.52	0.47	0.47
61301	Software and Application Development and Multimedia Engineering	-0.70	0.52	0.53
61901	Computing	-0.73	0.53	0.54
71101	Industrial Chemical Engineering and Environmental Engineering	-0.42	0.54	0.46
71301	Power Engineering	-0.56	0.56	0.48
71302	Electrical Engineering	-0.50	0.55	0.46
71401	Computer Engineering	-0.79	0.54	0.54
71402	Sound and Image Engineering	-0.58	0.51	0.52
71403	Telecommunication Engineering	-0.62	0.54	0.50
71404	Industrial and Automatic Electronics Engineering	-0.54	0.55	0.47
71405	Electronics Engineering	-0.57	0.53	0.52
71501	Industrial Design and Product Development Engineering	-0.46	0.51	0.44
71502	Industrial Technology Engineering	-0.59	0.57	0.46
71503	Mechanical Engineering	-0.48	0.56	0.47
71601	Aerospace Engineering	-0.64	0.60	0.47
71603	Naval and Oceanic Engineering	-0.38	0.56	0.50
71901	Industrial Organization Engineering and Nanotechnology	-0.49	0.51	0.44

TABLE 2A *(continued)*

ROUTINE TASK INTENSITY INDEX AND INDEX OF EXPOSURE TO TECHNOLOGIES. DEGREES

		Routine Task Intensity	*AI (Webb)*	*Software (Webb)*
72101	Food Science and Technology and Food Engineering	-0.36	0.49	0.48
72102	Oenology	-0.44	0.52	0.43
72201	Materials Engineering and Textile Engineering	-0.61	0.51	0.42
72401	Mining and Energy Engineering	-0.44	0.52	0.47
73101	Architecture and Urban Planning and Landscaping	-0.58	0.59	0.45
73102	Geomatics Engineering, Surveying and Mapping	-0.45	0.53	0.46
73201	Technical Architecture	-0.41	0.50	0.43
73202	Civil Engineering	-0.48	0.54	0.46
81102	Agricultural and Agri-Food Engineering	-0.36	0.49	0.45
81103	Agricultural, Livestock and Rural Engineering	-0.36	0.47	0.43
81201	Horticultural and Landscape Engineering	-0.19	0.46	0.45
82101	Forestry and Forestry Engineering	-0.35	0.47	0.42
84101	Veterinary Science	-0.36	0.40	0.42
91101	Dentistry	-0.41	0.41	0.43
91201	Medicine	-0.41	0.41	0.42
91301	Nursing	-0.39	0.41	0.42
91401	Biomedical and Health Engineering	-0.57	0.52	0.43
91402	Optics and Optometry	-0.37	0.42	0.42
91501	Physiotherapy	-0.38	0.40	0.42
91502	Speech Therapy	-0.33	0.38	0.41
91503	Human Nutrition and Dietetics	-0.24	0.38	0.41
91504	Podiatry	-0.38	0.41	0.43
91505	Occupational Therapy	-0.30	0.38	0.39
91601	Pharmacy	-0.38	0.42	0.42
92301	Social Work	-0.36	0.35	0.34
101401	Physical Activity and Sport	-0.29	0.35	0.36
101501	Tourism	-0.09	0.33	0.36
104101	Nautical and Maritime Transport	-0.18	0.48	0.51
104103	Ground Transportation Services and Air Transportation Services	-0.32	0.46	0.45
109999	Services (Other Studies)	-0.28	0.42	0.39

Sources: Schotte *et al.* (2023) and Albanesi *et al.* (2023).

TABLE 3A

INDEX OF UNMET DEMAND. DEGREES

Career	*Excess Demand Ratio*
Biotechnology	3.41
Industrial Design and Product Development Engineering	3.19
Design	3.13
Medicine	2.68
Biochemistry	2.19
Veterinary Science	2.04
Industrial Organization Engineering and Nanotechnology	1.83
Criminology	1.66
Dentistry	1.50
Advertising and Public Relations	1.48
Physical Activity and Sports	1.45
Biomedical and Health Engineering	1.44
Aerospace Engineering	1.34
Physics	1.34
Architecture and Urban Planning and Landscaping	1.24
Mathematics	1.21
Protocol and Events	1.18
Translation and Interpreting	1.17
Industrial Technology Engineering	1.13
Psychology	1.12
Conservation and Restoration	1.09
Communication	1.06
Computing	1.04
Social Education	1.03
International Relations	1.01
Nursing	0.98
Mechanical Engineering	0.96
Administration and Business	0.92
Fine Arts	0.91
Marketing	0.91
Literature	0.88
Physiotherapy	0.83
Classical Languages	0.81
Primary Education	0.81
Archaeology	0.79
Spanish Languages and Dialects	0.76
Power Engineering	0.75
Law	0.74
Philosophy	0.73

TABLE 3A *(continued)*

INDEX OF UNMET DEMAND. DEGREES

Career	*Excess Demand Ratio*
Pharmacy	0.72
Biology	0.70
Finance and Accounting	0.69
English Language	0.68
Journalism	0.68
Human Nutrition and Dietetics	0.67
Industrial Chemical Engineering and Environmental Engineering	0.67
History	0.66
Art History	0.63
Social Work	0.63
Geography and Land Use Planning	0.57
Industrial and Automatic Electronics Engineering	0.56
Early Childhood Education	0.55
Sound and Image Engineering	0.55
Humanities	0.54
Economy	0.50
Electrical Engineering	0.50
Pedagogy	0.50
Trade	0.50
Telecommunication Engineering	0.50
Chemistry	0.50
Agricultural, Livestock and Rural Engineering	0.49
Labor Sciences	0.48
Policy and Public Management	0.47
Social and Cultural Anthropology and Cultural Studies and Management	0.46
Occupational Therapy	0.40
Financial and Actuarial	0.40
Naval and Oceanic Engineering	0.38
Materials Engineering and Textile Engineering	0.36
Forestry and Forestry Engineering	0.35
Geology	0.35
Tourism	0.33
Information and Documentation	0.32
Computer Engineering	0.30
Optics and Optometry	0.30
Sociology and Gender Equality	0.28
Management and Public Administration	0.28
Environmental Sciences	0.27
Geomatics Engineering, Surveying and Mapping	0.27

TABLE 3A *(continued)*

INDEX OF UNMET DEMAND. DEGREES

Career	*Excess Demand Ratio*
Civil Engineering	0.25
Food Science and Technology and Food Engineering	0.23
Podiatry	0.20
Speech Therapy	0.17
Technical Architecture	0.09

Note: The index is calculated as the ratio between the number of people admitted to a given degree program and the number of people who have made it their first choice in the ranking. It does not include double degrees or degrees from affiliated centers.

Source: Created by the authors with admission microdata from the universities of the Community of Madrid joint district.

ARTIFICIAL INTELLIGENCE AND HUMAN CAPITAL: ARE COMPLEMENTARITIES AT RISK?

Juan F. JIMENO*
Ana LAMO

Abstract

The employment consequences of technological innovations depend crucially on the degree of complementarity between new machines and workers. In previous episodes of technological revolutions, complementarities between technology and human labor have displayed a skill-bias, that is, they were higher for skilled workers than for unskilled ones. In this piece, facing the context of a new technological environment determined by the advances in Robotics and Artificial Intelligence, we discuss i) what are their main characteristics that may change the skill-bias observed in previous technological changes, ii) what are so far the occupations more exposed to the new technological advances brought up by Robotics and Artificial Intelligence, and iii) what kind of investment in educational is needed to fully exploit the complementarities between new technologies and human labor.

Keywords: Robotics, artificial intelligence, tasks, occupations, education.

JEL classification: I20, J24, O30.

* The views expressed are those of the authors and do not necessarily represent those of the Banco de España, European Central Bank or the Eurosystem.

I. INTRODUCTION

History of technological changes teaches us that it is the adaptation of human capital through the re-skilling of the labour force what allows to increase productivity and employment, even if technological innovations displace jobs in some occupations. Nevertheless, each wave of innovation is more likely to complement particular sets of skills. Hence, the adjustment of labor supply through investment in human capital (mostly channelled by the education system) differs with the implementation of technological innovations.

The types of technological progress we have witnessed in the past is of two types. One is skill-biased technological progress, that is, technologies that complement human labor in occupations that required high levels of educational attainments and complex manual/non-manual skills. Another is the automation of routine tasks, typically manual tasks that free human labor to more productive activities. In both cases, the adjustment of employment is through skill upgrading, so that human labor can be devoted to those productive tasks more complementary to the new technologies. Hence, the policy response should consist mainly of changes in the educational system that allow to match the skills of labour supply with those required by the new technologies.

Nowadays, a new wave of technological advances appears to have the scope of changing the production of goods and services in many dimensions. Artificial Intelligence, Machine Learning, Generative Artificial Intelligence, and Large Language Models could autonomously perform tasks that previously required the participation of human labour. This time there are great concerns that these innovations are much more disruptive since not only routine tasks, but also creative tasks can be performed autonomously by "robots" and AI algorithms without human intervention. In principle, AI is closer to be "skill-bias technological progress" than automation of routine tasks. Still, there is the possibility of AI substituting human labor in all kinds of tasks with much more job displacement, intensively and extensively, than previous technological advancements.

With these premises a key question to be addressed is: how could human capital adjust to exploit complementarities with AI? Potential productivity and employment gains, and changes in economic inequalities from the implementation of AI will crucially depend, as in previous episodes of technological revolutions, on the adjustment of labor supply. We address this question in three steps. First, we highlight what is new about the AI technological revolution, to what extent can AI provide a General Purpose Technology that affect the production of a wide variety of goods and services, and what are the human skills more likely to be performed by robots and algorithms. Secondly, we draw on our previous research (Albanesi *et al.*, 2024) to map those skills into tasks and, hence, to find which occupations are more potentially exposed to AI advancements. Thirdly, we look within occupations to find out the type of human capital (educational attainments) required to perform those occupations, Finally, we use data on educational systems across Europe to show to what extent changes in the composition of labor supply are taken place and could be complementary to AI.

II. WHAT WE TALK ABOUT WHEN TALKING ABOUT ARTIFICIAL INTELLIGENCE

AI is defined as a field of computer science that deals with the development of computer systems that can perform tasks that typically require human intelligence, such as speech recognition, natural language processing, text generation and translation, video, sound and image generation, decision making and more. The two most distinctive features of AI are the capabilities of analysing the environment and of autonomously taking actions to achieve specific goals. Its development has taken place in several waves with different techniques and instruments (from expert systems and Narrow AI to machine and deep learning and neural networks and large language models). They basically differ in two dimensions: i) degree of autonomy or need of human intervention, and ii) variety of problems/tasks that they can solve/perform. We now summarize their most relevant characteristics and their potential associations with human skills (in third Section).[1]

The first phase of AI development took place around 2010 and was based on the development of machine learning and deep learning techniques and discriminative artificial intelligence. Machine and deep learning broadly consists of applications focused on providing systems with the ability to learn and improve from experience without being explicitly programmed. Discriminative AI is built on models often used for tasks like classification or regression, sentiment analysis, and object detection, which use instruments such as logistic regressions, decision trees, and random forests.

[1] A more detailed summary, with a strong focus on policies to better implement AI techniques, can be found in European Parliament (2020). More recently the OECD has updated its definition: "An AI system is a machine-based system that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that [can] influence physical or virtual environments. Different AI systems vary in their levels of autonomy and adaptiveness after deployment" (https://oecd.ai/en/wonk/ai-system-definition-update).

What we are witnessing now is the development of Generative AI (Gen-AI). This is a set of algorithms capable of generating image synthesis, text, and music, using deep learning, neural networks, and large language models that detect patterns and relationships in the data to train then. Generative Adversarial Networks, Variational Autoencoders, transformer and diffusion models, and many more are specific application of Gen-AI that serve as foundational models providing basis for a wide range of tasks involving comprehension and generation of natural language (textual, mathematical, and computer programming).

III. WHICH TASKS ARE MORE POTENTIALLY EXPOSED TO AI DEVELOPMENTS?

The leading theoretical construction in Economics to analyse the labor market impact of AI technologies is the so-called "task-based framework" (Acemoglu and Restrepo, 2019). Both in the US and in Europe there are available occupational catalogues (O*NET and ESCO, respectively). These are a list of occupations classified by both the tasks that they perform and the mix of knowledge, skills, and abilities, require to perform them (see European Commission, 2020). Hence, a job post could be defined as the combination of tasks performed, and a mapping between jobs and tasks can be constructed. The connection between jobs and AI is in two dimensions: i) how much AI is making progress in the performance of tasks under each occupation ("exposure"), and ii) to what extent AI perform task substituting human labor or allowing it to be more productive ("complementarity").

As for exposure, one of the most used indicators is from Felten *et al.* (2021), based on the correspondence between 10 AI applications and 52 human skills (the so-called AI Occupational Exposure, AIOE). They use weights of importance and complexity of tasks within each occupation, and measures of AI advancements in the performance of those tasks form expert reports (taken form the Electronic Frontier Foundation) to obtain a relative measure, which Albanesi *et al.* (2024) exports to European data and normalize it to take values between 0 and 1. Similarly, Webb (2020) uses the overlap between patent descriptions (taken from Google Patent Public Data) and job descriptions (from O'NET) to construct a similar index. Both represent different aspects of AI. While the former is driven by the exposure of workers´ abilities to technological advancements, the latter highlights the availability of machine learning algorithms could perform occupations' tasks.

As for complementarity, Cazzaniga *et al.* (2023) propose to adjust the original AIOE measure with a corrected index (C-AOIE). Notice that exposure to AI does not by itself imply job displacement, as it could enhance worker´s productivity. This is more likely to happen in complex jobs, where there many tasks and most of them are "hard" (not easily codified), than in simple jobs, with only a few sets of "easy tasks". The complementarity-adjusted AIOE (C-AIOE) takes explicitly into account labor substitution. The correction is basically due to the analysis of work contexts and physical aspects of how work is conducted in each occupation. Using their own judgement, they take into account the criticality of decisions and the gravity of the consequences of errors as two main factors that we preclude full transition to AI. The construction of this index leads to conclude that exposure and complementarity are positively correlated (see Box 1 in Cazzaniga *et al.*, 2024).

An alternative approach to measure complementarity is to associate AIOE to changes in the composition of employment by occupation. In a nutshell, it is trying to see if occupations more exposed to AI gain employment shares. This is precisely what Albanesi *et al.* (2024) do using data from exposure to AI-enabled technologies and changes in employment shares by occupations in 16 European countries over the period 2011-2019. These years saw the rise of deep learning applications such as language processing, image recognition, algorithm-based recommendations, or fraud detection. Though more limited in scope than the current generative AI models such as ChatGPT, deep learning applications were nonetheless revolutionary – and still triggered concerns about the impact on jobs. As indicators of AI exposure, they use both Felten's *et al.* (2021) and Webb (2020), together with an indicator of exposure to software to gauge to what extent AI exposure is different to the implementation of digitalization. Their results show that, regardless of the exposure index used, occupations more exposed to AI indeed gained employment shares, overall, in Europe and in each country in the sample (with few exceptions). Moreover, this positive association between AI exposure and increases in employment (in relative terms) was stronger among those occupations with more young and highly educated workers. This suggests that, in principle, AI is complementary to human labor but with some "skill-bias".

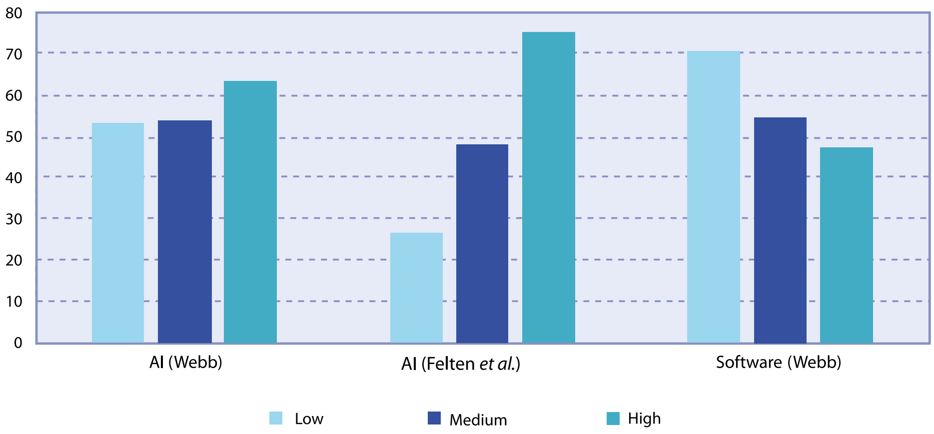
IV. WHICH EDUCATIONAL INPUTS REQUIRE THE FULFILMENT OF TASKS THAT ARE MORE POTENTIALLY EXPOSED TO AI DEVELOPMENTS?

The mapping of tasks into occupations is informative about the skills required for the performance of the tasks but does not provide detailed insights into the educational attainments that provide the skills. Which fields of study are more fit to provide skills complementary to AI technologies is an open and evolving question. The conventional wisdom is that university graduates from the so-called STEM fields (Science, Technology, Engineering and Management) will be in increasing demand. Is that what can be observed so far? If so, is labor supply adjusting to the increasing demand of skills provided by the STME fields of study?

As for the first question, figure 1 presents exposure to AI technologies by educational level, as computed by Albanesi *et al.* (2024). They group workers into cells, defined as the intersection of occupations (at the 3-digit ISCO level of aggregation) and six sectors of activity (agriculture, construction, financial services, services, manufacturing, and public services). Then, educational attainment of each cell is defined as lower/middle/upper according to the average educational attainment of its workers position in the terciles of the distribution of education levels in each country. The chart reports the exposure to AI and software by educational group. Clearly, workers with higher educational attainments are more exposed to AI, and this contrasts with the exposure to software, which goes in the opposite direction. This suggests that new AI technologies is something else than computerization or digitalization.

FIGURE 1

EXPOSURE TO TECHNOLOGY BY EDUCATION LEVEL AVERAGE PERCENTILE

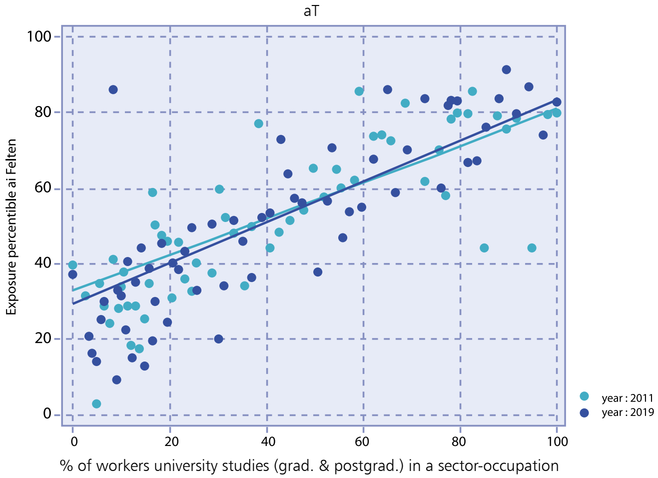


Notes: The chart reflects how exposed different "education groups" of workers are on average to the three technology measures. Education groups are defined as the subsample of occupation-sector cells whose average educational attainment is in the lower, middle, and upper third (tercile) respectively of the national education distribution.

Source: Albanesi *et al.* (2024).

FIGURE 2

EXPOSURE TO AI (FELTEN *ET AL.*) BY PERCENT OF WORKERS WITH UNIVERSITY STUDIES. SPAIN 2011 AND 2019



Notes: Y- axis is AI potential exposure percentile, Felten *et al.* (2021). The x-axis is the percent of workers in a sector-occupation observation with university studies (graduate and postgraduate) in 2011 and 2019.

Source: Felten *et al.* (2021).

To understand better which educational requirements are brought by the implementation of AI technologies because they are more complementary to them, we analyse data for Spain in more detail. Figure 2 plots average exposure scores, the AIOE index by Felten *et al.* (2021) for occupation-sector cells by percent of workers with university studies in 2011 and in 2019. The positive slopes, steeper in 2019 than in 2011, show that occupations whose workers predominately exhibit university education are more exposed to AI than occupations with fewer percentage of workers with university studies. In contrast, those occupations potentially more exposed to AI employ a smaller fraction of low skill workers, defined as those with primary education and less. Again, this is more pronounced in 2019 than in 2011 (figure 3).[2] This confirms the argument that AI is indeed skill-biased technological change.

More generally, Panels (a) and (b) in figure 4, borrowed from Albanesi *et al* (2024), provide evidence for 16 European countries that AI is indeed skill

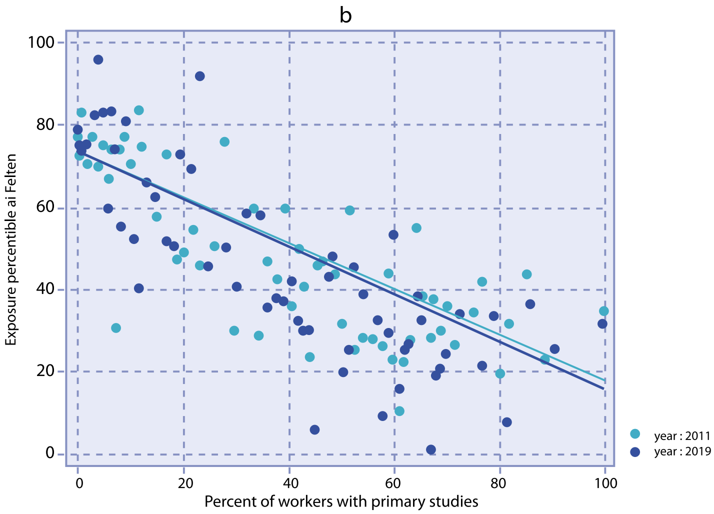
[2] Figures 2 and 3 are binned scatterplots. These provide a non-parametric way of visualizing the relationship between two variables with many observations. A scatterplot that plots every data point would become too crowded to interpret visually. These charts group the x-axis variable into equal-sized bins, computes the mean of the x-axis and y-axis variables within each bin, then creates a scatterplot of these data points.

biased. It shows the estimated coefficients of the association between changes in employment and AI-enabled automation by level of education (broken down into terciles, *i.e.* the lower, middle and upper thirds of the population). Statistically significant coefficients are plotted in dark blue. The coefficient for the whole sample is shown by the horizontal line. The bars display the coefficient estimated for the subsample of cells for average educational attainment in the lower, middle, and upper tercile respectively of the within-country education distribution. For occupations where average educational attainment is in the low and medium-skill groups, AI exposure does not seem to shake things up significantly. However, for the high-skill group we find a positive and significant association: moving 25 centiles up along the distribution of exposure to AI appears to boost the sector-occupation employment share by 3.1% using Webb's AI exposure indicator, and by 6.7% using the measure of Felten *et al.* (2021)

Admittedly, the focus in employment share neglects another important variable that shows the impact of AI technologies on the labor market, namely, wages. Did relative wages of workers more exposed to AI also increase? The

FIGURE 3

EXPOSURE TO AI BY PERCENT OF WORKERS WITH ONLY PRIMARY STUDIES BY OCCUPATIONS. SPAIN 2011 AND 2019



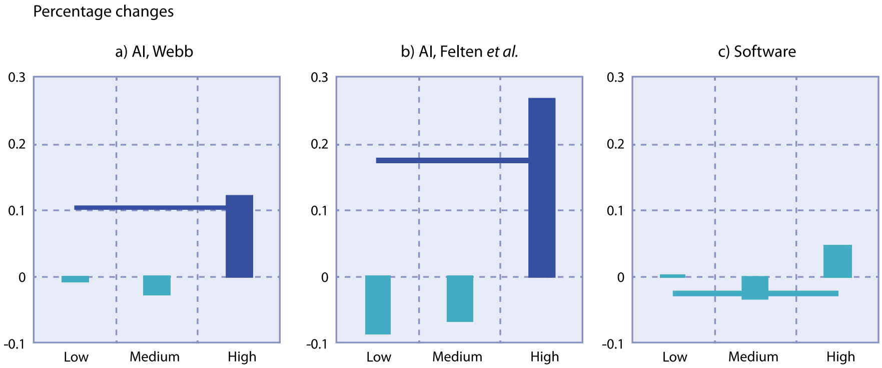
Notes: Y-axis is Ai potential exposure percentile, Felten *et al*. (2022). The x-axis is the percent of workers in a sector-occupation observation with only primary studies in 2011 and 2019.

Source: Felten *et al.* (2022).

statistical information about relative wages is more incomplete and imprecise than the statistical information about jobs. Nevertheless, Albanesi *et al.* (2024) also correlate an indicator of changes relative wages by occupations-sectors with the AIOE index.[3] In contrast with the results for employment shares, during the sample period (2011-2019) there is hardly any significant association between these two variables. Hence, so far there is no signs that AI is changing the wage distribution by occupations. This raises two interesting hypotheses. One, already formulated in the previous episodes of skill-biased technological change is that relative wages in Europe are rigid and it takes big shocks and long periods to change them. Being at its initial stage and looking only at developments during a decade might not be sufficient to detect how wages might react to the AI revolution. Another is that labor supply is already adjusting and the relative supply of workers with skill complementary to AI is also increasing. In the next section, we take this question to the available data on university graduates by fields of study.

FIGURE 4

EXPOSURE TO TECHNOLOGY AND CHANGES IN EMPLOYMENT SHARES BY SKILL LEVEL. SPAIN 2011-2019



Notes: Regression coefficients measuring the effect of exposure to technology on changes in employment share. Each observation is a ISCO 3-digit occupation times sector cell. Observations are weighted by cells' average labor supply. Sector and country dummies are included. The sample consists in data for 16 European countries, from 2011 to 2019. The coefficient for the whole sample is shown by the horizontal line. The bars display the coefficient estimated for the subsample of cells for average educational attainment in the lower, middle, and upper tercile respectively of the within-country education distribution. Coefficients that are statistically significant at least at the 10% level are plotted in dark blue.

Source: Albanesi *et al.* (2024).

[3] Changes in relative wages are proxied by changes in percentile positions along the wage distribution in 2011 and 2019. Therefore, the information is only of a "qualitative" nature, rather than fully quantitative.

V. HOW ARE EDUCATIONAL SYSTEMS ADAPTING TO AI DEVELOPMENTS AND HOW THEY SHOULD DO IT?

As noted in the Introduction, the main mechanism by which workers adapt to the labor market is by moving from displaced jobs to other jobs, either already existing or newly created by the new technologies. What kind of jobs, if any, is AI generating? In principle, if our interpretation of the data is correct, *i.e.*, there are complementarities with human skills, there will be increasing demand in the occupations where those skills are most needed. Moreover, new tasks and jobs could arise because of the implementation of AI. We have already provided some evidence on the complementarities. As for the new tasks/jobs generated by the implementation of AI, the account, so far, is pessimistic. What we are witnessing is the appearance of manipulative activities with negative social value, such as deep-fakes, misleading digital advertisements, addictive social media, or AI-powered malicious computer attacks.[4] It is difficult to see the potential increasing labor demand from these activities.

The most common view on the complementarity between AI and educational attainment hints at STEM fields. It is anticipated that working with robots and AI algorithms will require a stronger background on Science, Technology, Engineering, and Mathematics, as these fields provide a deeper understanding of how AI operates. An extremely opposite view is that technology workers are sowing their "own seeds of self-destruction" by advancing AI that will eventually take the same jobs in the future. Under this view, managerial, creative and empathetic skills, including communications, customer services and healthcare, will likely remain high in demand as they are less replaceable by technology, particularly AI.[5]

It might be too early to solve this debate. In fact, the jury will be out for some years before we see the full implementation of AI and its labor market effects. What we can see so far is to what extent labor supply is moving to some specific fields. Given the prominent role of STEM fields in the question at hand, now we provide some data on the increasing demand of STEM studies during the past decade (2013-2019) and to what extent this increasing demand of education is following the increasing labor demand in occupations that seems more complementary to AI.

[4] See Acemoglu (2024) for a quantification of the effects of these activities on productivity and GDP growth.

[5] This, for example, is the view of Nobel Prize Laureate Chris Pissarides.

FIGURE 5

UNIVERSITY GRADUATES IN STEM FIELDS, 2013-2019

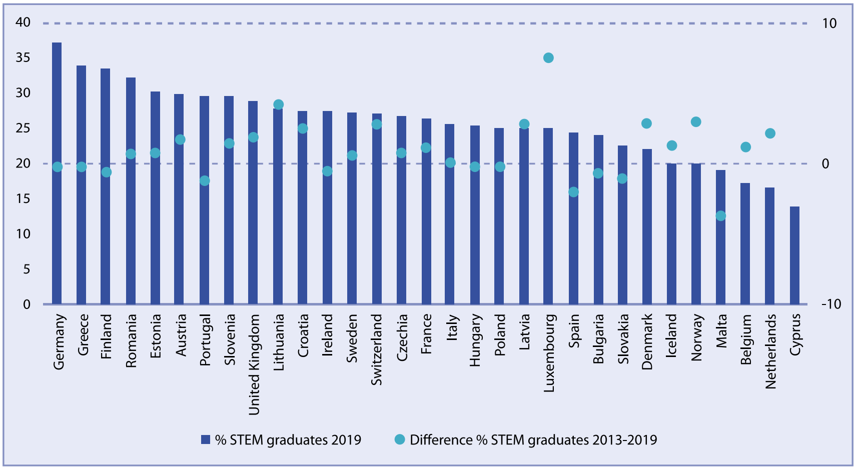
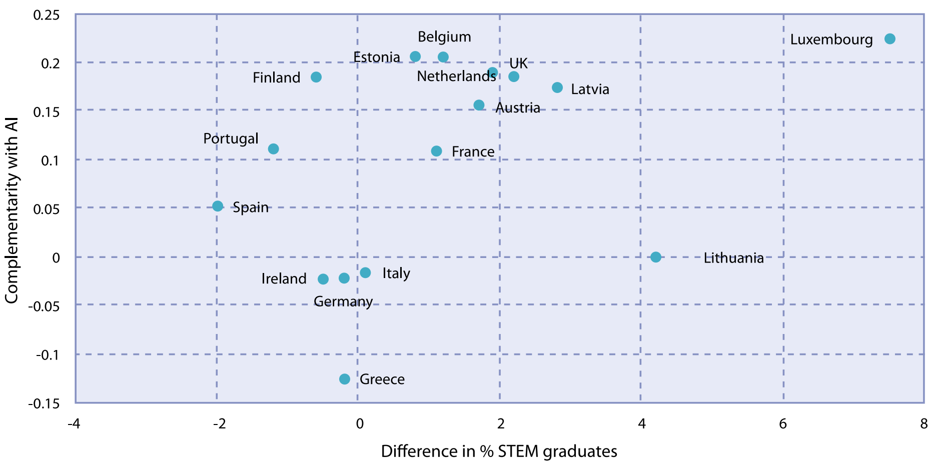


FIGURE 6

INCREASE IN UNIVERSITY GRADUATES IN STEM FIELDS, 2013-2019, AND COMPLEMENTARITY WITH AI



Notes: Complementarity with AI is the statistical association between the AIOE index and changes in employment shares across occupations-sectors, 2011-2019, from Albanesi *et al.* (2024).

Source: Albanesi *et al.* (2024).

Figure 5 plots data from Eurostat Education attainment statistics on the proportion of university graduates in STEM fields in 2013 and 2019.[6] There are wide differences across European countries, with Germany, Greece, and Finland at the top, and Belgium, the Netherlands, and Cyprus at the bottom. Moreover, although the proportion of STEM university graduates has increased in most countries during the last decade, there are a few countries where this proportion diminished. Spain is among the countries with a lower proportion of STEM university graduates and among the few where it decreased between 2013 and 2019.

Figure 6 displays the association between changes in the proportion of STEM university graduates and complementarity with AI, measured by Albanesi *et al.* (2024).

In principle, there is a positive correlation, so that labor supply with STEM educational requirements is increasing by more in those countries where the complementarity with AI is higher. Nevertheless, the changes in the proportion of STEM university graduates seem, overall, small in relation to the big changes in the composition of labor demand that AI might bring. Better and more detailed educational statistics and a closer follow-up of the employment prospects of university graduates by fields of study will be needed, both for understanding the consequences of AI and for preparing sound policy responses.

Nevertheless, the consequences of the Robotics and AI for human capital accumulation go beyond the composition of university graduates by fields. Being a General-Purpose Technology, their implementation is bound to affect all kinds of occupations and activities, regardless of their educational contents, by levels and by fields. Thus, the curricula of both vocational training and of university education across all fields will need to be adapted to the requirements of the new technologies for complementarities with human labor to be fully exploited. Moreover, reforms should also consider changing the style of educating and training workers in the new technological scenario, where knowledge and creativity will also be provided by machines. Admittedly, there is a high degree of uncertainty about how new technologies will evolve and how they will be implemented in the production of goods and services. And because uncertainty may bring the need of rapid adjustment it is urgent to start providing to the educational sector with the instruments and flexibility needed for rapid adaptation.

[6] We take as university studies those under levels 5-8 of the International Standard Classification of Education (ISCED, 2011). In STEM fields we include: i) Natural sciences, mathematics and statistics, ii) Information and Communication Technologies, and iii) Engineering, manufacturing and construction.

VI. CONCLUDING REMARKS

During the deep learning boom of the 2010s, occupations potentially more exposed to AI-enabled technologies increased their employment share in Europe. Occupations with a relatively higher proportion of younger and skilled workers gained the most. For wages, the evidence is less clear and suggests neutral to slightly negative impacts. These results do not amount to an acquittal: AI-enabled technologies continue to be developed and adopted. Most of their impact on employment and wages –and therefore on growth and equality– has yet to be seen. There are reasons to expect that Generative-AI is more significant as a General-Purpose Technology and more disruptive for labor markets than earlier versions of AI technologies. Although may conjecture on either catastrophic or fortunate effects of future developments in AI, it is too early to see them in hard data.

In any case, educational systems will need to adapt. Keeping an eye on data to observe rapid changes and guaranteed sufficient flexibility in educational systems to respond as quickly as changes are observed, would be of paramount importance to exploit the full potential and AI and mitigate its negative consequences

BIBLIOGRAPHY

Acemoglu, D. (2024). *The Simple Macroeconomics of AI*. MANUSCRIPT.

Acemoglu, D., and Restrepo, P. (2019). Automation and New Tasks: How Technology Displaces and Reinstates Labor. *Journal of Economic Perspectives, 33*(2), 3-30. DOI: 10.1257/jep.33.2.3

Albanesi, S., Dias Da Silva, A., Jimeno, J. F., Lamo, A., and Wabitsch, A. (2024). New technologies and Jobs in Europe. *Economic Policy.* Forthcoming.

Cazzaniga, M., Jaumotte, F. Li, L., Melina, G., Panton, A. J., Pizinelli, C., Rockall, E. J., and Mendes Tavares, M. (2024). Generative AI and the Future of Work. *Staff Discusion Notes, 2024(001).* International Monetary Fund. https://doi.org/10.5089/9798400262548.006

European Commission. (2022). The crosswalk between ESCO and O*Net. *Technical Report. Employment, Social Affairs and Inclusion.* https://esco.ec.europa.eu/system/files/2022-12/ONET%20ESCO%20Technical%20Report.pdf

European Parliament. (2020). Artificial intelligence: How does it work, why does it matter, and what can we do about it? European Parliament Research Service, June 2020. https://www.europarl.europa.eu/RegData/etudes/STUD/2020/641547/EPRS_STU(2020)641547_EN.pdf

Felten, E., Raj, M., and Seamans, R. (2021). Occupational, Industry, and Geographic Exposure to Artificial Intelligence: A Novel Dataset and Its Potential Uses. *Strategic Management Journal, 42*(12), 2195– 217.

Webb, M. (2020). The Impact of Artificial Intelligence on the Labor Market. *Stanford University Working Paper.* Stanford, CA.

PUBLIC IN-PERSON UNIVERSITY EDUCATION: DEMAND AND SUPPLY MISMATCH

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Jorge SAINZ
Ismael SANZ

Abstract

This study explores the potential mismatch between demand and supply of university degrees in Spain in the context of structural change in labor demand. Our investigation analyzes the trend of students seeking studies in other regions that are not their usual residence. It is observed that certain universities have increased the number of courses offered without increasing the number of places available potentially worsening the mismatch between supply and demand. The courses with greater access barriers in 2022 yielded higher salaries for their graduates in previous years, although no direct relationship was found between the number of places offered and future job opportunities. In addition, we integrate a review of international literature shedding light on how income expectations, perceived skills, and personal preferences play a crucial role in the choice of degree. Our findings show that although there are moderate elasticities between the choice of degree and expected earnings, subjective expectations are the dominant factor.

Keywords: University, field of study performance, grade inflation.

JEL classification: I23, I26, J11, J24.

* The views expressed are those of the authors and do not necessarily represent those of the Banco de España.

I. INTRODUCTION

Both the global labor market and, more specifically, the euro area, are facing new challenges. One of them is the shortage of labor in high-demand sectors, which is increasing and has a negative impact on business activity (European Commission, 2022). This imbalance in the labor market may result in higher labor costs and prices, as well as a possible reduction in production in the short term. In the medium term, this situation may hinder the necessary structural changes in the economy, especially in the sectors most affected by the transition to more sustainable and digital practices (Arpaia and Halasz, 2023).

In this analysis, we focus on the potential mismatch that may exist between supply and demand for public in-person university degrees, which is particularly important in the context of accelerated structural change. If the demand for degrees responds to job opportunities and the supply of degrees responds more slowly, the gap between the skills demanded by employers and the skills offered by graduates would widen rapidly in the context of structural change. Such a situation not only hampers firms in their search for qualified talent, but also limits equal opportunities for young people seeking to acquire skills in demand in the labor market, thereby increasing inequality.

This paper aims to examine these dynamics through a detailed analysis of the evolution of demand, supply and admission grades for different university degrees in Spain. Spain is an interesting case study because the data available allows us to correlate the demand, supply and employment outcomes of graduates by degree and university. Additionally, despite a high unemployment rate of 12.9% in 2023, Spanish companies complain of problems finding suitable workers. For example, the *Bank of Spain's Business Activity Survey (EBAE)* showed that in the first quarter of 2024, a significant 43.8% of Spanish companies reported that the lack of skilled workers had a negative or very negative impact, which is an increase of 34 percentage points since the beginning of 2021 (Fernandez and Izquierdo, 2024).

This paper examines whether there are significant mismatches between supply and demand for certain degrees and universities, with a particular focus on those with greater employment opportunities. We investigate whether the demand for university places in these areas exceeds the available supply, suggesting a possible inadequacy of the educational system to meet the demands of the current labor market.

To have a better understanding of this issue, the structure of this article is as follows: the second Section focuses on the influence of the potential job placement possibilities on the university students' choices, offering a review of the international literature that examines the relationship between the choice of higher education and expected profitability and other influencing factors such as personal skills and preferences. In the third Section, we analyze the public in-person university access system in Spain, detailing the admission process and trends in cut-off grades that reflect the balance between supply and demand in different degrees. The fourth Section examines the recent evolution of the demand and supply of university degrees, highlighting changes in student preferences and the response of institutions. Then, the fifth Section establishes the relationship between various factors such as the contribution base, the minimum admission grade, the pre-enrolment applications and the supply of places and degrees, with particular emphasis on how these variables interact and influence the decisions of students and institutions. Finally, in the sixth Section, we summarize the main findings and reflect on their implications for education and employment policies. This Section highlights the need to better align the supply of education provision with labor market trends in order to reduce the mismatch between supply and demand for tertiary education.

II. THE INFLUENCE OF LABOR MARKET INSERTION ON THE UNIVERSITY STUDENTS' DEMAND: A REVIEW OF THE INTERNATIONAL LITERATURE

The choice of higher education is an important determinant of earnings. The composition of college degrees explains some of the long-term changes in gender and race wage gaps (Gemici and Wiswall, 2014). There are large wage differences between students with the same level of education who choose different fields of study (Altonji *et al.*, 2012). The choice of a profession is linked to college degree decisions because it represents a substantial investment in specific human capital (Wiswall and Zafar, 2015a). Policymakers have begun to link university funding to degree production in specific fields (Snyder and Boelscher, 2018) and to design financial aid programs that incentivize students to choose programs with high societal and labor market demand (Allen, 2019; Natanson, 2019). However, there is little evidence on the extent to which job opportunities influence students' program choices. Although expected earnings and perceived ability are important determinants, other heterogeneous preferences are the dominant factor when selecting a degree.

Altonji *et al.* (2016) provide a comprehensive review of the relationship between the rate of profitability to education and degree choice. Altonji *et al.* (2016) conclude that although the results vary depending on the context and methodology used, most recent evidence shows that there is a significant, but quantitatively small, elasticity of college degree choice with respect to expected earnings. For example, Beffy *et al.* (2012) use data from France to develop a model that simulates students' sequential decisions about their degree selection process. In this model, students make their degree decisions based on both expected earnings and the non-monetary benefits associated with each field of study. To determine the income elasticity of degree choice, the study exploits fluctuations in the economic returns to different degrees over the business cycle. The results reveal significant but moderate elasticities, ranging from 0.09 to 0.14 for fields of study in sciences and in humanities and social sciences. Many subsequent studies find elasticities similar to Beffy *et al.* (2012).

Altonji *et al.* (2016) conclude that there are other aspects, such as preferences and skills, which have more influence on the decision to enroll in a particular degree. For example, mathematical skills play a more important role in the choice of specialization than verbal skills. Differences in degree preferences are the main driver of the gender gap in degree choice, while the distribution of degree-specific skills, while significant, is less important. Men responded more strongly than women to the increase in relative wages for science and business skills in the 1980s and 1990s, leading to a widening of the gender gap in college degree choice during this period.

Many of the studies take into account students' uncertainty about completing different degrees. Arcidiacono *et al.* (2015) also point out how students update their beliefs about their skills as they receive new information with the first grades in college. Parental approval is another important factor in explaining degree choice (Altonji *et al.*, 2016).

The review by Altonji *et al.* (2016) includes papers that, like the seminal work by Zafar (2013), use subjective expectation data to examine earnings beliefs in both real and hypothetical careers. These beliefs can then be used to see how expected earnings affect choices, providing another way to obtain wage elasticities.

In Table 1, we present more recent research than the papers included in the Altonji *et al.* (2016) study. The study by Wiswall and Zafar (2015a) implements an experimental design to explore the factors that influence students' choice of college degree. In this experiment, students at New York University (NYU) were provided with detailed data on the demographic profile and relevant characteristics of graduates in different fields of study. This approach allowed us to observe how students changed their beliefs and expectations in the face of new information, especially regarding their skills and job opportunities in different degrees. Wiswall and Zafar (2015a) found that both expectations about future earnings and perceived personal skills were important determinants of career choice. Specifically, they estimated that the average elasticities of career choice to changes in future wages ranged from 0.03 to 0.07. Furthermore, they found that providing low-cost information to students led to significant improvements in their well-being as they made more informed decisions about their education.

TABLE 1

DEGREES WITH HIGHER SALARIES HAVE HIGHER GRADES, MORE PRE-ENROLLMENTS AND DEGREES BUT NOT MORE PLACES AVAILABLE (A)

	Minimum entry grade (b)		*Pre-enrollments ©*		*Supply ©*		*Qualifications ©*	
	All	*Without medicine and nursing*	*All*	*Without medicine and nursing*	*All*	*Without medicine and nursing*	*All*	*Without medicine and nursing*
Salary	1.96	2.10	0.60	0.54	0.32	0.30	0.42	0.42
	(.60)***	(.63)***	(.28)***	(.28)*	(0.25)	(0.26)	(0.17)***	(0.19)**
Field of study	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Undergraduate or Dual Degree	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
University	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Remarks	652	587	652	587	652	587	652	587
R2	0.78	0.72	0.68	0.63	0.56	0.57	0.59	0.58

Notes: (a) The dependent variables are the access grade, the logarithm of the first choice pre-enrolment, the logarithm of the number of places offered, and the logarithm of the degrees in 2022. Each observation represents the average of the above variables for all degrees, distinguishing between undergraduate and double degrees offered in a field of study (there are 29 different ones) in each public university with in-person studies (there are 45). The salary corresponds to the annualized contribution base of the longest full-time affiliation episode in March 2020 for graduates who graduated in 2015-2016. All degrees are averaged, distinguishing between undergraduate and double degrees offered in a field of study at each university. The regression includes dummy variables for field of study, type of degree, and university. Total observations correspond to those pairs that have a wage. Standard deviation in parentheses: ***p less than 0.01; p less than 0.05:* p less than 0.1.

(b) A coefficient of 2 indicates that, controlling for differences in grades across fields, types of degrees, and universities, a degree whose graduates are paid 10% more would have a grade 0.2 points higher. If they are paid twice as much, 1.4 points higher.

(c) A coefficient of 0.5 indicates that, controlling for differences in pre-enrolment, supply, and completions across fields of study, types of degree, and universities, a program with graduates who earn 1% more than another would have 0.5% more pre-enrolment, supply, or completions. If it paid twice as much, it would have 50% more.

Source: Bank of Spain.

Wiswall and Zafar (2021) developed a survey of 493 top students at New York University (NYU), asking them about their expectations for obtaining various college degrees. The results show that both men and women expect significant benefits in the "marriage market" from earning a college degree. Women estimate that their chances of getting married at age 30 increase by 13% with a college degree, while men perceive an increase of more than 35% in their chances of getting married. In addition, there is a perceived marital disadvantage for women who choose a science or business degree over a humanities or social science degree, believing that these choices reduce their chances of marrying before age 30 by 15%.

In addition, both men and women believe that any degree will increase their likelihood of full-time employment at age 30, and in particular that a science or business degree rather than a liberal arts degree will increase their likelihood of full-time employment at age 30 by 15% (for men) and 9% (for women). These findings suggest that family-related variables such as marriage, future spouse's income, and family planning are important components in the choice of college degree. Ignoring these factors could lead to an overestimation of the importance of income in these decisions. Because investments in human capital tend to be directed toward specific occupations and jobs that have different levels of flexibility in working hours and work-life balance opportunities, individuals often evaluate how their educational choices will affect issues such as fertility and work-life balance.

Acton (2021) analyzes community college students' decisions about which field of study to pursue and finds that declining local employment in Michigan discourages students from applying to related programs. Students primarily shift their enrollment between programs that lead to occupations requiring similar skills. Local and occupational employment losses affect students' decision making because these young people tend to stay close to home during college and after graduation. In addition, community college programs are typically designed to be completed in two years or less, so students are likely to weigh short-term changes in labor demand more heavily in their degree choices than students at four-year institutions. Acton (2021) finds that, on average, each additional layoff per 10,000 working-age residents in a Michigan county reduces the proportion of high school graduates who enroll in related programs at community colleges the following year by 0.8%. An increase in one standard deviation in layoff risk reduces enrollment by 3.8%. This effect is due to students shifting enrollment to other community college programs rather than foregoing higher education opportunities all in all.

Beliefs are highly informative about future earnings and occupations and influence individual choices (Arcidiacono *et al.*, 2020). Correcting misperceptions about fields of study changes students' college intentions and, to a lesser extent, their enrollment decisions (Conlon and Patel, 2023). Conlon and Patel (2023) show that there are large and persistent differences between the careers U.S. college students hope to follow and the actual occupations they end up carrying out. Students have stereotypes about their fields of study that greatly exaggerate the likelihood that degrees will lead to specific jobs. Students expect to get the job that matches the stereotype of their degree: 65% of prospective art students expect to be artists (when in fact 17% are), 42% of communication/journalism students expect to be writers or journalists (when in fact only 4% are). Conlon and Patel (2023) conduct a randomized controlled experiment to analyze an informational intervention that provided students in the Ohio State University sample with statistics on the joint distribution of university degree and subsequent career development. In this way, Conlon and Patel (2023) correct students' misconceptions about the career paths of undergraduate degrees and find that students change their initial intentions as a result of the information. Specifically, these authors find statistically significant effects of students' increased knowledge about the type of occupation to which each college degree leads. This effect is significantly larger by 7% percentage points for students who considered applying to a program that was more stereotypically associated with a subsequent occupation and with fewer employment alternatives. The authors also find that the information leads students who overestimate the prevalence of the stereotypical occupation of their degree to take about 0.5 fewer classes in that subject over the next two semesters.

Abramitzky *et al.* (2024) examine how economic incentives affect higher education decisions and degree choices. The study focuses on a significant transition in Israeli kibbutzim from an equitable income distribution system to a productivity-based wage system. The wage reform implemented in the kibbutzim led to differences in the returns of education by field of study. Prior to the reform, the kibbutzim's equitable distribution model implied that all university degrees conferred identical economic benefits. After the reform, a diversification of returns was observed, with disciplines such as STEM (science, technology, engineering, and mathematics) yielding higher returns than the humanities, in line with the general trend in Israel. This shift from a scenario of minimal financial returns of education to a context of market-based returns provides a unique opportunity to examine how economic incentives affect higher education decisions, without relying on assumptions about expectations and preferences.

Abramitzky *et al.* (2024) use the staggered implementation of the reform over the years to conduct a difference-in-differences analysis, comparing the proportion of arts degree attainment and the field of study chosen by the adult members of the kibbutzim that implemented wage reform early ("treatment group"), with adults in kibbutzim that reformed later ("control group"), before and after the early reforms. In an environment where returns of education were initially low, the study finds that the marked increase in the rate of return of higher education, which varied significantly across fields of study, led to a substantial increase in the likelihood of completing a bachelor's degree, particularly in STEM fields. Young adults respond to the change in the returns of schooling by increasing their rate of bachelor's degree attainment and choosing fields of study in college that are expected to generate higher financial returns, primarily STEM subjects.

Conzelmann *et al.* (2023) analyze how four-year university degrees in the United States respond to variations in specific labor demand in each degree. To that end they develop a methodology that combines information from online job postings with geographic location data on alumni obtained from a professional networking platform. This approach allows them to identify an average elasticity of 1.3 in the production of four-year university degrees in response to labor demand. Conzelmann *et al.* (2023) provide further evidence that the magnitude of the aggregate response depends on both student demand and supply-side constraints on the part of universities. Specifically, they find that less selective and less research-intensive institutions are much more responsive to changes in skill demand than selective and research-intensive institutions. Limitations in the provision of specific degrees and restrictions due to requirements for certain degrees can lead to racial or socioeconomic stratification of students. Differences in educational production costs across degrees may also affect their responsiveness to changes in demand. Conzelmann *et al.* (2023) find that the overall elasticity is driven by degrees in the lower and middle tertiles of the average cost of each credit/hour. Social sciences, health, and communications show the most elastic responses to changes in skill demand.

On balance, the magnitude of the effect of working conditions on the choice of a degree is small, suggesting that factors outside the labor market play an important role in determining students' choices. Subjective expectations about income and perceived skills are a significant determinant of the students' current university degree choices but their heterogeneous taste is the dominant factor in the final choice.

III. ACCESS TO THE PUBLIC IN-PERSON UNIVERSITY IN SPAIN

88% of the new students enter the university after having passed the baccalaureate and after having passed the university entrance exams (EvAU, in Spanish). These two elements make up an individual grade that qualifies the student to access the degree of choice in the public in-person university.

The individual grade can reach a maximum of 14 points. The structure of the grade is calculated as follows: 60% is the baccalaureate grade (in which the student can obtain from 5 to 10 points) and 40% is the general entrance exam grade (from 4 to 10 points). This base entrance grade is a maximum of 10 points, and it is necessary to have at least 5 points to enter the university. This base grade is not the actual final admission grade used to apply for a place in the undergraduate program at the University. The final admission grade is calculated by adding the base grade plus the weighting of up to two subjects taken in the voluntary phase of the EvAU tests. Each subject of the voluntary phase can contribute between 0.1 and 0.2 points to the final admission grade, depending on the weighting parameters established in each Autonomous Community/University, up to a maximum of 14 points.

If a program at a public university has a limited number of places, *i.e*. the number of available places is less than the number of students applying for a place, the only criterion used to allocate a place is the admission grade. Applications are ranked from highest to lowest and students with the highest scores are offered a place until the program is full. The cut-off grade for admission to each public university program is the admission grade of the last student admitted.

If, after the first round of allocations, a student gives up the place he/she has obtained, it will be offered to the next student on the waiting list, and if he/she accepts it, a new place will become available in the other program to which he/she had been admitted as a second choice, and so on. In this way, the grade of the last enrolled student is lower than the cut-off grade. As a result, the enrollment of these last arrivals may be delayed until after the start of the course in the most popular programs.

Each student must submit a pre-enrolment application in which he/she must indicate, in order of preference, up to twelve degrees chosen from all the public universities of an Autonomous Community. If the student wants to apply for different degrees in different Autonomous Communities, they must submit a pre-enrolment application in each region, so if there are two pre-enrolment applications submitted by the same student but in two different regions, they will be treated as if they were the pre-enrolment applications of two different people.

Once all the grades of the pre-enrolled students are collected, each Autonomous Community ranks them from best to worst, and the students are assigned to the degrees according to their preferences in the pre-enrolment application. The student with the highest grade gets access to his or her first preference, the second preference, and so on until each program is full. If a person cannot get into their first preference because it is full of students with higher grades, they will be assigned to their second preference, in this way students are gradually assigned to programs according to their grades and order of preference.

Since there are students who are pre-enrolled in different Autonomous Communities or in private universities and who may decide not to finally enroll in the assigned degree, students who are assigned to preferences other than the first one may decide to wait for a better option that becomes available as a result of dropouts. Thus, the assignment process is iterative and consists of several rounds of assignments. Since the student who enrolls last with the lowest grade in each program determines the minimum admission grade, this minimum admission grade determines the difficulty of access to a program. Given the same distribution of grades, the higher the cutoff grade, the harder it is to get into the program.

It is also important to note that public universities may have incentives to behave strategically in determining the number of places they offer due to their funding system, internal politics, or simply for image reasons. In Spain, the program with the highest cut-off grade is the double degree in mathematics and physics. This means that, although the demand is not particularly high, the cut-off grades are very high, even higher than for medicine, which is the course that traditionally has the highest unmet demand, justified by the very high cost per place and the limited number of specialization places offered by the healthcare system. Universities consider that a high cut-off grade creates prestige to attract the best students.

The existence of very similar programs within the same university creates diseconomies of scale. Similar programs competing for students leads to a greater need for faculty, which ensures the growth of departments. This situation has, in some cases, led to having programs with a very small demand, which has forced the Autonomous Communities governments to include in their funding systems limitations on the viability of programs based on the number of students enrolled. A principal-agent problem arises, since the administrative authorities want to offer the greatest number of places at the lowest cost, while the academic authorities want to maximize the size of their organization with the public funds available.

It is also important to mention that the existence of scholarships can influence the mobility of students between the Autonomous Communities. The Spanish Ministry of Education offers several scholarships for undergraduate and graduate students. One of them is known as the Mobility Grant, a grant of 2,500 euros to help the student to move during the school year. In addition, until 2013, the Spanish Ministry of Education also offered a scholarships program for inter-university mobility, known as the Seneca

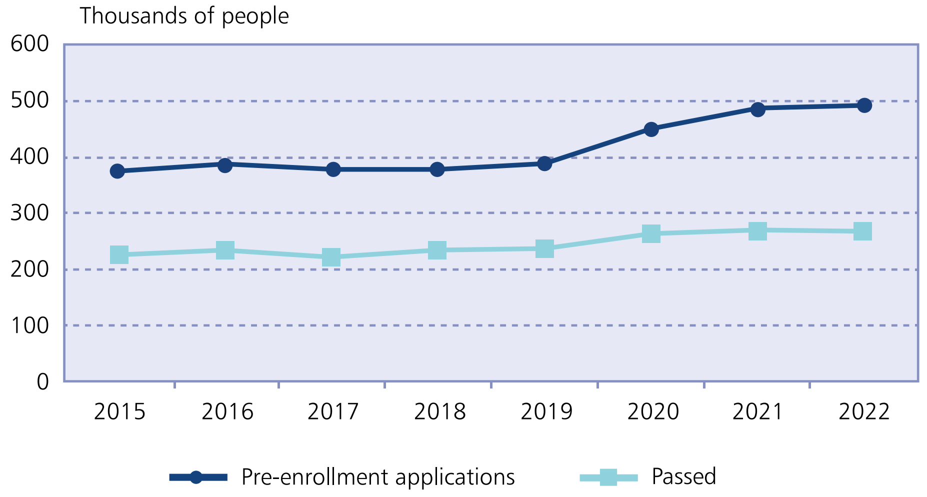
Scholarships, as financial support for the inter-university mobility program called the Spanish University Exchange System (Sicue). In addition to these scholarships, the governments of the Autonomous Communities and the universities themselves may offer other scholarship programs. Data on students who have received scholarships of this type are rather limited. However, the total number of beneficiaries of general government scholarships (general scholarships that include income-related scholarships in addition to mobility) was 372,111 students, which represents 32% of the total number of students enrolled in undergraduate studies in public universities in school year 2020-2021.

IV. RECENT EVOLUTION OF THE DEMAND AND SUPPLY OF UNIVERSITY DEGREES

Figure 1 shows the evolution of the total number of students who passed the University Entrance Examinations and the number of pre-enrolment

FIGURE 1

INCREASE IN EBAU (EVALUATION OF THE SPANISH BACCALAURATE TO ACCESS TO UNIVERSITY) PASS RATES AND PRE-ENROLLMENT APPLICATIONS IN PUBLIC ON-SITE UNIVERSITIES



Notes: Total number of students passing the exams, excluding exams for students over 25 years of age, 45 years of age and 40 years of age with work experience, and total pre-enrolment in undergraduate and bachelor's degree programs in public personal universities. The pre-enrolments are the sum of the first options, so for each student, one pre-enrolment per Autonomous Community is taken into account. The pre-enrolments in each year include the applications made in the academic year that begins in that year and ends one year later.

Source: Integrated University Information System (SIIU).

applications submitted (one per person and per Autonomous Community where it was submitted). The number of students passing the EvAU has gradually increased in recent years, from 223,000 in 2015 to 266,000 in 2022. The change in demand is equally due to the dynamism of the young population and its increased desire to access university studies. Figure 2a shows that the 19-year-old population will increase steadily between 2015 and 2022, from 428,000 to 484,000. During the period 1995-2008, fertility in Spain experienced a certain upturn, in line with the economic expansion that took place in those years. This led to a recent increase in the number of young people of university age. According to the population forecast of the Spanish National Statistics Institute (INE), the 19-year-old population will reach 586,000 in 2028. However, due to the lower fertility observed since the financial crisis, this population will tend to decline to around 440,000 people after 2040. On the other hand, Figure 2b shows that the probability that a 19-year-old will enroll in university has also increased, from 35 to 42% between 2015 and 2022. A tight supply of university places combined with a larger number of young people wanting to go to university increases the difficulty of access, especially to the most in-demand courses.

FIGURE 2

INCREASE IN THE POPULATION WISHING TO PURSUE UNIVERSITY STUDIES IN A DIFFERENT AUTONOMOUS COMMUNITY FROM THEIR PLACE OF RESIDENCE

2a. 19 years old population

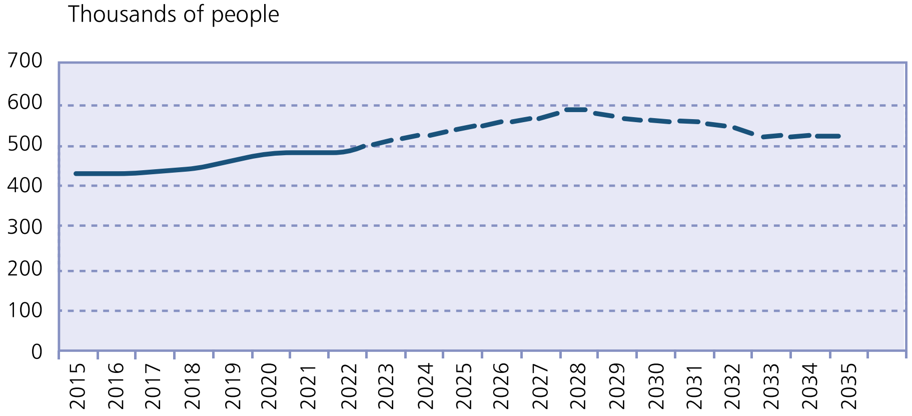
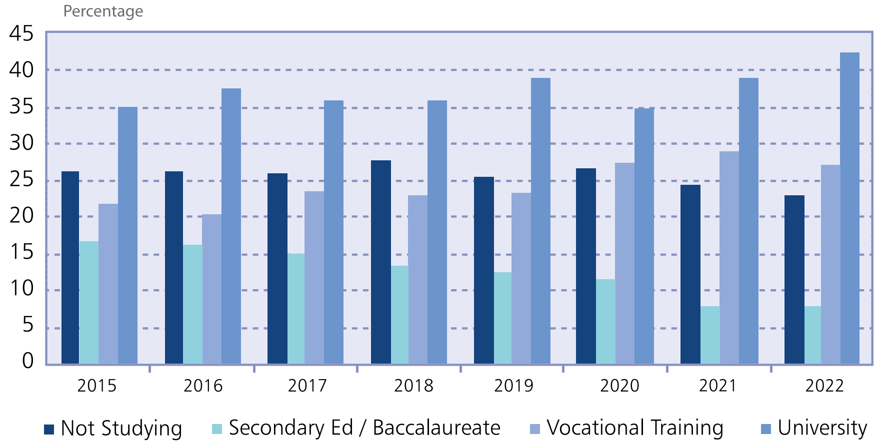


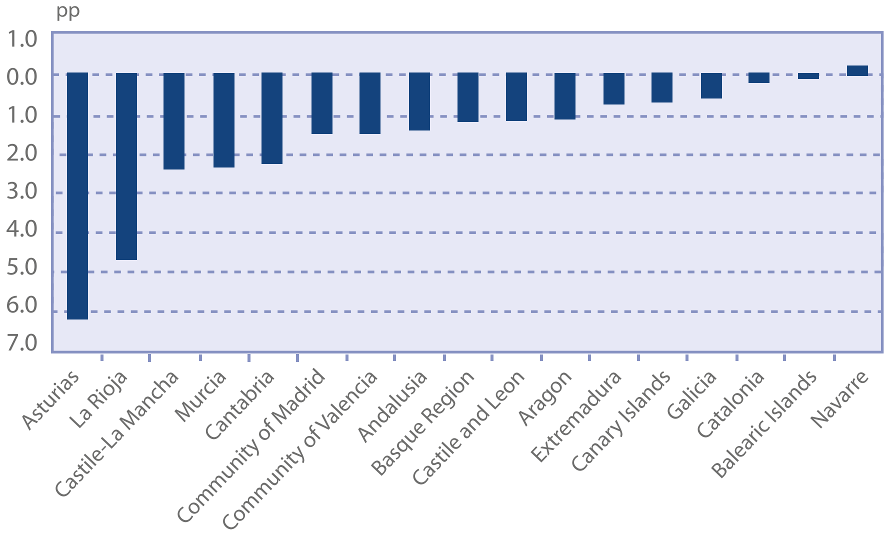
FIGURE 2 (*continued*)

INCREASE IN THE POPULATION WISHING TO PURSUE UNIVERSITY STUDIES IN A DIFFERENT AUTONOMOUS COMMUNITY FROM THEIR PLACE OF RESIDENCE

2b. Population aged 19 by formal education attainment



2c . Changes in the percentage of Students who enrolled in the Autonomous Community where they took the University Entrance Exam between 2018 and 2021

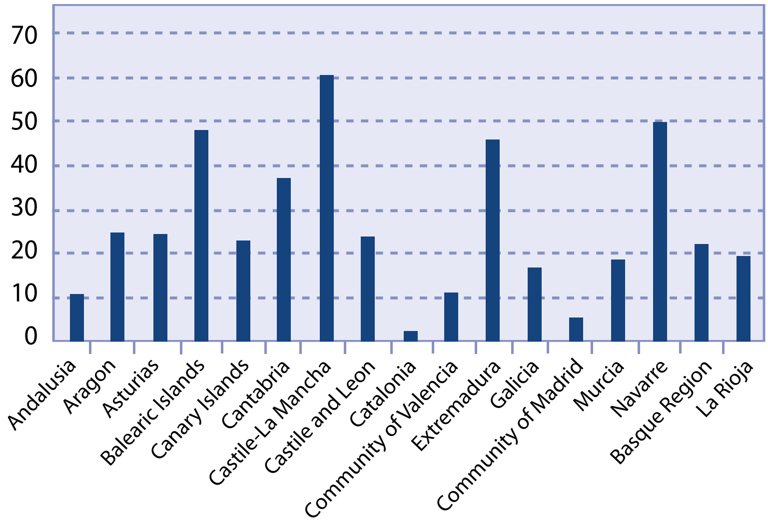


Sources graphs 2a to 2c: INE population figures, INE population projections, Labor Force Survey (fourth quarter of each year) and Integrated University Information System (SIIU).

FIGURE 2 (*continued*)

INCREASE IN THE POPULATION WISHING TO PURSUE UNIVERSITY STUDIES IN A DIFFERENT AUTONOMOUS COMMUNITY FROM THEIR PLACE OF RESIDENCE

2d. Percentage of students by Autonomous Community enrolled outside their Autonomous Community in undergraduate programs, academic year 2021-2022



Source: Integrated University Information System (SIIU).

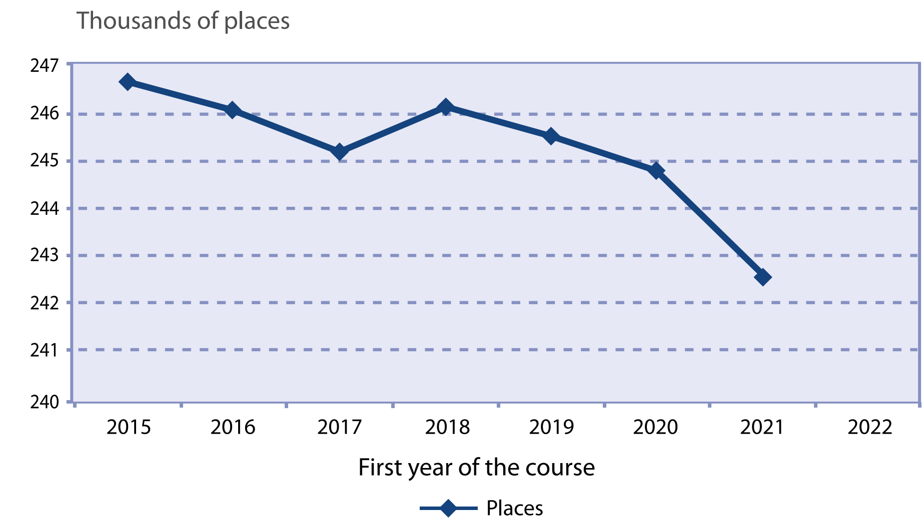
The fact that students can pre-enroll in different Autonomous Communities generates a certain multiplier effect of the pre-enrollment figures. Although in 2019 there were 237,000 students who passed the university entrance exams, pre-enrollments reached 390,000 (Figure 1). And this gap has increased since then. Thus, in the school year that began in 2022, there were 100,000 more pre-enrollments than in 2019 (26%), but only 30,000 more students passed (13%). This increase in pre-enrollments between the 2019 and 2022 academic years suggests a greater predisposition on the part of students to enroll in different autonomous communities. As an indicator of the greater interest to move to other regions, Figure 2c shows the evolution of the percentage of students who enrolled in the region where they took the university entrance exams between 2018 and 2021. For most regions, this percentage has decreased, with the change being particularly marked in Asturias and La Rioja, with a decrease of 6.2 and 4.7% points, respectively. Reducing the cost of attending universities outside the student's region of residence allows for a better allocation of students and desired degrees regardless of where they are located, leading to greater degree discrimination. Young people who have a strong preference for a particular degree are increasingly applying to study that degree in municipalities other than where they live if they are not accepted at universities in their region. This greater willingness to pursue specific higher education, even if it is outside their region, explains why there is a convergence in minimum admission grades across regions of the most in-demand degrees (from the 90 percentiles of degrees with the highest minimum grade) between 2015 and 2022. Figure 2d complements the detailed perspective on interregional student mobility, showing the percentage (in levels rather than variation) of students by autonomous community who choose to pursue their university studies outside their region of residence.

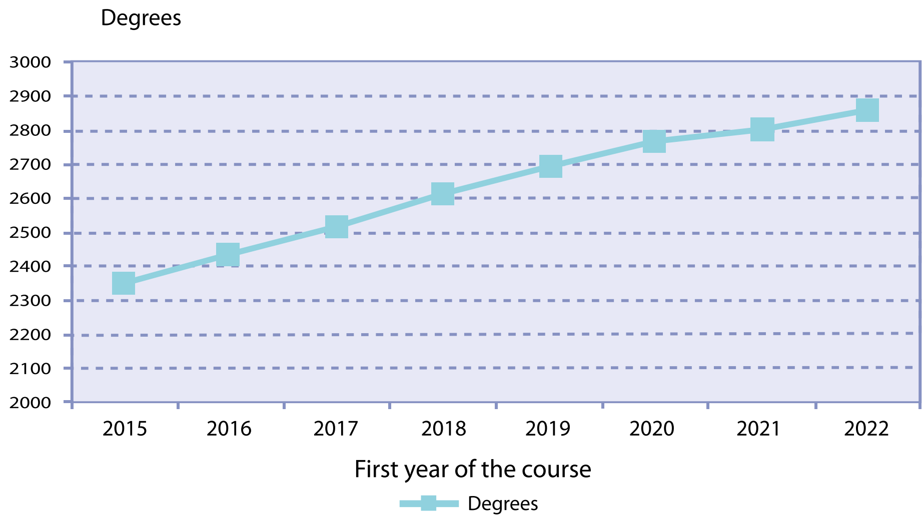
The figure shows that some autonomous communities, such as Castile-La Mancha (60.6%), Navarre (49.9%), the Balearic Islands (48.3%) or Extremadura (46.0%) or Cantabria (37.2%) had in the school year 2021-22 more than a third of their usual local university students enrolled in another region. In contrast, in Catalonia (2.1%) and the Community of Madrid (5.3%) percentage is less than 10% and in Andalusia (10.4%) or the Community of Valencia (11.2%) it is slightly over 10. This mobility could also be interpreted as a reflection of a potential shortfall of the academic offer in the community of origin. The high mobility of students from some regions suggests a lack of options that meet the student's aspirations and needs. On the other hand, the low mobility observed in communities with larger populations, such as Catalonia, the Community of Madrid, Andalusia or the Community of Valencia, indicates that their size allows them to offer a wider range of higher education.

Figure 3 shows the number of places available in all public in-person universities and the number of degrees awarded (undergraduate and double degrees). Throughout the period of study (2015-2022) there was a slight decrease in the supply of university places (2%). This figure contrasts with the supply of private in-person universities, measured in terms of new students, which increased by 34% to 51,000 students, reflecting both the increase in the number of private in-person universities over this period, from 27 to 31, and the increase in places available in most of them. However, in terms of the number of degree programs offered, in the school year that began in 2022, there were 2,863 undergraduate or double degree programs at public in-person universities, 22% more than in the academic year that began in 2015. This growth is more in line, although somewhat lower, than the growth in the private universities, which increased their offering of degrees by 40%, from 864 to 1,206, in the same period. An example of the growth in both types of universities is the case of the degrees in data analysis. In the 2017-2018 school year, neither private nor public universities offered this type of degree, while in the 2022-2023 school year there were 34 degrees taught at public universities, 74% of the total number of these degrees.

FIGURE 3

THE OFFERING OF IN-PERSON PUBLIC UNIVERSITIES DECREASED THE NUMBER OF NEW PLACES AVAILABLE AND INCREASED THE NUMBER OF DEGREE PROGRAMS





Notes: Sum of the number of places available in undergraduate and double degree programs at public in-person universities and the number of degree programs. The data on the number of places available are from the publication *Datos y cifras del Sistema Universitario español 2023-2022* which provides information up to the school year 2021-22.

Source: Integrated University Information System (SIIU).

In higher education, it is costly to increase the number of places available per degree due to the need to invest in infrastructure and staff in order to ensure that the quality of education is not compromised. In some cases, such as medicine, the actual size of the healthcare professional sector may impose its own limits on the capacity to absorb resident students. Launching a new degree program may also require such type of investment and staff recruitment or to use infrastructure and faculty from other, less in-demand programs. Another requirement for a new degree is to go through a complex review process involving the Spanish National Evaluation and Accreditation Agency (ANECA) or the Autonomous Community agencies, which in many cases takes more than one or two years. In addition, before the proposal can be submitted to these agencies, the project for a new degree program must be approved internally by the corresponding school and by the Governing and Social Councils of each university, on the basis of necessity and feasibility reports. In this sense, the fact that public universities have chosen to increase the number of courses without changing the total number of places available indicates that other factors, unrelated to cost, may be influencing the universities' decisions on what to offer.

Understanding the reasons that motivate a change in university provision is important because increasing the number of places available or degrees taught has very different implications for student access. An increase in the number of places available in a program makes it easier for students to enter as the minimum entry grade is lower. However, this need not be the case if there is an increase in the number of degrees, but they maintain the same number of places available. For example, suppose there are 20 pre-enrolments and 10 places available for a program. The minimum entry grade will be the tenth lowest grade. If a new program is added and the places available are divided between the two programs, the cut-off grade of the less popular program will not change because the last student to enter is the tenth, but the more popular program will have a higher cut-off grade, automatically increasing the average of the cut-off grades. There could be several explanations for the scarce increase in university places. Some of them could be related to how the increase in demand is interpreted. In particular, the increase in demand could be interpreted as something cyclical or the result of an increase in demand from students with low ex ante expectations of completing their degree. Other reasons may be related to the structure of demand in this market. A context in which individual demand is a function of the demand of others would be consistent with the maintenance of excess demand in universities in order to maintain the quality signal of their degrees. Becker (1991) gives the example of individual demand for social activities such as restaurants or entertainment. In the case of restaurants, they would rather have a line of people waiting at the door than expand their business. This serves as a lure for other customers since the line serves as a signal of their quality.

The changes in supply and demand explained in the previous section have contributed to the increase in the minimum entry grade. The creation of new degrees with high grades is not the only factor behind the increase in the average minimum grade. The sample includes the degrees and double degrees that have existed since the 2015-2016 school year and the minimum entry grade would also have increased by 1 point, from 6.8 to 7.8, especially from the 2020-2021 school year onwards. Figure 4a shows the recent evolution of the average minimum entry grade for all public in-person degrees. An increasing trend can be observed between the admission grade of students who took the entrance exams in 2015 and those who took them in 2022. Until 2019, there was an increase of 4 decimals, reaching 7.3. However, after the pandemic, the average cut-off grade increased at an accelerated rate, reaching 8.2. By field of study, the degrees in mathematics, computer science, psychology, nursing and physical sciences are the ones that have increased the minimum admission grade the most. On the other hand, journalism and information science, tourism and hotel management, and languages are the fields with the smallest increases.

An increasing trend in grades, both in the two-year baccalaureate and in the EvAU, may also imply an improvement in students' education or a relaxation of quality standards, which the education economics literature has termed grade inflation (Denning *et al.,* 2023). This phenomenon raises concerns because the grade signal loses its value in determining the relative changes in demand between occupations and the real possibilities of access for students at the time of pre-enrolment. Grade inflation could therefore also create a mismatch in the process of matching supply and demand.

FIGURE 4

INCREASE OF THE MINIMUM GRADE FOR ACCESS TO PUBLIC IN-PERSON UNIVERSITIES

4a . Minimum access grade (a)

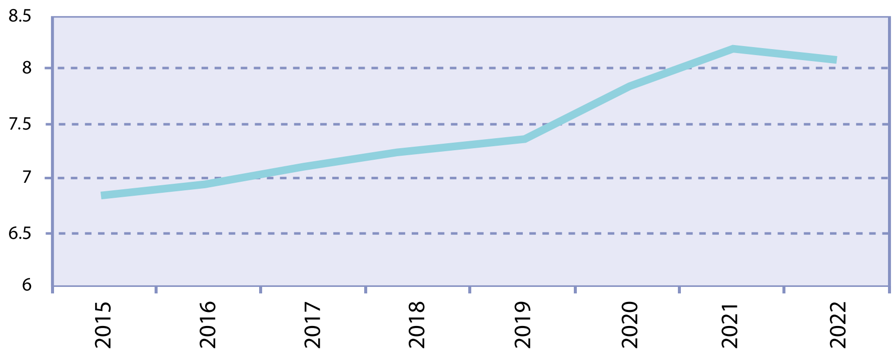
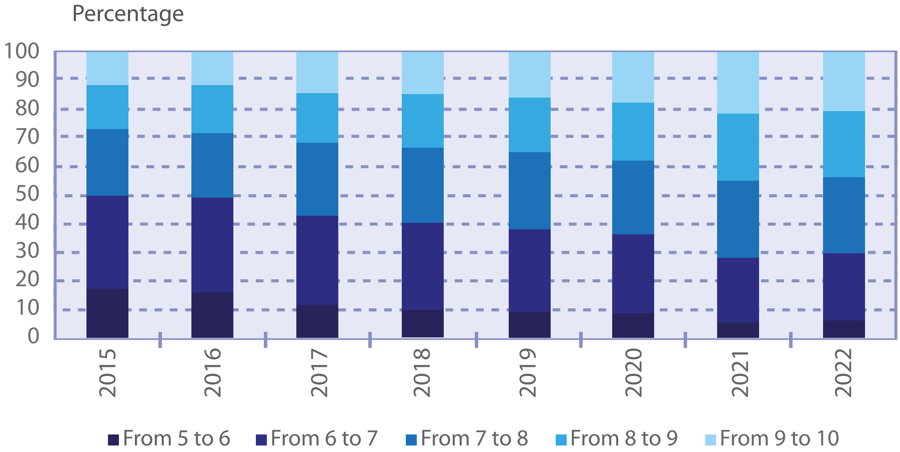


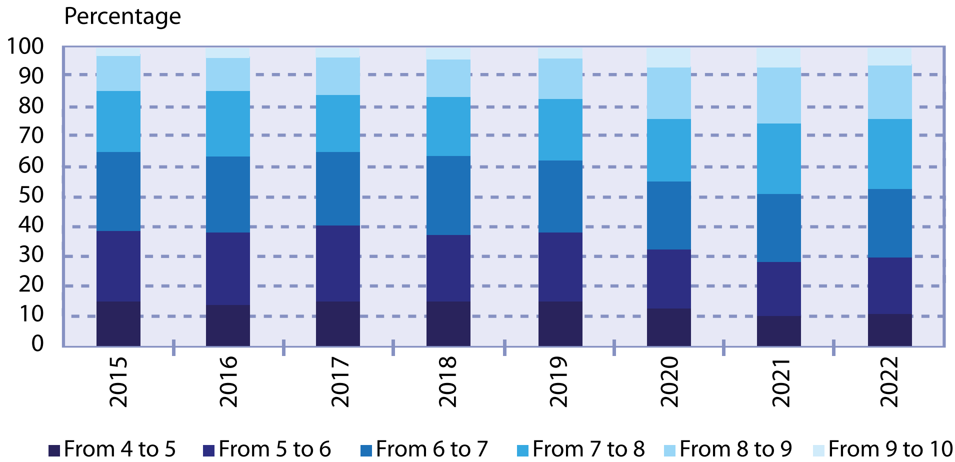
FIGURE 4 *(continued)*

INCREASE OF THE MINIMUM GRADE FOR ACCESS TO PUBLIC IN-PERSON UNIVERSITIES.

4b . Distribution of Baccalaureate grades



4c . Distribution of general phase grades of the qualifiel candidates



Note: (a) Average of the minimum access grade of all undergraduate and double degree programs at public in-person universities.

Source: Integrated University Information System (SIIU).

Cobreros *et al.* (2023) provided evidence that part of the increase in admission grades between 2013 and 2020 was due to a process of grade inflation, caused partly by various changes in the design of the EvAU. Figures 4b and 4c show the evolution of the distribution of baccalaureate grades of students who took the entrance exam and the general EvAU from 2015 to 2022. In 2015, 11.6% of students completed the two years of the baccalaureate with an average grade of *sobresaliente (A, 9 or more out of 10)*, a proportion that almost doubled in 2022, reaching 20.6%. There was also an increase in the number of *notable (B, 7 to 9 out of 10)*, with the percentage of students increasing from 38.5% in 2015 to 49.3% in 2022. This inflation in baccalaureate grades is only partially due to the relaxation that occurred during COVID-19, as it was already observed before the pandemic. Cobreros *et al.* (2023) suggest that the 2017 reform, which made the specific EvAU operational, led to a compensatory increase in baccalaureate grades. Other reforms, such as raising the grade threshold for scholarship eligibility from 5.0 to 6.5 in 2013, may have had a similar effect on how baccalaureate teachers awarded grades.

The percentage of students with B or A grades increased from 50.0% in 2015 to 59.2% in 2018 and reached 69.9% in 2022. If we compare the grades in the general phase of the EvAU with the baccalaureate grades, the former is significantly lower than the latter (with 46.2% of Bs or As in the general phase of the EvAU in 2022, compared to 69.9% in the baccalaureate). In the general phase of the EvAU, there is also an upward trend in the distribution of grades. However, unlike the baccalaureate, the increase in grades in the EvAU began in the pandemic year, when the proportion of students with 7 or more grades increased from 36.8% in 2019 to 45.4% in 2020. Possible reasons for the increase in grades include of this phase of the EvAU since the pandemic could be the increased optionality of the university entrance exams (Cobreros *et al.,* 2023). Among the reasons that could explain the increase in EvAU grades after the pandemic could be the change in the classical model of the university entrance exam. Until the 2018-2019 school year, there were two types of exams (A and B) that students could choose as a block. Since 2019-2020, students can choose questions from both types of exams, giving them more combinations to choose from. In addition, before the COVID-19 pandemic, the EvAU was held over three days, while now it is held over four days (five in regions with co-official languages).

Overall, the grade inflation in the general phase of the EvAU does not originate from the years before COVID-19, while in the case of the baccalaureate the trend was already there. In any case, beyond the importance of changes in the design of university entrance exams, there is evidence that grade inflation is not limited to Spain or non-university education. Finn *et al.* (2022) analyze the changes that A levels have undergone since the beginning of the pandemic in the United Kingdom. Results for the 2020-2021 school year continued the trend of grade inflation, with 44.8% of students receiving A* or A grades in 2021, compared to 38.5% in 2020 and 25.2% in 2019. Meanwhile, Denning *et al.* (2022) show that there has been a significant increase in graduation rates at U.S. universities over the past three decades. The researchers conclude that the increase at nine large public universities, one liberal arts center, and a nationally representative survey does not reflect better student preparation or an increase in the educational attainment of students' parents, but rather grade inflation.

V. RELATIONSHIP BETWEEN THE CONTRIBUTION BASE, THE MINIMUM ADMISSION GRADE, PRE-ENROLLMENT APPLICATIONS, THE NUMBER OF PLACES AVAILABLE AND THE DEGREES OFFERED

From a macroeconomic point of view, the mismatch between supply and demand will be of greater concern when there is greater demand than supply for those degrees that offer greater job opportunities. Specifically, this suggests that the education system is not adequately addressing a growing demand for certain profiles in the labor market. In order to analyze this possibility, the data on minimum entry grades for each field of study, type of degree (bachelor or double degree) and university in 2022 are correlated with the average social security contribution base in March 2020 of graduates in that field of study, type of degree and public university four years earlier, in 2016. The salary information is the gross annual remuneration of graduates in the 2015-2016 school year, using the annualization of the base for common contingencies corresponding to the longest contract during the month of March 2020 for employees with a full-time contract. Among other information, the Ministry also publishes the affiliation rate, which refers to whether the graduate was affiliated with Social Security for at least one day during the month of March 2020.[1]

Similarly, the contribution bases are correlated with the number of people who choose that degree at that university as their first choice (pre-enrolment application), the number of places available (supply) and the number of degrees offered. The minimum grades reflect separately the average of all bachelor's

[1] In this chapter, information on the first three years after graduation was not used because the estimates were more imprecise, although qualitatively similar results were obtained. We did not use information on affiliation to the social security because a low affiliation rate does not necessarily indicate that there is a high percentage of graduates who are unemployed, as there are people who, after completing their degree, may be abroad or may have decided to continue studying. More information on the variables available in Ministerio de Ciencia, Innovación y Universidades (2023).

degrees within a field of study at a university as well as the double-degree programs. Pre-enrolment applications and supply are calculated in the same way as minimum grades, but as a sum to get the total amount rather than an average.

The regression is run with field of study fixed effects, so that differences in demand, supply, and job opportunities for different degrees at different universities within the same field of study are computed. In particular, note that there may be different degrees and double degrees within these fields. For example, while in the field of medicine there is only the possibility of obtaining a medical degree, in the field of economics there are several degrees such as economics, economics and finance, or economics and international business. There are also double degrees, such as economics and mathematics, or economics and history. The various exercises have been carried out for all degrees, both retaining and eliminating medicine and nursing, two fields of study whose degrees are characterized by more job opportunities, high minimum grades, and also high pre-enrollment ratios per student, which may bias the aggregate estimates. There is a large variation in contribution bases among graduates by field of study.

As an illustration, in March 2020, the highest average of social security contribution bases of 2016 graduates working on any day in that month corresponded to medicine (38,328 euros per year) and the lowest to psychology (21,901).

The results in Table 1 show that admission grades are correlated with differences in contribution bases. The coefficient in the first column shows that a degree with a salary that is 10% higher than another degree has an admission score that is 0.2 points higher, and the difference would be as much as 1.4 points if the salary four years after graduation in one degree were twice as high as in another degree. A degree with a salary that is 10% higher than another will have a difference in the log of the salary of 0.1, so according to the regression shown in Table 1, the grade of the program with the higher income will be 0.2 points higher, which is the result of 2*0.1. Likewise, a degree that makes twice as much money has a difference of 0.7 in (salary), so the grade is 1.4 points higher, which is the result of 2*0.7. This correlation between the access grade and the salary of the graduates of this degree remains robust when we exclude the degrees of Medicine and Nursing, two degrees for which vocation is a very important determinant in the choice of students (column 2).

Column 3 shows the positive relationship between the number of pre-enrollment applications, which largely reflects student demand for a degree, and the contribution base of graduates four years after graduation. The coefficient in the third column indicates that a degree with a 10% higher salary than another degree has 6% higher pre-enrollments. This semi-elasticity is robust if we exclude medical and nursing degrees in column 4, with a similar coefficient (0.5372, significant at 10%). These results are consistent with the economic literature reviewed in Section 2, which has found a small but significant elasticity of higher education choice with respect to expected earnings.

In Spain, the SM Foundation (2023) survey, conducted online among 400 students aged 15-29, found that the search for good job opportunities and vocation were the main reasons for choosing a degree. Other motivations such as skills, qualifications or the ease of obtaining a degree were far behind. The report also found that 54% of respondents would have studied something else if they could have had their future guaranteed.

Columns 5 and 6 analyze the extent to which the offering of places by universities is correlated with the variation in salaries. In other words, this is an analysis that explores whether the universities take into account the contribution bases when designing their degrees, so that they would increase (decrease) the number of places available in the courses whose graduates receive a higher (lower) salary. As can be seen, there is no correlation between the contribution bases and the number of places available in each degree. In any case, it is possible that this lack of association between the job opportunities of university degrees and the number of places offered occurs because higher education institutions take time to process before they can respond to changes in the labor market.It is possible that the initial effect of a relative increase or decreasein the salaries of graduates of a program will have an impact on demand, on the number of pre-enrolled students. From there, changes in enrollment send a signal to universities about the possibility of changing the number of places offered. In addition, the implementation of a new university degree requires verification by the National Evaluation and Accreditation Agency (ANECA) or the agencies of the Autonomous Communities, which takes more than a year. In addition, before the proposal can be submitted to external agencies, the proposal for a new degree must be approved internally by the corresponding faculty, the Quality System, the Governing Council and the Social Council.

Finally, columns 7 and 8 have the same regressions with the number of degrees within the same field of study. In this case, the number of degrees is higher in those fields whose graduates receive a higher contribution base. Therefore, the results suggest that within the fields of study with higher salaries, specialization has increased by increasing the number of degrees without increasing the number of vacancies per degree.

VI. CONCLUSIONS

This paper has shown various indicators of the demand and supply of degrees that are consistent with an increase in the mismatch between the two, especially after the health crisis. These proposals require detailed analysis and debate to ensure that the measures reinforce equity in access to university education while maintaining quality. Moreover, when these indicators are combined with other labor market indicators, it is observed that there are greater access problems in those programs with higher contribution bases of their graduates four years after graduation. This is because, as the literature in other contexts and countries has shown, student demand responds, among other things, to job opportunities. However, the supply of places in public in-person universities has not adjusted to the differences in salaries between degrees. The reasons for the increase in demand for degrees include factors such as the increase in the number of young people and their greater desire to go to university. These structural factors suggest the need to introduce mechanisms that allow a faster adaptation of the supply of public university places to demand, for example by taking into account the employment opportunities of the degrees. To address these challenges, it is proposed to strengthen the ex-post quality assessment of educational programs, allowing for a more efficient adjustment of academic supply. It is also crucial to take into account the employment opportunities and contributions of graduates in the planning of university places in order to better adapt education to the needs of the labor market. These measures will help to optimize the value and relevance of higher education, benefiting both students and the labor market in general. One possible measure worth exploring is the possibility of coordinating university places between the Autonomous Communities and the Spanish Ministry of Universities in a more agile and adapted way to the changing needs of the labor market.

These findings are consistent with Mountjoy (2024), who analyzes the impact of public universities in Texas and shows that students who are marginally admitted complete an additional year of education, are 12% more likely to earn a college degree, and earn 5 to 10% more than their rejected peers. Cost-benefit calculations show significant internal rates of return for students, society, and the public budget.

BIBLIOGRAPHY

Abramitzky, R., Lavy, V., and Segev, M. (2024). The Effect of Changes in the Skill Premium on College Degree Attainment and the Choice of Major. *Journal of Labor Economics, 42*(1), 245-288.

Acton, R. K. (2021). Community College Program Choices in the Wake of Local Job Losses. *Journal of Labor Economics, 39*(4), 1129-1154. https://doi.org/10.1086/712555

Altonji, J. G., Blom, E., and Meghir, C. (2012). Heterogeneity in human capital investments: High school curriculum, college major, and careers. *Annual Review of Economics*, 4, 185-223.

Altonji, J. G., Arcidiacono, P., and Maurel, A. (2016). The Analysis of Field Choice in College and Graduate School: Determinants and Wage Effects. In *Handbook of the Economics of Education* (Vol. 5, pp. 305-396). https://doi.org/10.1016/B978-0-444-63459-7.00007-5

Allen, J. (2019). *Connecticut community colleges offer SNAP scholarship.* From https://www.wnpr.org

Arcidiacono, P., Hotz, V. J., Maurel, A., and Romano, T. (2020). Ex Ante Returns and Occupational Choice. *Journal of Political Economy, 128*(12). https://doi.org/10.1086/710559

Arpaia, A., and Halasz, A. (2023). Short- and long-run determinants of labour shortages. *Quarterly Report on the Euro Area, 22*(1). https://economy-finance.ec.europa.eu

Baker, R., Bettinger, E., Jacob, B., and Marinescu, I. (2018). The Effect of Labor Market Information on Community College Students' Major Choice. *Economics of Education Review*, 65, 18-30. https://doi.org/10.1016/j.econedurev.2018.05.005

Becker, G. (1991). A Note on Restaurant Pricing and Other Examples of Social Influences on Price. *Journal of Political Economy, 99*(5), 1109-1116. https://www.jstor.org/stable/2937660

Beffy, M., Fougère, D., and Maurel, A. (2012). Choosing The Field Of Study In Postsecondary Education: Do Expected Earnings Matter? *The Review of Economics and Statistics, 94*(1), 334–347. https://doi.org/10.1162/REST_a_00174

Cobreros, L., Gortázar, L., and Moreno, J. M. (2023). La subida de las notas de Selectividad: ¿Inflación o competición? *EsadeECPol Brief #*41. https://www.esade.edu/ecpol/es

Comisión Europea, Directorate-General for Economic and Financial Affairs. (2022). European Business Cycle Indicators, 3rd Quarter 2022. A closer look at labour shortages across the EU. *European Economy Technical Paper*, 059. https://economy-finance.ec.europa.eu

Conlon, J. J., and Patel, D. (2023). *What Jobs Come to Mind? Stereotypes about Fields of Study.* https://economics.princeton.edu

Conzelmann, J., Hemelt, S. W., Hershbein, B., Martin, S., Simon, A., and Stange, K. (2023). Skills, Majors, and Jobs: Does Higher Education Respond? *NBER Working Paper*, No. w31572. https://ssrn.com/abstract=4546439

Denning, E., Eide, J., Mumford, K., Patterson, R., and Warnick, M. (2022). Why have college completion rates increased? *American Economic Journal: Applied Economics, 14*(3), 1-29. https://doi.org/10.1257/app.20200525

Fernández, A., and Izquierdo, M. (2024). Encuesta a las empresas españolas sobre la evolución de su actividad: primer trimestre de 2024. *Boletín Económico Banco de España*, 1/2024, 8. https://doi.org/10.53479/36151

Finn, P., and Cinpoes, R. (2022). The impact of COVID-19 on A-levels since 2020, and what it means for higher education in 2022/23. *Blogs LSE. British politics and policy.* https://blogs.lse.ac.uk/politicsandpolicy/impact-of-covid19-on-a-levels/

Fundación SM. (2023). *¿Por qué estudiamos?* https://oji.fundacion-sm.org/sondeo-flash-por-que-estudiamos/

Gary, A., and Halasz, A. (2023). Short- and long-run determinants of labour shortages. *Quarterly Report on the Euro Area, 22*(1). https://ideas.repec.org/a/euf/qreuro/0221-02.html

Gemici, A., and Wiswall, M. (2014). Evolution of Gender Differences in Post-Secondary Human Capital Investments: College Majors. *International Economic Review,* 55, 23–56. https://doi.org/10.1111/iere.12040

Ministerio de Ciencia, Innovación y Universidades. (2023). *Indicadores de afiliación a la Seguridad Social de los egresados universitarios.* https://www.universidades.gob.es/indicadores-de-afiliacion-a-la-seguridad-social-de-los-egresados-universitarios/

Mountjoy, J. (2024). Marginal Returns to Public Universities. *NBER Working Paper Series,* No. 32296. National Bureau of Economic Research. http://www.nber.org/papers/w32296

Natanson, H. (2019). *Gov. Northam proposes making community college free for some job-seekers in Virginia.* https://www.washingtonpost.com

Snyder, M., and Boelscher, S. (2018). *Driving better outcomes: Fiscal year 2018 state status and typology update.* http://hcmstrategists.com

Wiswall, M., and Zafar, B. (2015a). How Do College Students Respond to Public Information about Earnings? *Journal of Human Capital, 9*(2), 117-169. https://doi.org/10.1086/681542

Wiswall, M., and Zafar, B. (2015b). Determinants of College Major Choice: Identification using an Information Experiment. *Review of Economic Studies*, 82, 791-824. https://doi.org/10.1093/restud/rdu044

Wiswall, M., and Zafar, B. (2021). Human Capital Investments and Expectations about Career and Family. *Journal of Political Economy, 129*(5), 1361-1424. https://doi.org/10.1086/711026

CREATING AND SUSTAINING RESEARCH UNIVERSITIES: POTENTIAL RETURNS AND DEFINITE CHALLENGES

Miguel URQUIOLA

Abstract

This chapter considers research universities. It focuses on two aspects. First, their potential returns: Why should countries care about setting up and sustaining high-quality research universities? The evidence suggests that university research (and university activity more generally) has *causal* and often *localized* positive impacts on economic and other outcomes. Second, suppose one accepts that university research is worth promoting. What obstacles do university authorities and policymakers face? What approaches and measures might help address these challenges? The discussion focuses on factors like Attracting and ensuring a supply of research talent and measuring research performance.

Keywords: University Research.

JEL classification: I23, I28, O30, O40.

I. INTRODUCTION

This chapter considers research universities. It focuses on two aspects.

First, their potential returns: Why should countries care about setting up and sustaining high-quality research universities? Answering this question is challenging. It requires establishing causal relationships between policies or institutions on the one hand and economic and social outcomes on the other. Despite this difficulty, research on this question has advanced, particularly in recent years. The first section of the chapter briefly summarizes some central studies.

This evidence suggests that university research (and university activity more generally) has *causal* and often *localized* positive impacts on economic and other outcomes. In other words, some countries/regions might be tempted to "free-ride"–to sit back and let others fund research universities producing knowledge that benefits the whole world. Recent work shows this may be a mistake: research universities' positive effects depend on distance. In other words, a country/region can derive disproportionate benefits from research done within its borders.

The chapter reviews the evidence, focusing on studies that arguably establish causal relationships and identify specific channels.[1] Due to this criterion, this evidence is not representative of all countries but focuses on a few cases (*e.g.,* Germany, the U.S., China).

It is worth stating that this evidence does not definitively show that research universities are a high-return investment. But it certainly points to worthwhile positive impacts.

The chapter's second section discusses challenges in setting up and sustaining good research universities. In other words, suppose one accepts that university research is worth promoting. What obstacles do university authorities and policymakers face? What approaches and measures might help address these challenges?

The focus of this discussion is on challenges like:

- Attracting and ensuring a supply of research talent,
- Measuring research performance,

[1] Put otherwise, this chapter does not aim to present an exhaustive review; the text provides further references.

- Securing public funding and popular/political support,
- Understanding and conveying the university's comparative advantage,
- Managing inequality and differentiation across schools,
- Managing inequality in compensation between researchers,
- Generating incentives and rewards for high-quality research, and
- Generating private support.

In discussing these challenges, the chapter directs disproportionate attention to lessons from the U.S. Since this is the approach, two observations are worth explicitly stating. First, the U.S. is relevant because it is widely acknowledged to have the highest quality research universities. Interestingly, that was certainly *not* the case 150 years ago. Thus, understanding what ingredients contributed to its progress is valuable. Second, the U.S. institutional design is *sui generis;* for example, its institutions would be impossible to replicate in much of Europe or Asia. Nevertheless, the U.S. case is helpful because it helps identify what ingredients likely contribute to a robust research university sector. How each country, within its institutional constraints, might put those ingredients in place is a separate question.

II. CREATING AND SUSTAINING RESEARCH UNIVERSITIES: POTENTIAL RETURNS

Prima facie, university research is associated with innovation that promotes economic growth and human welfare. In the sciences, university investigations were central to medical technologies that substantially increased life expectancy, such as X-rays, magnetic resolution, and mRNA vaccines. In the social sciences, university research has helped policymakers mitigate the impacts of financial crises and recessions. University research is also behind technologies used by major corporations, *e.g.,* audio recording by RCA, jet travel by Boeing, algorithms by Google, and positioning systems by Uber (for further discussion see Cole, 2009 and Gruber and Johnson, 2019).

Nevertheless, a careful reader might reasonably question whether such examples conclusively demonstrate that investment in university research is desirable.

First, research universities are expensive. Thus, a country might be tempted to wait for research to happen in the most technologically advanced countries, and benefit as discoveries and their applications disseminate. For example, even high-income and technologically advanced countries, like Japan, made limited investments in a COVID-19 vaccine. This did not stop them from quickly taking advantage of vaccines produced in a handful of countries that had incurred the expense, so they arguably did well.

Second, the examples of research cited above are extreme success stories. Focusing on them may provide a biased picture if a lot of university research lacks impact, particularly given its high cost.

Third, the commercial applications listed are by U.S. corporations. Such success may come only when research output is coupled with other ingredients present in the U.S., like clear property rights, developed capital markets, a large and often relatively unfettered corporate sector, etc.

Such doubts are reasonable, and the available evidence cannot entirely dispel them, certainly not in all settings. Nevertheless, recent work suggests that university research can affect regional and national development. The remainder of this section reviews recent examples. As stated, these are chosen due to the rigor of the evidence rather than attributes like geographical representativeness.

1. Industrial Development in Germany

Dittmar and Meisenzahl (2022) use German microdata to show that before 1800, the development of manufacturing across German cities did not vary with cities' distance to universities. In other words, it does not appear that–in terms of industrial development–a city with a university had any advantage over one without one. They argue that this is not surprising because, over the 1700s, German universities had been focused on theology and law rather than on fields that directly affected industry. Further, for many reasons, at this point, German schools were not the most vital institutions, as evidenced by declining enrollments (see Paulsen, 1906).

This changed in the decades around 1800, with reforms that followed the French Revolution and the Napoleonic invasion. German universities became more science- and research-oriented in ways that could affect manufacturing. For instance, these schools invested in chemistry in ways relevant to the chemical industry; they began to emphasize fields related to engineering, etc. These shifts, along with increased public funding, meant that by the mid-1800s, it was widely accepted that German universities were world leaders in research. For example, aspiring American academics routinely received their Ph.D. training in schools like Berlin, Göttingen, Heidelberg, etc. (see data in Urquiola [2020] and discussions in Paulsen [1906] and Veysey [1965]).

Dittmar and Meisenzahl argue that this transformation differentially affected cities in a way that had an element of historical accident–cities that, for historical reasons, had universities were more likely to find themselves suddenly endowed with a school doing industry-relevant research. In other words, the setting helps address the concern that industrial growth led to the creation of research universities rather than the other way around.

The paper's key result is that starting in the early 1800s, manufacturing expanded more rapidly in cities near universities. In addition, firms physically closer to universities were more likely to introduce mechanization, particularly in new and more knowledge-intensive industries. They were also more likely to land international prizes for industrial innovation.[2]

In short, this paper suggests that a research university provides a localized, causal benefit. Finally, Dittmar and Meisenzahl argue that these reforms made university-educated inventors more responsive to economic incentives and more likely to act as conduits for technological change. This last point is consistent with research universities contributing to innovation by producing graduates trained at the highest skill levels, a point emphasized in extensive research (Mokyr, 2002 and 2005; Mokyr and Voth, 2010; Squicciarini and Voigtlander, 2015; Bianchi and Giorcelli, 2020).

2. Agricultural Development in the U.S.

While the previous example deals with manufacturing, Kantor and Whalley (2019) consider how university research affects agricultural productivity. They study the effect of funding for agricultural experiment stations at pre-existing U.S. land-grant universities. Their approach relies on studying two pieces of legislation.

First, the U.S. government subsidized higher education through the Morrill Act of 1862, which awarded states the proceeds from the sale of Federal lands. The Act stipulated that the funds were to benefit schools whose activities related to agriculture. There were almost no other conditions; for instance,

[2] The authors implement several robustness checks, *e.g.,* showing that schooling is not a confounder. The effect is also for a period before coal deposits became a driver of industry.

whether the schools had to be public or private. For historical/political reasons, different states awarded their land-grant funds to different types of schools, some pre-existing and some new. Kantor and Whalley (2019) and Moretti (2004) argue that, on average, the pattern was unrelated to locations' future economic development.

Second, Kantor and Whalley consider the Hatch Act, which provided land-grant universities with funding to run agricultural experimentation stations. This allowed them to hire scientists to work on basic research and practical problems (*e.g.,* appropriate crop rotation). On average, these stations conducted effective research, *e.g.,* "notable biological innovations embodied in new crop varieties were achieved quite soon after the stations were established… These innovations are readily apparent in much higher crop yields achieved in station experiments relative to local farmers' productivity …"

The key finding is that although this led to overall gains in agricultural productivity, for about 20 years, the effects were more significant for farms close to the land-grant universities. Over time, such "spatial frictions disappeared as extension programs, automobiles, and telephones made it easier for discoveries to reach farther farms."

In short, the distance to a research university does matter in specific settings and periods. There are reasons to believe this may be particularly the case in agriculture and that the effect dissipated in the U.S. because conditions in broad regions were similar. For example, a corn farm in Indiana might be able to benefit from research on corn production in Illinois–this might be if climatological and soil conditions are similar, for instance (see discussions in Alston *et al.,* 2011).

But across countries, conditions can be quite different. For example, Moscona and Sastry (2022) show that agricultural technology research and development are significantly biased towards the ecological conditions of high-income countries. This is much like commercial drug development being biased toward diseases prevalent in high-income, high-purchasing power countries. Under such conditions, distances of different types will matter, and it may be helpful for countries to sustain their own research universities.

3. Institutional Development in Europe

Another potential impact of research universities, and universities more generally, is a contribution to institutional development. Since institutional strength is largely a country-level trait, here again spatial considerations matter.

Cantoni and Yuchtman (2014) consider the impact of universities during the high Middle Ages when such schools emerged in cities like Bologna and Paris. These centuries set the stage for Europe's transformation from a region that, in many dimensions, trailed parts of China and the Islamic world. They saw Europe attain technological/institutional leadership that allowed it to grow and control/colonize large parts of Africa, America, and Asia. A key innovation during this period was urbanization and the rise of the commercial revolution.

The paper carries out two tasks. First, it presents data on the establishment of about 2,200 German cities, and on when these cities received grants to hold markets and fairs. It presents evidence that these grants are meaningful indicators of expanding economic activity. Second, it asks whether universities had a causal impact on this activity. As usual, the challenge is to argue that the universities contributed to commercial development rather than that commercial development led to the rise of universities.

For analytical leverage, Cantoni and Yuchtman exploit the papal schism that affected the Catholic Church in the 1300s. Historically, popes had been a key source of university charters, and their protection had often been vital to many schools' survival. With the schism, competing popes engaged in further university foundations. This substantially increased Germans' access to university training, as historically, Germany had fewer schools than, say, France or Italy. The authors estimate that German enrollments roughly tripled following the schism.

They also find that establishing universities positively affected commercial activity and that this effect was more significant the closer cities were to emerging universities.[3] In terms of channels, they suggest that part of universities' effect operated through their role in developing legal and administrative knowledge; this helped clarify property rights.

4. Regional Economic Resilience in the U.S.

One question the above studies raise is: when is a university a research university? At what research intensity do effects like the above emerge? Do they only arise when there is a high-end school doing cutting-edge research? Or at more modest research levels?

[3] The paper also implements robustness checks to address the fact that while the schism may have been exogenous, the location of the new universities was not. It also controls for the alignment of different cities with different popes.

Such questions are particularly relevant for middle and low-income countries. For many, the realistic menu does not include setting up a world-leading university. Should they expect any return to investing in university research?

Recent work suggests that there can be positive effects even when considering schools that are not at the very top end of even their country's distribution. As always, to address such questions, researchers must address when given universities arose and where they did.

Howard *et al.* (2022) study the effect of regional universities on local economic resilience. Consider the case of Pittsburgh, once easily among the leading industrial cities in the U.S. In 1910, it was the 8^{th}-largest city in the country and accounted for up to one-half of steel production. It suffered a significant shock, particularly in the 1970s and 80s, as this industry declined. Nevertheless, Pittsburgh's economy proved resilient, and the city diversified into healthcare, finance, and technology (*e.g.,* robotics). It is frequently claimed that Pittsburgh's universities helped it weather the storm. Again, this is a story of a localized effect of university activity.

To explore if there is a causal element to such claims, Howard *et al.* (2022) exploit that in the 1800s, state governments used similar criteria to assign locations for normal schools (*i.e.,* teacher training institutions) and insane asylums. In other words, similar political and economic considerations went into locating state facilities of both types, *e.g.,* both were placed close to population centers and transport networks. The crucial step in their argument is that because of this, counties that received the site for an insane asylum provide a good counterfactual for counties that received a normal school. For example, one might have expected them to have similar future economic trajectories.

However, over the years, asylums and normal schools–although initially of similar sizes–evolved differently. Asylums mainly remained small, state-owned health service facilities. By contrast, many normal schools became regional universities. Such schools, the authors state, "focus on undergraduate and master's level education and are not as research intensive as flagship state universities." In other words, these schools conduct research at a significantly lower intensity than leading state schools.

Howard *et al.* (2022) key result is that such schools make a location more resilient to economic shocks like a decline in manufacturing. For example, counties initially assigned normal schools–relative to counties assigned insane asylums–lose less employment, income, and population following a shock.

This resilience seems to partly arise from the university's resilience–a regional university attracts significant, possibly countercyclical enrollment. Another possible mechanism is that universities increase the local educational level, possibly in ways that help the economy adapt.

5. Universities and Subnational GDP Growth Around the Globe

Valero and Van Reenen (2019) consider related issues –although with less of a focus on research but rather on broad university activity– at the subnational level. They develop a historical database on the location of about 15 thousand universities throughout 78 countries. They find that increases in the number of universities are positively associated with future growth of GDP per capita (an association robust to controlling for a host of observables and unobserved regional trends). Further, Valero and Van Reenen find evidence of positive spillover effects to neighboring regions. They suggest that part of the effect of universities on growth is mediated through an increased supply of human capital and higher levels of innovation. Andersson *et al.* (2004) and Kantor and Whalley (2014) find broadly consistent effects in Sweden and the U.S., respectively.

6. Universities and Local Innovation in the U.S.

Andrews (2023) considers the effect of universities on local innovation in the U.S. He focuses on the decades after 1840, during which many colleges were founded. During this period, localities often competed to become the site of a college. For instance, a religious denomination might express an interest in opening a college, ideally backed up by donors. Towns would then essentially "bid" to become the college site. They might offer land or additional money. To cite an example from an earlier era, Yale College–centuries before it became a large university–operated in Killingworth and Saybrook before moving to New Haven, "whose citizens had outbid all other communities in both land and money to support the college."[4]

Andrews uses narrative information to determine the "runner-up" sites for a set of colleges. The idea is that the runner-up sites provide a useful counterfactual for the sites selected. They were probably similarly organized, had similar access to resources and economic growth prospects, and an equally motivated citizenry, etc.

Andrews shows that, in the long run, establishing a new college causes a substantial increase in local patenting. Specifically, the college counties

[4] "Resources on Yale History: A Brief History of Yale" (guides.library.yale.edu).

have about 60 percent more patents per year than the runner-up counties. Interestingly, most of this effect in patenting is driven not by people affiliated with the college (*e.g.,* faculty members or alumni) but rather by people who moved to the area. This suggests that the college effect may operate through externalities.

7. University Moves in China

The above cases all suggest positive effects of university presence. However, recent work also features at least one instance of a null effect. Liu (2024) studies the moves of universities induced by the Second Sino-Japanese War (1937-1945). During this period, 91 of China's 108 universities were forced to move as Japanese forces advanced. Their moves were generally inland, and their new locations were determined by road networks, building availability, and university leaders' personal connections. While these moves were not random, the analytical hope is that they contain elements unrelated to locations' future economics and educational trajectories.

The main result is that relative to counterfactual locations, those that received a university display some short- to medium-term advantages. For example, they are likelier to have relatively high secondary school enrollment ratios. However, such differences dissipate over time. While this may be due to the setting or to other factors, this study reminds us that while universities may well have positive effects, they are not silver bullets.

8. Summary

The evidence above does not definitively prove that a quality research university would always be a cost-effective investment. However, it does suggest that research universities– and universities more generally –can have a causal impact on outcomes, including economic growth.

This evidence is also consistent with the notions that universities can contribute to innovation by:

- Accelerating patenting in firms and aiding their discoveries (Nelson, 1986; Jaffe, 1989; Mansfield, 1991, and Ahmadpoor and Jones, 2017, and
- Training at a high level (Toivanen and Vaananen, 2016; Aghion *et al.,* 2017),

- More generally, economics emphasizes that such innovation is a crucial source of sustained growth (Solow, 1956; Romer, 1986 and 1990; Aghion and Howitt, 1997, and Galor, 2011).

In short, countries and jurisdictions that seek to set up and sustain research universities may well make a good investment. We now turn to discussing challenges that arise in making that investment successful.

III. CREATING AND SUSTAINING RESEARCH UNIVERSITIES: CHALLENGES

This section reviews challenges that arise in creating and sustaining quality research universities. It features some recommendations in this regard. As noted, the discussion frequently references the U.S. case.[5] The intent is not to imply that the U.S. strategy applies everywhere–far from it. For one, U.S. institutions are, to a significant extent, *sui generis* and difficult to replicate.

Rather, this focus arises because the U.S. was able to create and sustain good universities. In the decades between 1860 and 1930, the U.S. moved from having an academically weak higher education sector to creating the world's leading research universities (Urquiola, 2020). Its trajectory illustrates several ingredients necessary for such a transformation. How different countries produce those ingredients within their institutional frameworks is a complicated question in which local conditions matter. However, highlighting what those ingredients are can be helpful.

1. Attracting and Ensuring a Supply of Talent

Successful research universities must be able to attract talented researchers and, in time, secure a steady supply of them. In this, a university is no different from any other enterprise –like a soccer club or a corporation–that must have the right human resources to prosper. Attracting research talent requires effort and an openness to the outside environment.

Consider how this issue played out in the U.S. Well into the 1800s, American colleges provided almost no specialized or advanced instruction. In this period, a young American who wished to focus on a specific topic, get an advanced

[5] In this, it draws on Urquiola (2020, 2023) and MacLeod and Urquiola (2021).

degree, or prepare for a career featuring research would have immediately considered studying abroad, typically in Germany, England, or France.

Johns Hopkins was the first U.S. school that aspired to make advanced instruction and research a central part of its mission. Its ambition pushed older schools like Harvard and Columbia to compete. All soon found that pursuing these required experts who could be hard to find. For example, early in his presidency of Harvard, around 1872, Charles Eliot observed,

> "There is in this country a considerable body of teachers who know how to teach Latin and Greek, and the elements of language; but if you are in search of teachers to teach botany, chemistry, physics and so on, you cannot find them. They do not exist."

In response to this situation, Daniel Gilman, the first president of Johns Hopkins, began to hire professors trained in Europe, regardless of their citizenship. He hired enough graduates of the University of Göttingen, for example, that some academics nicknamed his school "Gottingen-at-Baltimore" (Flexner, 1946).

This was an essential reform because U.S. colleges had previously been reluctant to hire foreigners or even foreign-trained individuals. Leaders must help their societies resist such impulses if one of their goals is to set up research-oriented schools.

More recently, countries like Chile and China have invested heavily in training their citizens at Ph.D. institutions abroad, to improve their universities. Beyond training, sending faculty abroad exposes a country's researchers to work at the research frontier, and it establishes valuable contacts. To illustrate, Xie and Freeman (2023) document how American training helped advance Chinese science; they state that "the main channel by which China –born scientists collaborated with U.S.-experienced scientists was through the cross-country mobility of China– born researchers to the U.S. … and their return mobility to China …" Such mobility led to higher quality work, as measured by citations and journal quality. Similarly, Ash *et al.* (2024) show that researchers returning to China had positive externalities on their peers' work.

On the other end of these exchanges, the U.S. and other countries received yet another influx of talent from these Chinese migrations, particularly at the graduate student level. This added to repeated academic immigration waves U.S. universities have benefited from.

Similarly, consider the field of economics. While most leading departments are in the U.S., several excellent schools some able to compete with the very best –are in England, France, Spain, Italy, and Mexico. A common denominator of these schools is their willingness to offer instruction in English and, associated with that, their openness to hiring foreign academics. This approach expands the talent pool they can access to include Europe –and U.S.– trained professors.

An open, migration-friendly environment cannot be taken for granted. For an example of how it can fray, consider the present U.S.-China political tensions, which are reducing collaborations and the mobility of researchers and students (Xie and Freeman, 2023). The same is seen in the U.K. and the U.S.: policies that hinder graduate students' ability to study and immigrate, for example, hurt research universities.

2. Measuring Research Performance

Even if the will to hire talent is present, measurement presents an additional challenge. To identify talented researchers –and to decide whether to reward their efforts– one must have access to *measures* of their research output. Have they produced a substantial volume of research? Has their output been of high quality? Here again, looking at the historical U.S. experience is helpful.

As universities like Johns Hopkins attempted to compete with European counterparts, they had difficulty observing research output. Unlike European countries, the U.S. did not have a network of academic journals/publications that revealed that this or that individual had done good work.

As stated, Daniel Gilman was the first U.S. university president to focus his school on research. He quickly realized that he would have to invest in a measurement infrastructure. Consider the case of mathematics. Math-related European periodicals, like the *Journal de l'Ecole Polytechnique,* appeared in the 1700s. Well into the 1800s, the U.S. had no equivalent outlets. Gilman hired an English mathematician, James Sylvester, who is credited with founding the *American Journal of Mathematics* (1878). Years later, Sylvester disputed that he was the founder, stating:

> "You have spoken of our Mathematical Journal. … Mr. Gilman is continually telling people that I founded it … I assert that he is the founder. Almost the first day I landed in Baltimore, ... he began to plague me to find a Mathematical Journal on this side of the water ... I said it was useless, there were no materials for it. Again and again he returned to the charge and again and again I threw the cold water I could on the scheme; nothing but obstinate persistence … brought his views to prevail" (Flexner, 1946).

With such steps, the U.S. measurement infrastructure grew gradually. On their side, faculty members contributed by creating professional associations, *e.g.,* the American Chemical Society (1877) and the American Historical Association (1884). These began to publish journals that certified research quality via the peer-review process. In time, there also evolved differentiation between journals. Those developing better reputations received more submissions, and their editors made them more selective, thus attracting more papers. The result was a hierarchy of venues by field or sub-field.

Charles Eliot reflected on the impact this had over the course of his long Harvard presidency:

> "The chief difficulty that I encountered was the procuring of teachers competent to give advanced instruction. There were really no guides to the discovery and invitation of the persons needed. Then none of the societies organized for the ... mutual support of learned ... men existed. By 1885 I could get some assistance ... from the proceedings of the ... scientific societies. At the beginning there was no such aid."

Countries around the world face an analogous challenge. On the one hand, there are some advantages now. First, English has become a sort of *lingua franca* for academics. Thus, English-language publications are much more accessible to many academics nowadays than German or French journals were to U.S. researchers in the late 1800s. Thus, it is easier for many countries to leverage the existing global publication network. A complementary investment, of course, is providing English instruction throughout the educational system.

On the other hand, an international publication infrastructure can be a mixed blessing. U.S. journals, for example, have their tastes and agendas, which may not suit every country's issue and policy challenges. So, investment into research venues still matters. Nonetheless, a dense periodical network with a relatively clear quality hierarchy can be very helpful.

Finally, having measures of research quality in place can tempt people to infer research output using those measures mechanically. For example, an evaluation system may become a mechanical function of how many papers a researcher or a school has published in a specific list of domestic and international journals. As is well known, distortions can emerge anytime performance is fixed to a narrow criterion. We return to this issue below.

3. Public Funding

Assuming it is possible to identify talent, one must still be able to attract and retain it. In a broad sense, this requires resources. Providing academics with the conditions they need to engage in research is expensive. Achieving it requires sufficient pay and other costly inputs including:

- Time (time away from teaching and other responsibilities),
- Infrastructure (computers, laboratories, conference venues),
- Research assistants, graduate students, and post-doctoral positions,
- The acquisition of data,
- Field visits,
- Travel, etc.

The bill adds up and tends to increase.

As a result, countries with successful research universities devote substantial public funding to their operation. This does not mean that the private sector cannot be a significant source of support. As discussed below, private contributions are salient drivers of university research in the U.S. But even there, public funding is essential, and the discussion of how to sustain it is central (Gruber and Johnson, 2019).

One fundamental reason is that research is what economists call a public good. The fact that a given person benefits from it does not mean that someone else cannot ("nonrivalry"). For example, consider the mRNA technology –partially developed in universities– used to produce the covid vaccine. The fact that the U.S. or Germany uses the technology does not mean that Kenya or Argentina cannot use it to the benefit of their citizens. As a result, research can have an enormous impact, as a single discovery can benefit millions. But this also means that all kinds of agents, from countries to firms, might prefer to let someone else do the research. If everyone follows that impulse, not enough agents will produce research.

The fact that it is hard to exclude people from the benefits of research ("nonexcludability") aggravates the problem. For example, suppose a university study shows that a particular type of regulation is the best at lowering pollution or that one macroeconomic policy is the best at promoting financial sector stability. It is hard to exclude anyone from using that knowledge. As a result, research generates benefits that are difficult for institutions to capture or "monetize." For example, many firms will want to pursue research only to the extent that it contributes to profitability. The patenting system helps firms and individuals capture such gains. But it is hard to capture the gains from pure and basic science in that way. The result is that under typical conditions, research will be under-provided by an unfettered market.

In short, as a general principle, adequate funding for research may not emerge absent decisive public intervention. Further, unsubsidized private universities will not be reliable sources of large-scale research. Those institutions will be busy engaging in activities (*e.g.,* teaching) for which it is easier to get people to pay. This is particularly relevant in lower- and middle-income countries where the private university sector has grown the most.

Finally, particularly in advanced, high-income countries, it is worth clarifying when universities have patent rights over intellectual property created using public funding. This can be one factor that helps university-based discoveries impact firms' innovation (Jensen and Thursby, 2001; Hausman, 2022, and Lerner *et al.,* 2024).

4. Political/Popular Support

Since public funding is essential to their progress, one challenge for research universities is to generate the public and political support required to sustain it. This need brings its own set of challenges. Consider two views that have become common in recent years.

First, successful research universities, by definition, have cutting-edge faculty. As a result, they also tend to attract well-prepared students; those individuals will find these schools stimulating and conducive to good skills. The interest is mutual because research-active faculty often view good students as essential to their production process. For instance, graduate students often work with faculty on research. More generally, academics usually prefer to teach well-prepared students. Outstanding preparation, in turn, is usually correlated with students' socioeconomic background. Thus, calling for public funding for research universities typically amounts to calling for funding for schools that, at least to some extent, cater to the wealthy. Some observers further characterize this as a call for funding for repositories of privilege and engines of inequality. These people often call for public resources to go instead toward less exalted institutions reaching broader portions of the population.

Second, in recent years, many observers have concluded that some research universities have been "captured" by progressive, left-wing ideologies or agents that, more than caring about teaching skills or carrying out research, with to impose ideological uniformity.

When one adds the people who see merit in the first position with those who see merit in the second, one can begin to reach sizable coalitions. These coalitions threaten research universities' access to public support and, thus, the sustainability of the research enterprise.

Thus, policymakers and university leaders must make the case that research schools:

- Contribute to the social good; for example, they must articulate the type of rationale covered in Section 1,
- Train an elite useful to public entities, private firms, public health, etc., and
- Work in ways that promote meritocracy and provide access to under-represented groups.

Achieving this is a delicate balance. Suffice it to say that research university admissions processes are a regular target of criticism. For example, the oscillations between the use of admissions exams illustrate the associated challenges.[6]

5. Understanding and Conveying Comparative Advantage

University leaders must also understand and convey to society what their schools' "comparative advantage" is. What can they do better than anyone else? What talent do they recruit? What activities is that talent particularly well suited for? How can they keep the focus on those activities, *i.e.,* "keep their eyes on the ball"?

To illustrate, suppose a successful soccer club recruits talented soccer player. Could one exploit their athletic ability to set up "volleyball training camps" where the team's members coach children or adults on the proper ways of playing volleyball? One could, and presumably, such camps would be popular and importantly, visible: the club would be seen as doing something socially useful. But that could be a misallocation of talent –many people can teach

[6] See Friedman *et al.* (2024) for a discussion. See also Riehl on reforms to standardized tests (2023).

volleyball, and many will be more adept at doing so than a top soccer player. And the players' soccer training will suffer while they engage in this activity.

Similarly, some observers think research university resources should be marshaled to address societal ills directly. Indeed, university leaders seeking to keep their institutions popular –a challenge noted above– can think that the best way to do it is to direct their schools' energy toward ventures with immediate, tangible, and, most of all, visible impacts.

However, the question should always arise: Is that the best use of the talent they are good at identifying and recruiting? It may be that the best contribution a research university can make is to give its professors the freedom to do basic research, as opposed to marshaling them to tackle the most visible "problem of the day." Making such calls can be difficult as they raise tradeoffs and issues that are hard to settle *ex ante.*

6. Inequality and Differentiation Across Schools

Another challenge is that of inequality between schools. Here again, the U.S. setting helps to frame the issue. The U.S. generally gives wide latitude to market forces in its institutional configuration. Its education sector is no exception. For example, any group, whether religious or secular, can relatively easily open a university and attempt to charge high tuition, etc.

Economic theory suggests that such a free-market setting will tend to produce a hierarchy of schools (Spence, 1973; Epple and Romano, 1998, and MacLeod and Urquiola (2015) (see Spence, 1973; Epple and Romano, 1998; MacLeod and Urquiola, 2015). For example, some universities will be incentivized to become selective, as students seek high-ability peer groups or ways to "signal"/transmit their ability to the labor market. As they become more exclusive, such schools can charge higher tuition, fund generous financial aid policies, etc. Those schools will also have incentives to turn away many prospective buyers and to remain small. Not surprisingly, many of these features have emerged in the U.S., just as economic models would predict.

When such patterns prevail, higher-ranked schools will access many more resources than lower-ranked ones. That is the case in the U.S. too. Hoxby (2016) estimates that the most selective American universities spend about fifteen times as much per student as many of their less fortunate counterparts.

Putting this in context, Table 1 presents the per-student expenditure on higher education for the 28 highest-spending OECD countries. The U.S. ranks only behind Luxembourg.

TABLE 1

PER STUDENT EXPENDITURE IN TERTIARY EDUCATION (INCLUSIVE OF RESEARCH EXPENDITURE) OECD COUNTRIES, 2020

Rank	*Country*	*Per student expenditure*	*Rank*	*Country*	*Per student expenditure*
1	Luxembourg	53,421	15	New Zealand	19,567
2	United Stastes	36,172	16	France	18,880
3	United Kingdom	29,534	17	OECD average	18,105
4	Sweden	26,215	18	Estonia	17,930
5	Norway	24,374	19	Slovenia	17,795
6	Canada	24,363	20	Ireland	17,400
7	Denmark	24,432	21	Czech Republic	16,237
8	Belgium	22,555	22	Icelans	16,128
9	Australia	22,204	23	Slovak Republic	14,637
10	Austria	21,753	24	Poland	14,488
11	Netherlands	21,642	25	Spain	14,361
12	Germany	20,760	26	Lithuania	13,629
13	Japan	19,676	27	Latvia	13,043
14	Finland	19,583	28	Italy	12,663

Note: The OECD notes to these data state: "Expenditure in equivalent U.S. dollars converted using PPPs for GDP. Data is based on full-time equivalent students. Data is inclusive of R&D expenditures of those institutions."

Source: Based on OECD data.

Applied to these data, Hoxby's (2016) estimate suggests that the top U.S. research universities spend roughly six times the U.S. average depicted in Table 1–much more than Luxembourg. By contrast, at the bottom end, U.S. schools are spending less than Italy, the lowest-ranked country in Table 1. These numbers are rough, but they convey the type of variation education markets can induce.

Note also that the U.S. inter-school inequality does not only emerge from market forces. Public research funding is allocated to projects as a function of quality, as assessed by expert panels. To the extent that the top universities account for more than their fair share of research talent, it is not surprising that they receive a substantial share of these funds (Graham and Diamond, 1997).[7]

[7] For recent data, see also https://www.nsf.gov/statistics/nsf13325/content.cfm?pub_id=4240&id=2

In the U.S., this inequality likely contributes to research performance. This observation reflects that leading research university performance can come from relatively few schools. In particular, the U.S. has roughly 6,000 higher education institutions, but only about 100 or so –often called "Research 1" institutions– account for the bulk of the country's highest-quality research.

Here, a contrast emerges with Europe, where many states suppress the market forces and the inequality and sorting that characterizes the U.S. university sector. For example, German states and Spanish autonomous communities largely control their university sectors. They often allocate resources in ways that promote equality across schools. It is certainly possible to make the case that this is a good outcome.

However, if the goal is to maximize the quality of research output, it may make sense to allow further differentiation in schools' resources and missions, with a few research universities getting more than a fair share of research talent, funding, and prepared students. To put it bluntly, unless a country/jurisdiction has at least one well-resourced research university, it will be hard to compete at high levels.

Of course, one may think that allowing this type of stratification hurts those students who do not attend elite research-oriented schools. That is not obvious, however. Rigorous research considers the possibility that sorting students into schools of different levels may enhance learning for all, as it allows teachers/schools to target curricula to different levels (Duflo *et al.,* 2011; Machado *et al.,* 2023).[8]

In short, a challenge for a country seeking a quality research university sector is to find a level of differentiation it is willing to allow and to find the public support that will make it sustainable. However, suppressing all differentiation is likely not a way to promote a strong research university sector.

7. Inequality Across Researchers

Attracting and retaining talent requires some tolerance of inequality not just across schools but also across researchers. Return to the emergence of research universities in the U.S. As schools like Chicago or Yale gained the ability to identify research quantity and quality, they began to bid for the best researchers. Chicago, for example, started parts of its faculty by raiding departments at Clark University, taking away talent from a school that had been building a leading research capability but ultimately did not have the funds to compete at the top level.

[8] See also Malamud *et al.* (2024) on how stratification affects non-cognitive outcomes.

Such recruitment processes naturally began to lead to inequality. The U.S., which allows a fair amount of flexibility in pay, naturally accommodated this development. The result was that professors in higher demand got higher salaries, lower teaching, enhanced laboratory space, etc. Decades later this remains the case. At the leading U.S. research universities, academic leaders spend much time deciding on faculty salaries and how to compete with other schools' bids for talent.

The costs of this are well-known, and the resulting inequality is often highlighted as a downside of the U.S. academic career. Specifically, at the top end, American academics are easily among the highest-paid in the world. Conversely, less well-funded schools pay much less or rely on contingent faculty.

Despite the costs of inequality, some high salaries allowed the system to attract talent to research. For example, it allowed a move away from something observed into the 1800s, where it was more likely that only independently wealthy academics might be able to devote themselves to research.

Allowing inequality between researchers poses a challenge in many countries. For example, in parts of Europe, faculty pay is relatively rigid–approximately a mechanical function of seniority and rank. While this has obvious advantages such as transparency, it also makes selecting and rewarding faculty hard. To the extent that it limits salaries at the top, it also makes attracting talent difficult. This is particularly true because as stated, top researchers can be mobile across countries. Indeed, one reason the U.S. research universities do so well is that they compete in a global market where other institutions enjoy less flexibility.

8. Incentives for Quality Research[9]

The above sections dwell on research talent and financial resources. Both ingredients are essential to obtaining high-quality research output. Another critical element is effort: success also requires that academics be willing to work very hard.

To some extent, if professors are selected well, this takes care of itself. Many faculty members are intrinsically motivated–they love research and would be willing to do it for little pay. However, policy cannot rely on that alone, incentives matter.

9 This discussion draws on MacLeod and Urquiola (2021).

As a result, it is good to have rewards for research performance. The existence of a market –and the ability of top schools to pay better researchers more– significantly moves things in this direction. Even in countries that restrict pay inequality, "real pay" can be used to vary rewards. For example, two European chair-holders may make the same nominal salary, but one might be given resources to lead a more prominent institute, have access to better space and more post-doctoral positions, etc. Effectively, they are paid differently, and if set accordingly, their pay can reflect their research productivity.

However, pay alone is insufficient, and inequality arising from school competition is a coarse way of tailoring rewards to research performance. For example, if pay can only be adjusted when an individual moves or receives an offer to do so, it may imperfectly reflect productivity. To illustrate, some productive researchers may be unable to move due to family reasons. If prospective employers realize this, they will extend fewer offers, and their salaries might reflect their productivity with only long lags.

In some countries, universities adjust for this by granting bonuses for publications in specific journals as a function of these outlets' prestige, "impact factor," etc. This can undoubtedly incentivize output, but it can also distort incentives. For example, a researcher might choose to publish many articles in lower-ranked journals if she finds that more financially rewarding than spending a lot of time investing in a more fundamental contribution. For example, a common concern about universities in East Asia is that while the quantity of research produced has dramatically increased, the quality still needs improvement (see Ito *et al.,* 2023 and discussion in that volume).

In short, a key question is how to incentivize effort in ways that direct researchers to maximize quality and do not purely rely on pay. There is no unique way of doing this; coming up with one is another relevant challenge.

In the U.S., the tenure system is one way to address this challenge. The decades in which the U.S. emerged as a leader in university research also saw the emergence of tenure, a salient reward for research performance.

The central feature of tenure is a fixed-term trial period followed by an "up or out" decision. A junior professor at a top U.S. university will be given 6-8 years to produce a collection of research that goes into a tenure "dossier." This file is thoroughly evaluated in a process that takes months and involves reports from multiple committees and input from ten or more experts at other schools.

At the top schools, the question posed to committees and outside referees is not whether the candidate published enough papers in specific journals –the question is not about counting papers. The question is whether the package and its impact are high-quality enough to warrant classifying the candidate as an intellectual leader or a creative individual. This flexibility prevents the type of gaming that naturally arises when the criterion is simply mechanical.

If the candidate is judged to have achieved enough, he/she receives tenure and all but guaranteed employment without a retirement age. If not, the candidate is given a fixed time to find another position.[10] On average, junior professors respond to this scheme by exerting high effort.[11]

However, such a response is only rational if candidates believe they are reasonably likely to get tenure. If there is a lot of variation in ability, then some individuals will have a very low or high probability of getting tenure, and for them, the scheme will have little effect. This implies that tenure will more effectively promote effort if combined with a process whereby professors sort into schools according to their research ability (MacLeod and Urquiola, 2021). This is precisely the type of sorting delivered when schools can compete for the best researchers. In other words, the top departments in the country have, on average, the best researchers, and they are of roughly similar abilities. The second-ranked department may be just below, and so forth. In such a setting, tenure will have effects throughout the distribution.[12]

Tenure is not the only way to provide incentives. For example, the European Union has implemented large grants targeted at researchers in different career stages. They are allocated based on the quality of researchers' proposals and their records as captured in their CVs. That scheme has advantages and disadvantages relative to tenure, but it is another way to mark high-stakes moments when people examine the quality of work.

9. Private Support

Funding research universities is expensive; thus, any help from the private sector can make a substantial difference. A key challenge is how to mobilize it.

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[10] In recent decades, tenure has become less common in the U.S., and it is increasingly available only to research-focused professors at wealthier universities (Figlio *et al.,* 2015).

[11] Note that, unlike a salary, tenure is a discrete prize given for reaching a threshold level of achievement or relative performance–it does not allow for minor enhancements. For applications of economic theory to this type of contract see Lazear and Rosen (1981), Carmichael (1983), and Malcomson (1984) and MacLeod and Urquiola (2021).

[12] Like many features of the U.S. system, tenure emerged in a decentralized fashion. The way in which it interacts with other system features was not part of a centralized design.

One option is to allow schools flexibility in setting their tuition. Such flexibility is undoubtedly available in the U.S., where annual tuition (not including living expenses) at the leading private research universities exceeds 60 thousand dollars. Despite such prices, American and foreign citizens are eager to enroll. These schools' ability to charge such high prices *could* reflect that they provide outstanding skills, valuable networks, and good job placements. But it could also exist absent such advantages if families simply like to "consume" the prestige associated with such selective environments.

Notably, U.S. states generally allow similar flexibility in their public research universities. For example, while the University of Michigan charges about 18 thousand dollars in tuition to in-state students, its out-of-state charges, at just under 60 thousand, are like those at top private universities. The corresponding figures at the University of California at Berkeley are in the same realm, if a bit lower (about 15 and 45 thousand, respectively). This should not be shocking, given that Berkeley and Michigan –among several other public universities in the U.S.– compete at the highest level. They could not do so without this type of private support, which, in some cases (*e.g.,* that of Berkeley), is a large part of their budget.

Of course, U.S. universities do particularly well in one additional dimension of private support: donations given outright rather than in exchange for instructional services. Their model is one in which students develop an enduring loyalty to their schools and become invested in their reputation and future. The evidence suggests at least part of their support stems from the desire to raise the probability of admission for their children.[13] However, part of it is genuine loyalty and a desire to be affiliated with prestigious institutions that positively impact the world.

The role of private support in the U.S. might seem so extreme as to be irrelevant to most other countries. It is worth mentioning that the fundamental practices it displays did not originate in the U.S. The original tuition-funded universities emerged in cities in France and Italy. The original donations to colleges originated in England and France, in many cases animated by donors who secured special treatment for sons and nephews (or people from their home regions). For example, the *Collège de Sorbonne* (Paris) was founded with a donation by Robert de Sorbon, and Merton College (Oxford) by Walter de Merton. The U.S. coupled these ideas with a *laissez-faire* educational market orientation that amplified them, but it did not invent them.

[13] Meer and Rosen (2009) suggest that roughly half of giving my alumni at one selective private university is driven by hope of reciprocity for their children.

Significantly, the U.S. also augmented them with public support because donations are tax-deductible (tax deductibility applies to schools and many charitable institutions). Thus, private support in the U.S. does not exist in a vacuum; it receives strong support from public policy. The bottom line is that there are measures countries can take to increase private support for universities.

A system that mobilizes private support can take decades to build, but efforts can provide some short to medium-term returns. For example, in recent years a handful of private Latin American universities have cultivated alumni and wealthy families in ways that cover non-trivial portions of their capital investment and financial aid budgets.

IV. CONCLUSION

Casual observation suggests that research universities can substantially contribute to economic growth and human welfare. In a way, that is not shocking, as universities are part of the research ecosystem, and economists believe that, in the long run, pure and applied research/innovation are the central source of sustainable growth.

Nevertheless, while research universities' positive impact may be plausible, whether it is causal is ultimately an empirical question. Increasing evidence suggests that research universities have a real positive impact and that this effect is somewhat localized. In short, the evidence indicates potential returns to investing in and sustaining a quality research university sector.

Nonetheless, doing so immediately raises challenges. A research university sector is unlikely to develop naturally; its formation and continued health require government authorities' and university leaders' deliberate attention and work. This raises several tradeoffs that are hard to navigate. They are concerned with issues including communication, funding, access for under-represented groups, and inequality. Each country or jurisdiction must address these within its institutional and political constraints. The U.S. developed the leading research universities because it developed ways to address these challenges, particularly over a few decades in the late 1800s.

More generally, universities are one of the more enduring forms of human organization. Having arisen spontaneously, they have existed for about 800 years. While they were always concerned with instruction, research gradually became one of their central activities and one reason they garnered interest and support. Keeping this part of the endeavor going is an important challenge for policymakers and university leaders.

BIBLIOGRAPHY

AGHION, P., AKCIGIT, U., HYYTINEN, A., and TOIVANEN, O. (2017). The social origins of inventors. *National Bureau of Economic Research Working Paper,* No. 24110.

AGHION, P., and HOWITT, P. W. (1997). *Endogenous Growth Theory.* Cambridge, MA: MIT Press.

AHMADPOOR, M., and JONES, B. F. (2017). The dual frontier: Patented inventions and prior scientific advance. *Science, 357*(6351), 583-587.

ALSTON, J. M., ANDERSEN, M. A., JAMES, J. S., and PARDEY, P. G. (2011). The economic returns to U.S. public agricultural research. *American Journal of Agricultural Economics, 93*(5), 1257-1277.

ANDERSSON, R., QUIGLEY, J. M., and WILHELMSSON, M. A. (2004). University decentralization as regional policy: The Swedish experiment. *Journal of Economic Geography,* 4, 371-388.

ANDREWS, M. J. (2023). How do institutions of higher education affect local invention? Evidence from the establishment of US colleges. *American Economic Journal: Economic Policy, 15*(2), 1-41.

ASH, E., CAI, D., DRACA, M., and LIU, S. (2024). *Bootstrapping science? The impact of a 'return human capital' programme on Chinese research productivity.* Mimeo ETH Zurich.

BIANCHI, N., and GIORCELLI, M. (2020). Scientific education and innovation: From Technical diplomas to University STEM degrees (the social origins and IQ of inventors). *Journal of the European Economic Association 18*(5), 2608-2646.

CANTONI, D., and YUCHTMAN, N. (2014). Medieval Universities, Legal Institutions, and the Commercial Revolution. *Quarterly Journal of Economics, 129*(2), 823–887.

CARMICHAEL, H. L. (1988). Incentives in academia: Why is there tenure? *Journal of Political Economy, 96*(3), 453–472.

Cole, J. R. (2009). *The Great American University: Its Rise to Preeminence, its Indispensable National Role, Why it Must be Protected.* New York: Public Affairs.

Dittmar, J., and Meisenzahl, R. (2022). The research university, invention, and industry: Evidence from German history. *Center for Economic Performance Discussion Paper,* No. 1856.

Duflo, E., Dupas, P., and Kremer, M. (2011). Peer effects, teacher incentives, and the impact of tracking: Evidence from a randomized evaluation in Kenya. *American Economic Review, 101*(5), 1739-1774.

Epple, D., and Romano, R. E. (1998). Competition between private and public schools. *American Economic Review, 88*(1), 33-62.

Figlio, D., Schapiro, M. O., and Soter, K. B. (2015). Are tenure track professors better teachers? *The Review of Economics and Statistics, 97*(4), 715–724.

Flexner, A. (1946). *Daniel Coit Gilman: Creator of the American Type of University.* New York: Harcourt, Brace and Company.

Friedman, J., Sacerdote, B., and Tine, M. (2024). Standardized test scores and academic performance, Opportunity Insights.

Galor, O. (2011). *Unified Growth Theory.* Princeton University Press.

Graham, H. D., and Diamond, N. (1997). *The Rise of American Research Universities: Elites and Challenges in the Postwar Era.* Baltimore, MD: The Johns Hopkins University Press.

Gruber, J., and Johnson, S. (2019). *Jump-Starting America: How Breakthrough Science Can Revive Economic Growth and the American Dream.* New York: Public Affairs.

Hausman, N. (2022). University innovation and local economic growth. *The Review of Economics and Statistics, 104*(4), 718-735.

Howard, G., Weinstein, R., and Yang, Y. (2022). Do universities improve local economic resilience? *The Review of Economics and Statistics,* 1-51.

Hoxby, C. M. (2016).The dramatic economics of the U.S. market for higher education. *National Bureau of Economic Research Reporter,* No. 3.

Ito, T., Iwata, K., McKenzie, C., and Urata, S. (2023). Higher education: Editors' overview. *Asian Economic Policy Review, 18*(2), pp. 217-219.

Jaffe, A. B. (1989). Real effects of academic research. *American Economic Review, 79*(5), 957-970.

Jensen, R., and Thursby, M. (2001). Proofs and prototypes for sale: The licensing of university inventions. *American Economic Review, 91*(1), 240-259.

Kantor, S., and Whalley, A. (2014). Knowledge spillovers from research universities: evidence from endowment value shocks. *The Review of Economics and Statistics, 96*(1), 171-188.

Kantor, S., and Whalley, A. (2019). Research proximity and productivity: long-term evidence from agriculture. *Journal of Political Economy, 127*(2), 819-854.

Lazear, E. P., and Rosen, S. (1981). Rank-order tournaments as optimum labor contracts. *Journal of Political Economy, 89*(5), 841–864.

Lerner, J., Manley, H. J., Stein, C., and Williams, H. L. (2024). The wandering scholars: Understanding the heterogeneity of university commercialization. *National Bureau of Economic Research Working Paper,* No. 32069.

Liu, S. (2024). *Does University Relocation Benefit Local Education? Evidence from the Second Sino-Japanese War.* Mimeo. Columbia University.

Machado, C., Reyes, G., and Riehl, E. (2023). The direct and spillover effects of large-scale affirmative action at an elite Brazilian university. *Journal of Labor Economics,* forthcoming.

MacLeod, W. B., and Urquiola, M. (2015). Reputation and school competition. *American Economic Review, 105*(11), 3471-3488.

MacLeod, W. B. and Urquiola, M. (2021). Why does the U.S. have the best research universities? Incentives, resources, and virtuous circles. *Journal of Economic Perspectives, 35*(1), 185-206.

Malamud, O., Mitrut, A., Pop-Eleches, C., and Urquiola, M. (2024). S*elf-, peer-, and teacher perceptions under school tracking.* Mimeo. Columbia University.

Malcomson, J. M. (1984). Work incentives, hierarchy, and internal labor markets. *Journal of Political Economy, 92*(3), 486–507.

Mansfield, E. (1991). Academic research and industrial innovation. *Research Policy, 20*(1), 1–12.

Meer, J., and Rosen, H. (2009). Altruism and the child cycle of alumni donations. *American Economic Journal: Economic Policy, 1*(1), 258-286.

Mokyr, J. (2002). *The Gifts of Athena: Historical Origins of the Knowledge Economy.* Princeton and Oxford: Princeton University Press.

Mokyr, J. (2005). Long-term economic growth and the history of technology. In P. Aghion and S. N. Durlauf (Eds.), *Handbook of Economic Growth.* Amsterdam: Elsevier.

Mokyr, J., and Voth, H-J. (2010). Understanding growth in Europe, 1700-1870: theory and evidence. In S. Broadberry and O'Rourke, K. H. (Eds.), *The Cambridge Economic History of Europe.* Cambridge: Cambridge University Press.

Moretti, E. (2004). Estimating the social return to higher education: Evidence from longitudinal and repeated cross-sectional data. *Journal of Econometrics,* 121, 175-212.

Moscona, J., and Sastry, K. A. (2022). *Inappropriate technology: Evidence from global agriculture.* Mimeo. Harvard University Economics Department.

Nelson, R. (1986). Institutions supporting technical advance in industry. *American Economic Review, 76*(2), 186–189.

Paulsen, F. (1906). *The German Universities and University Study.* New York: Charles Scribner's Sons.

Riehl, E. (2023). Do less informative admissions exams reduce earnings inequality? Evidence from Colombia. *Journal of Labor Economics,* forthcoming.

Romer, P. M. (1986). Increasing returns and long-run growth. *Journal of Political Economy, 94*(5), 10002–10037.

Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy, 98*(5), S71-S102.

Solow, R. M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics, 70*(1), 65–94.

SPENCE, M. (1973). Job market signaling. *The Quarterly Journal of Economics, 87*(3), 355-374.

SQUICCIARINI, M. P., and VOIGTLANDER, N. (2015). Human capital and industrialization: evidence from the age of enlightenment. *The Quarterly Journal of Economics, 130*(4), 1825-1883.

TOIVANEN, O., and VAANANEN, L. (2016). Education and invention. *Review of Economics and Statistics, 98*(2), 382–396.

URQUIOLA, M. (2020). *Markets, Minds, and Money: Why America Leads the World in University Research.* Cambridge, MA: Harvard University Press.

URQUIOLA, M. (2023). Higher education in the United States: Laissez-faire, differentiation, and research. *Asian Economic Policy Review, 18*(2), 196-213.

VALERO, A., and VAN REENEN, J. (2019) The economic impact of universities: Evidence from across the globe. *Economics of Education Review,* 68, 53-67.

VEYSEY, L. R. (1965). *The Emergence of the American University.* Chicago and London: The University of Chicago Press.

XIE, Q., and FREEMAN, R. B. (2023). Creating and connecting U.S. and China science: Chinese diaspora and returnee researchers. *National Bureau of Economic Research Working Paper,* No. 31306.

PART III

University Financing, Equity and Diversity

BREAKING IVORY WALLS IN HIGHER EDUCATION: EMBRACING DIVERSITY AND CREATING BELONGING

Stefania PAREDES FUENTES

Abstract

This chapter examines the persistent challenges to diversity and inclusion within universities. It argues that dismantling remaining “ivory walls” at universities necessitates fostering a culture of belonging that actively addresses social inequalities and empowers under-represented groups. The chapter explores how academics can contribute to this transformation. It offers practical strategies for creating inclusive communities through individual behaviours, and teaching practices. Additionally explains how universities can update their processes to support these changes. By emphasising both individual and systemic efforts, the chapter provides a starting point for building more equitable and inclusive academic environment. This, in turn, strengthens universities’ ability to serve as true drivers of positive social change. However, this is contingent upon the engagement of the university leadership and the allocation of adequate resources.

Keywords: Diversity, inclusion, belonging, higher education, assessment, learning environments.

JEL Classification: I23, I24, J15, J16.

I. INTRODUCTION: EMBRACING DIVERSITY AND INCLUSION IN HIGHER EDUCATION

Diversity and inclusion have become prominent themes in universities. This chapter explores the significance and importance of embracing diversity, creating inclusion, and the need to break down universities' *ivory walls,* making them spaces for all.

Universities have a rich history as gateways to knowledge and opportunity, serving as hubs for intellectual exchange and academic exploration. Diversity in some form has always played a pivotal role in their evolution. From their origins as gatherings of international students in pursuit of learning, universities like the University of Bologna[1] were founded as communities of scholars from different countries and backgrounds, who arrived at the city driven by a shared commitment to knowledge acquisition. In fact, the term "university" derives from the Latin *universitas magistrorum et scholarium,* signifying a community of teachers and scholars.

Over centuries, universities have transformed from small-scale institutions catering to a select few –primarily affluent men– into dynamic entities welcoming students from different nationalities, backgrounds, genders, and ethnicities. Through strategies of *internationalisation* and *diversification,* universities can now offer multicultural environments. This, in turn, provides students the opportunity to develop skills beyond academic knowledge, such as cross-cultural communication and collaboration, essential for navigating today's interconnected world.

This chapter explores ideas for nurturing inclusive academic communities which represent the diversity of staff and students at universities today. The goal is to create a culture of belonging in which all members actively engage in addressing structural inequalities and contribute to break old style "ivory walls."

The ideas and practices presented in this chapter stem from my lived experience studying and working in UK academia, my expertise in promoting equality, diversity, and inclusion within my discipline–Economics–and in Social Sciences, and the broader literature. However, I do not propose a systematic review of the literature on diversity and inclusion, I mostly focus on the evidence available to explain the situation, and for the actionable points I present.

[1] Despite the University of Bologna be considered the oldest university in the world, there are records of institutions offering higher education before the foundation of the University of Bologna in 1088. For instance, the University of al-Qarawiyyin in Morocco was founded as a mosque in 857 and converted into a madrasa, an educational institution, hence considered by some classifications to be the oldest institution of higher learning still in operation.

Before exploring strategies for achieving inclusivity, it is essential to understand the negative impact of a lack of diversity and inclusion on the whole university community (Section II) and we also need to clarify the meanings of these terms, understanding their relevance for all members of the academic community (Section III). The chapter introduces various ways in which us, as members of the academic community, can contribute through our own behaviours (Section IV), and our teaching practices (Section V) to create inclusive environments that foster belonging for all groups.

Whilst most of this chapter addresses our role as individual academics in contributing to break any ivory walls that make universities elitist institutions, these efforts cannot be disconnected from the university structure. Therefore, it proposes some considerations for universities processes and how to support the overall change in culture, with the strong caveat that, as an area of study, this still needs further development (Section VI). It is important to emphasise that this work is not possible without allocation of adequate resources by university management. Insufficient financial and human resources can have a counterproductive effect on achieving diversity goals, by creating competition and tension. Lack of resources make staff feel unsupported and undervalued, which can manifest in conflict, sense of injustice, and erosion of morale, in particular when individuals perceive unequal distributions for different roles.

Notwithstanding, the suggestions here represent an invitation to institutions to truly engage with the process and understand what steps to take to provide a safe, inclusive environment to all members in their communities, and truly contribute to make the society a better place.

II. BEYOND IVORY TOWERS: UNDERSTANDING THE BARRIERS FOR DIVERSITY IN ACADEMIA

Universities have long served as engines of knowledge creation and societal progress. Yet, persistent lack of diversity threatens to reinforce the perception of these institutions as “ivory towers”. This Section explores how under-representation hinders access, retention and progression in students and staff, and ultimately, the very knowledge production that underpins academic excellence. By examining the experiences of under-represented groups, we expose how a lack of diversity undermines not only staff and student well-being, but also the credibility and impact of academic research, ultimately eroding public trust in experts having a chilling effect on scientific advancement.

1. Awarding Gaps and Discrimination in Higher Education

Alongside the interest in offering multicultural environments in universities, there has been an increased recognition of the existence of significant " awarding gaps".[2] These gaps refer to the differences in outcomes by student groups. Awarding gaps cannot be solely attributed to students' capabilities, but they seem linked to demographic characteristics.

In the United Kingdom, a growing awareness exists regarding the disparities in degree attainment between White students and ethnic minority groups at university level. White students are more likely to be awarded higher grades than students from all other ethnicities, even after controlling for prior attainment. The gap narrowed from 13.2% in 2017/18 to 8.8% in 2020/2021 for *good degrees* (average final mark of 60% or above).[3] However, progress is less evident for first-class degrees (average final mark of 70% or above) in which the gap merely decreased from 10.2% in 2017/18 to 9.5% in 2020/21 and disaggregated data by ethnicity reveals a worsening gap for Black students from 16.9% to 19.3% (Universities UK, 2022; Office for Students, 2021; Cordiroli-McMaster, 2021).

Awarding gaps also exist based on socio-economic background. All else equal, students from deprived areas are more likely to drop-out, less likely to complete their degree and more likely graduate with lower degree classifications in the UK (Crawford, 2014).

The analysis of disaggregated data shows that awarding gaps vary by discipline and demonstrate significant intersectionality. For instance, in economics, the probability of a White male student achieving a first-class degree in 2020/2021 was 51%. This figure dropped to 30% for a Black student with otherwise similar characteristics (higher socio-economic background, similar pre-university features) and is only 22% for Black students from lower socio-economic backgrounds (Paredes-Fuentes *et al.,* 2023).

Similar gaps exist for other characteristics. Revell and Nolan (2023) found awarding gaps for disability in medicine students in the UK: students with mental health conditions were five or ten times more likely to fail multiple exams, resit a year, and achieve lower degree outcomes and these effects were amplified when considering ethnicity.

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[2] Often called *attainment gap,* the term "awarding gaps" is preferred to emphasise this is an outcome of structural institutional factors, rather than students' individual characteristics. This also matters for the solutions to close these gaps. The latter suggests the need for institutional changes in their administrative and pedagogical practices, rather than focusing on students' behaviours.

[3] UK universities classify undergraduate honours degrees based on weighted averages of marks into First Class (70%+), Upper-Second Class (60-69%), Lower-Second Class (50-59%), and Third Class (40-49%), although institutions have autonomy on thresholds and degree regulations.

The literature highlights multiple and complex reasons for these awarding gaps. All students may face challenges like social isolation, low prior attainment, and unequal access to quality education, leading to disparities in preparedness. However, there are additional challenges linked to specific groups. Unconscious biases among academic staff can influence teaching and assessment practices, leading to unfair evaluations of students from under-represented backgrounds. Students from these groups tend to be subject to stereotyping, microaggressions, and unequal treatment by faculty and peers. Students from ethnic minorities may face cultural challenges and even racism and discrimination, to the extent that universities in the UK have been accused of being "oblivious to the scale of racial abuse on campus" (EHRC, 2019a; EHRC, 2019b). Additionally, curriculum content may not be equally accessible and may even alienate some students, depending on their cultural or social background.

Female students can also feel socially excluded and tend to report lower sense of belonging in male-dominated subjects (Thoman *et al.,* 2014; Matz *et al.,* 2017; Rainey *et al.,* 2018). Sexual violence and sexual harassment tend to be pervasive across university campuses (Coulter *et al.,* 2017; Coulter and Ranking, 2020). Students from LGBTQ+ groups are more likely to face bullying, harassment, and violence (Stonewall, 2019 for the UK; Allen *et al.,* 2020 for the US), and students from some religious groups experience feelings of isolation and exclusion as they feel treated less favourable (Stevenson, 2013 for the UK; Fosnacht and Broderick, 2020 for the US).

Experiences of discrimination and other forms of violence contribute to feelings of isolation, imposter syndrome, and a lack of belonging. These ultimately impact academic engagement and success. Students with greater sense of belonging report greater enjoyment and motivation (Pedler *et al.,* 2021). Conversely, those facing discrimination experience negative impacts on confidence, persistence, and health (Smith *et al.,* 2016; Jackson *et al.,* 2020).

Awarding gaps are a complex issue, and these factors often interact and compound, requiring multiple interventions. These interventions should address systemic inequalities, promote inclusive practices, provide targeted support, and foster a culture of belonging.

2. It is not Just Students: Engaging with Staff and Local Communities

The issue of diversity and inclusion extends beyond students. Staff from under-represented groups also face discrimination, impacting their well-being and career prospects within academia.

In disciplines like economics, gender disparities are well documented. These include under-representation (Auriol *et al.,* 2019; Lundberg and Stearns, 2019), unequal pay and promotion opportunities (Ceci *et al.,* 2014; Ginther and Kahn, 2004, Corsi *et al.,* 2017; Bosquet *et al.,* 2019), and a hostile work environment (AEA, 2019; Boring, 2017; Hengel, 2017; Wu, 2018; Dupas *et al.,* 2020). The broader academic literature echoes these concerns, for example highlighting similar issues for women across disciplines (Todd and Bird, 2000; Lundine *et al.,* 2018; Tenbrunsel *et al.,* 2019; Sharma and Poole, 2018) and how sexual harassment is driving them out of academia (Morber and Vartan, 2023).

There is also evidence that universities fail to attract and retain academics from ethnic minorities, lower socio-economic backgrounds and generally under-represented groups across all disciplines which contributes to the perception of universities *as ivory towers.*

Discrimination at entry may be one explanation. Despite laws prohibiting employment discrimination based on protected characteristics such as sex, race, disability, experiments demonstrate that identically qualified job applicants receive different job offers depending on their demographic characteristics (Baert, 2018). Furthermore, findings show that academics from lower socio-economic backgrounds face barriers to promotion and progression (see UCU, 2022 for the UK; Kniffin, 2007 and Lee, 2017 for the US).

The Equality and Human Rights Commission Report (2019c) highlights how racial harassment is a common experience for staff (and students) from ethnic minority groups at universities in England, Scotland, and Wales. Universities have a responsibility to ensure equal opportunities for success by eliminating any form of discrimination and violence within their institutions.

This is a matter of social justice, but the lack of diversity among academic staff also hinders universities' potential to attract the most talented pupils from diverse groups, creating a feedback loop. One reason for this may be the absence of role models. Role models are figures who can "influence role aspirants' achievements, motivation, and goals, by acting as behavioural models, representation of the possible, and/or inspirations" (Morgenroth *et al.,* 2015). In male dominated fields such as STEM and economics, under-representation of women discourages young girls from pursuing them, despite evidence that girls who do choose these fields may outperform boys (Paredes-Fuentes *et al.,* 2023).

There is also another issue. Lack of diversity among students translate into lack of diversity in graduates and professionals. For instance, lack of diversity among economists working on policy issues can lead to *groupthink,* that is when the lack of inclusion of a wide range of perspectives and experiences lead to suboptimal decisions, incomplete analysis of alternatives, and lack of consideration of consequences (we discuss this in Burnett and Paredes-Fuentes, 2023).

Breaking institutions' ivory walls therefore requires universities to broaden their engagement efforts to attract more students and staff from historically under-represented and under-recognised groups. Equitable access to higher education, regardless of background, should be a universities' prerogative. A diverse academic community better reflects the broader societal landscape. By actively promoting greater representation, universities can contribute to dismantling systematic inequalities, fostering cultural competence, and advancing human rights.[4]

3. Lack of Diversity Affects Knowledge Creation and Trust in Academia

Addressing these issues affecting specific groups is integral to the entire process of knowledge creation and dissemination. Knowledge is a product of human interpretation and experience, shaped by observation, inquiry, and analysis. As individuals, we interpret the world around us based on our lived experiences, leading us to formulate research questions, design experiments, and collect data. Consequently, the creation of knowledge is inherently intertwined with our backgrounds, drawing on the diverse perspectives and interpretations that we bring to the process.

Diversity also enhances the reach of the knowledge created within universities. To be effective, knowledge must be broadly communicated and made relevant to the society. Effective knowledge communication allows researchers to bridge the gap between academia and the public, informing public discourse, influencing policy decisions, and contributing to societal advancement. How we communicate and with whom we communicate are also interlinked with our individual characteristics. Hence, diversity contributes

[4] The 1948 Universal Declaration of Human Rights is a common standard of achievements for all peoples and all nations. While there are various relevant articles in this Declaration, I refer to Article 26:

"1. Everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit."

"2. Education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms. It shall promote understanding, tolerance, and friendship among all nations, racial or religious groups, and shall further the activities of the United Nations for the maintenance of peace."

to ensure better communication and a greater connection between universities and societies.

Failure to actively engage with local communities can result in universities becoming insular ivory towers, disconnected from the concerns and aspirations of the communities they serve. This disconnection can ultimately lead to universities losing their role in society. Establishing trust and rapport with broader society is essential for fostering confidence in academic research and scholarship. In recent years, we have witnessed a decline in trust in academic experts across various domains, with worrying examples in medicine and economics. This distrust can be attributed to several factors, including systemic racism, discrimination, and unethical, culturally insensitive research processes.[5] The erosion of trust in academia can have profound repercussions on the future of research and development and public support for universities, highlighting the critical importance of embracing diversity within higher education institutions.

III. DEFINING THE PROBLEM: CLEAR LANGUAGE MATTERS

In pursuing our goal to tackle such complex issues, it is essential to clearly define what we are working on and what we want to achieve. This contributes to create more collaborations, engage others, and avoid misunderstandings. In my experience, a lack of clarity can lead to confusion and even conflict, particularly if individuals or groups perceive initiatives aimed at a more diverse and inclusive environment as punitive for them. Therefore, before embarking on such initiatives, it is key to establish a shared understanding of the fundamental concepts.

As we explore these topics and move along our journey, we must be prepared to dynamically adapt our language. Language evolves and the terminology used around diversity and inclusion may need to be reconsidered. Ongoing research and engagement with the communities we aim to serve will allow us to identify new issues, learn from mistakes, and deepen our understanding of these crucial concepts. For some, this causes frustration, but we should see the process of updating our language as a positive development, reflecting continuous learning and progress.

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[5] Lack of trust on experts become relevant during major events in society. The ING-Economics Network 2019 Survey on "Public Understanding of Economics" shows lack of trust on economists was a characteristic of the "leaver" voters during the UK referendum on Brexit. During the COVID-19 pandemic, we observe an increase in vaccine hesitancy due to lack of trust on health systems and health professional (Bromme *et al.,* 2022; Tram *et al.,* 2022). In the UK, vaccine hesitancy was particularly diffused among minority communities, highlighting the importance of diversity in broadening communication channels (Razai *et al.,* 2021).

1. Diversity and Under-Representation in Higher Education

The Oxford English Dictionary defines diversity as "the quality, condition, or fact of being diverse or different; difference, dissimilarity; divergence." This definition captures the broad nature of diversity, encompassing a wide range of individual characteristics. Indeed, diversity is a multidimensional and dynamic concept, and its interpretation is contextual. In various settings, individuals bring their unique perspectives and experiences, enriching collective discourse and fostering innovation.

In higher education, diversity takes a more nuanced meaning, often referring to representation from all parts of the society. In this context, diversity is inexorably linked to addressing systemic inequalities that create barriers based on demographic characteristics such as gender, nationality, ethnicity, socio-economic status, disabilities, etc.

We should acknowledge that we are all inherently diverse. This diversity should be recognised and valued in the academic environment, as it contributes significantly to academic discourse. However, some groups in our communities face systematic barriers and inequalities and do not have the same level of opportunity. Individuals from marginalised and historically under-represented groups have been systematically affected by these challenges and these have hindered their opportunities to achieve their full potential and having their work recognised. Dismantling these barriers is essential not only to promote inclusivity, but also to foster a more equitable and just society.

Under-representation refers to a situation in which a particular group of people has a smaller presence or participation than its proportion in the general population, hence this concept is relative to each reality.

In England and Wales, for example, around 20% of the population belongs to an ethnic minority group[6] as a direct consequence of British colonisation, with a substantial proportion of the minority ethnic population being UK-born (Craig *et al.,* 2012). Some of these groups are under-represented in higher education and the workforce, with representation varying across disciplines. For instance, while Asian/Asian-British people make up 3.1% of the population, they represent 10% of economics students. On the other hand, despite women and girls comprising 51% of the population and being over-represented among university students overall (52%), they make up only ~30%

[6] According to the 2021 Census, 81.7% of the population in England and Wales identified as White (74.4% identified as White British) (Gov.uk, 2022). The remaining identified with one of the standardised list of 19 ethnic groups developed for the 2021 census, available: https://www.ethnicity-facts-figures.service.gov.uk/style-guide/ethnic-groups/

of economics students, highlighting the gender imbalances discussed in Section II. Similar under-representation exists for students from lower socio-economic backgrounds, people with disabilities, and LGBTQ+ groups.

The reasons behind under-representation vary from general challenges in accessing and navigating the university environment, to more specific ones as lack of financial resources, family support or networks (particularly in the case of students from lower socio-economic backgrounds), cultural barriers, stereotypes, and lack of role models for female and students from ethnic minority groups. Understanding which groups are under-represented and the reason for under-representation is crucial for the design of initiatives and policies.

2. Inclusion: Beyond Representation

Alongside diversity, several other terms are used (and sometimes misused) in this context. A clear understanding of these, their distinctions, and their relevance is crucial for everyone within the university community.

In higher education, we should strive for more than mere numerical representation. We should create inclusive structures and institutions where all individuals feel valued and recognised. This necessitates dismantling systemic barriers that hinder success based on specific traits. It is not just about bringing more individuals from marginalised backgrounds; efforts should also focus on dismantling institutionalised obstacles that perpetuate inequality and impede equitable access to opportunities. This concept falls under the umbrella of "inclusion," which refers to the active process of valuing all individuals within a group, regardless of their background or personal characteristics.

Attracting larger representation does not guarantee inclusion. Some groups may even be over-represented in some contexts; however, this is not reflected in their progression and promotion. Even if economics attracts a consistently large proportion of students from some ethnic minority groups in the UK, these are still more likely to drop out their studies, and economists from ethnic minorities are less likely to be promoted to senior roles. Hence, efforts in attracting higher diversity must be matched with more inclusive environments to allow this diversity to thrive.

Removing barriers to participation and ensuring equitable access to opportunities, resources, and decision-making processes for all contributes to a culture of mutual respect. This, in turn, fosters collaboration, innovation, and collective well-being.

3. Belonging: A Fundamental Human Need

Ultimately, inclusion should aim to foster a *sense of belonging* among group members. *Belonging* is a fundamental human biological need that we all seek to fulfil. It involves the interaction of cognitive, social, and environmental factors that cultivate feelings of purpose. Belonging refers to the feeling of deep connection with social groups, physical places, systems, and individual and collective experiences. It may be just as important as food, shelter, and physical safety for promoting health and wellbeing (Allen *et al.,* 2021). Feeling like we belong fosters feelings of security, self-worth, and purpose while reducing isolation and loneliness.

When we feel we belong, we are more likely to feel motivated, engaged and invested in our activities. In an educational setting, students' sense of belonging is rooted in their experiences within the learning environment and is influenced by their social interactions with lecturers and peers (Gillen-O'Neel, 2021). In a workplace setting, workers' sense of belonging matters for commitment and engagement with the institution. Feelings of exclusion lead to an immediate decline in an individual's performance, while feelings of belonging make employees less likely to leave and more likely to recommend their organisation as a good place to work (Carr *et al.,* 2019). This applies equally to university staff, both academic and professional. University staff wear multiple hats and go above and beyond the call of duty to provide a positive environment for students. The lack of recognition of these contributions significantly hinders the development of a sense of belonging for both staff and students.

4. Decolonisation: Bringing History into Knowledge Creation

"Decolonisation" is another term we may encountered when discussing diversity. While a detailed discussion of decolonising practices in education falls outside the scope of this chapter, a basic understanding may be useful. Decolonisation has become highly politicised term in some environments, leading to misunderstandings about its relevance to diversifying universities and fostering a sense of belonging. The explanation of this concept is intentionally longer as it requires more unpacking than others and will not be treated anywhere else in the chapter.

The concept of decolonisation is not new, in fact it emerged alongside the process of colonisation itself.[7] Colonialism involved dominating spaces and

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[7] The explanation in this subsection is based on "How to Start Decolonising Social Sciences?" a co-creation project I led on during my tenure as Deputy Chair of the Education Committee at the Faculty of Social Sciences at the University of Warwick, available at: https://warwick.ac.uk/fac/soc/decolonisingss/decolonising_social_sciences_workbook.pdf or on my personal webpage.

imposing ideologies, religion, believes, and knowledge on the colonised peoples. It established political hierarchies between colonisers and colonised, creating new power relations and a social order. Decolonisation, therefore, goes beyond specific political struggles or conflicts for independence. It aims to dismantle the power and social relations and structures created by colonialism and still persistent.

Decolonising education calls for increasing awareness of the historical and cultural context in which the knowledge we teach was created. Decolonising education does not aim to erase history or events that happened in the past –this is not possible– but rather to consider how current educational structures reflect the power dynamics established during colonialism. Applying this concept to education can indeed be very challenging even for committed academics. However, there are many examples of decolonial practices we can learn from.[8] As Morreira *et al.,* (2020) suggest, "there is no one single way of implementing decolonial thought and practice in the classroom, and this may well be recognised as a strength rather than a limitation." This openness can help us to overcome barriers and contribute to the project of decolonising higher education.

In the Western European context, decolonising education should go beyond simply including diverse voices in the curriculum, *e.g.,* by diversifying reading lists. It needs a critical examination of the entire curriculum and a questioning the centrality of *Eurocentric knowledge*. This necessitates a re-evaluation of the foundations of knowledge production and how it is linked to specific histories and cultures (Gopal, 2021).

Universities can take the lead in addressing this by re-examining what and how we know, how knowledge entered the curriculum, and what historical events impacted this process. This in turn can allow to incorporate diverse voices and perspectives and acknowledge and respect different ways of knowing. It can also contribute to understand the impact of that cultural background has on learning. By exposing students to a wider range of role models and knowledge systems, decolonising education fosters a more inclusive learning

[8] For an overview of the origins of the study of decolonisation, some short introductions are available: Jansen, J. and Osterhammel, J. (2017). *Decolonization: A Short History.* Princeton University Press; *Kennedy, D. (2016). Decolonization: A Very Short Introduction.* Oxford, UK: Oxford University Press; Young, R. (2016) *Postcolonialism: An Historical Introduction.* Wiley-Blackwell.

For a review of the philosophical development of decolonial thought see Maldonado-Torres (2011, in Spanish). Este (2017) evaluates the relationship between methodology, power, imperialism, colonialism, and empire, and includes a brief history of the construction of "methodologies" during the Enlightenment period. Shahjahan *et al.* (2021) offer a review of decolonising curriculum and pedagogy initiatives. More examples are offered in Alvares and Faruqi (2012), Bhambra *et al.* (2018), Moghli and Kadiwal (2021).

environment, by addressing some historical inequalities and creating greater sense of belonging for some groups.

IV. MICRO-AFFIRMATIONS: YOUR ROLE AS A UNIVERSITY COMMUNITY MEMBER

We may not realise it, but in our daily lives, we may rely on and reproduce many stereotypes that contribute to the alienation of some groups. Students and staff from under-represented backgrounds are likely to be exposed to microaggressions, or subtle everyday invalidations or dismissals that communicate hostile, derogatory, or negative attitudes towards these groups. These micro-aggressions reinforce stereotypes and have cumulative effect and can take a toll on a person's well-being and health. They cause emotional distress, reduce sense of belonging, and contribute to internalisation of negative beliefs about oneself and one's group (Nadal *et al.,* 2014). Even when unintentional, micro-aggressions are a form or discrimination and violence. We need to work on addressing these.

We can start by engaging with *micro-affirmations:* small gestures or statements that communicate respect, understanding, and inclusion for colleagues and students from under-represented groups. These substitute messages about deficit and exclusion by contributing to acknowledge and value identities and contributions. These highlight strengths, contributions and are often subtle but specific to a person's identity or experience. Some ideas:[9]

- *Setting Expectations*: Clearly outline respectful behaviour expectations in every meeting with colleagues. When teaching, outline this in your syllabus and reiterate them during the first class. Most universities have codes of conduct with consequences for disruptive or offensive behaviour. Make everybody aware of these.

- *Active listening*: Hearing what is being shared. Through eye contact, open body posture, asking qualifying questions to ensure understanding, demonstrating that we are listening to others' views and opinions.

- *Respecting Identities*: Recognise people's identities by pronouncing names correctly and using their preferred pronouns. Names are central to our identities, and correct pronunciation demonstrates respect. Mispronunciation can lead to feelings of isolation. In some

[9] Some of these are adapted from Powell *et al.* (2013).

cultures, names hold cultural significance. Respecting pronouns affirms an individual's gender identity and appropriate use of pronouns is associated with better mental health outcomes, including reduced depression and suicide risk (Russell *et al.,* 2018).

- *Proactive Pronunciation*: Take time to learn how to pronounce names beforehand.[10] Introduce yourself with your name and pronouns to create a comfortable environment for others to do the same. Remember: it is ok to ask. Do not allow fear or embarrassment to stop from engagement with this practice. The benefits of inclusivity outweigh any initial awkwardness.

- *Inclusive Language*: Be mindful of the language you use in your emails, communications, lectures, and teaching materials. Avoid gendered language or stereotypes about any group. When teaching, ensure your examples and case studies reflect the diversity of your student body without resorting to stereotypes.

- *Celebrating Diversity*: In your department, you can organise activities to recognise and celebrate the diversity of colleagues' backgrounds and experiences, decorating the building for various cultural celebrations, offering spaces to carry on cultural activities. For instance, in universities with Muslim communities, it is becoming more common to organise iftar fast breaking meals. I created a calendar of the main religious and cultural celebrations that my students may celebrate and prepare a slide in correspondence of these events to show in the classroom. This small gesture shows colleagues and students that their culture and values are recognised by the classroom community.

- *Recognising and validating experiences*: Expressing care about the effect of the event and demonstrating a willingness to think and act to create a path to move forward.

- *Affirming emotional reactions*: Verbal acknowledgement of experiences and feelings can help the conversation to focus on turning those feelings towards actions that will empower and heal.

1. Becoming an Ally and Active Bystander

Progress towards a more inclusive university requires everyone's participation. No matter how prepared we are, conflicts can happen. While

[10] For English speakers, https://www.pronouncenames.com can be useful, but there are many others.

under-represented groups experience the most significant barriers, the solutions should involve all of us. We need to educate ourselves on intervention strategies to address issues. We need to become *allies*.

An *ally* is someone from the dominant group who actively works to end discrimination and support marginalised groups (Washington and Evans, 2000). Allies often have greater credibility with their own in-group when advocating for anti-discriminatory practices as they are not seen as advocating for their own interest (Drury and Kaiser, 2014). By treating everyone with respect, allies help to counter exclusionary behaviour (Carr *et al.,* 2019). However, it is important to avoid narratives portraying marginalised groups as "needing help" to succeed. Allies should work collaboratively alongside these groups, not for them (Patton and Bondi, 2015).

To become an ally, we need to educate ourselves and understand how bias and privilege works. Many colleagues may struggle to recognise acts of discrimination. Therefore, a strategy to cultivate allies should involve open and honest dialogue about existing institutional initiatives, address any misconceptions, and highlight the benefits of creating a culture of belonging for everyone. We all share a fear of saying or doing the wrong thing, however, allyship is a journey, not a destination. Mistakes in this journey are inevitable; what matters is the commitment to learn, adapt, and keep moving forward.

Engaging with the micro-affirmations are one aspect of the ally's role. It is also important to become an *active bystander.* Active bystanders intervene when they witness discrimination or a potentially harmful situation. Active bystanders are guided by empathy and a sense of responsibility to intervene. We can adopt a "four Ds" framework for safe intervention:[11]

- *Direct*: If safe, directly confront the situation using "I" statements. For example, "I'm uncomfortable with what I just heard."
- *Distract*: When direct intervention is unsafe, create a diversion to shift the focus away from the target of the harassment.
- *Delegate*: Enlist someone else (or a group) to intervene *e.g.*, people in senior positions, security, etc.

[11] Adapted from "Breaking the Silence", a University of Cambridge campaign for preventing harassment and sexual misconduct https://www.breakingthesilence.cam.ac.uk/prevention-support/be-active-bystander#:~:text=How%20You%20Can%20Intervene%20Safely%3A,%2C%20distract%2C%20delegate%2C%20delay. This was also adopted by the diversity work of the Royal Economic Society in the campaign "Be the Change: The Role of Active Bystanders" https://res.org.uk/res-video-be-the-change-the-role-of-active-bystanders/

- *Delay*: Offer support to the person affected afterwards or, if safe, address the behaviour with the person responsible for the behaviour.

There are many situations in which we may need to apply this into academia: during meetings, seminars, causal conversations, and social events. Be aware of your surroundings and potential problems that may arise. This is not always easy, but the more of us are ready and prepare to become an active bystander, the easier it gets.

Resource yourself. Building peer support networks is vital when engaging with this work. Active networks of allies and bystanders foster a sense of community and provide a support system for addressing social injustices. Maintaining connections with under-represented groups is also crucial. The more we understand their challenges, the more likely we are to become effective allies and bystanders (Bennett *et al.,* 2014; Bennett *et al.,* 2017). Finally, universities need to improve reporting systems., which in many cases are not effective and are not trusted by the academic community. Negative experiences with reporting can lead to bystander inaction and decreased reporting rates (Nicksa, 2014; Meyer, 2008).

Above all, be patient and persistent. Creating a more inclusive culture takes time and sustained efforts; do not get discouraged by setbacks (they will happen) and keep advocating for change.

V. FOSTERING BELONGING: CREATING INCLUSIVE LEARNING ENVIRONMENTS

> "Teaching is a performative act. And it is that aspect of our work that offers the space for change, invention, spontaneous shifts, that can serve as a catalyst drawing out the unique elements in each classroom". Bell Hooks (1994), *Teaching to Transgress*, p. 11

The call for more diversity in higher education demands the creation of inclusive learning environments where this diversity can thrive. These environments encompass both physical spaces (classrooms, buildings, cultural and sport venues, etc.) and virtual spaces (virtual learning environments, webpages) that directly influence student experiences and success.

Despite students entering with similar qualifications and prior knowledge, significant demographic awarding gaps persist. Discriminatory teaching practices, exclusionary attitudes from lectures and peers, microaggressions, and the lack of safe spaces can all contribute to these disparities (Smith and Bath, 2006). Universities not always appreciate or understand the extent of these disparities, often justifying the gaps rather than actively addressing them (Mountford-Zimdars *et al.,* 2015).

While acknowledging the significance of the entire university experience, including extracurricular activities, supportive communities, and inclusive policies, this section prioritises areas where we, as educators, can exert the most immediate influence: teaching and assessments practices.

We also acknowledge that implementing these changes requires time and leadership support. Unfortunately, these changes are often left to the discretion of individual lecturers, rather than being integrated into systematic change. Many universities express a desire to implement change yet fail to allocate time in staff workloads to facilitate it and lack recognition processes to commend those who actively engage with it. This can be demoralising for staff and punitive for students who see only clustered progress. Hence, we hope this section serves to those who have some dedicated time and resources to engage with this and need ideas on how to start.

1. Inclusive Teaching Practices and the Learning Environment

Lecturers significantly influence the learning environment through their teaching methods, engagement strategies, and communication styles. We can choose to adopt some pedagogical strategies to contribute to creating non-discriminatory spaces that reduce inequalities. Here I present some ideas to promote some thinking and start the change.

1.1. Universal Design for Learning (UDL)

Universal design for learning (UDL) is a comprehensive framework for creating flexible learning environments that cater to the diverse student needs. Based on research in neuroscience and the nature of learning, UDL aims to remove barriers for students when engaging with the learning environment. It is built on three core principles:

1. *Multiple means of engagement*: This focuses on capturing and sustaining student interest and motivation by offering various ways for students to connect with the learning material.

2. *Multiple means of representation*: This focuses on presenting information in different ways to cater to various learning styles and abilities.

3. *Multiple means of action and expression*: This focuses on providing different ways for students to demonstrate their understanding and learning.

Each principle is underpinned by research into the neuroscience of why, what, and how people learn (CAST, 2018). UDL principles ensure all students, regardless of background, ability, or learning style, have equal opportunities to succeed. It keeps students engaged, motivated, and offers multiple pathways to understanding.

It should be clear by now that the way as we learn varies a lot. For instance, in the UK, it is estimated that 30-40% of the population are neurodiverse (adhdaware.org.uk). The concept of neurodiversity highlights the fact that people have different cognitive strengths and weaknesses. It acknowledges that there is no single "correct" way of thinking, learning, and behaving (Baumer and Freud, 2021). UDL aligns well with neurodiversity by proactively addressing learning differences and reducing the need for extensive individualisation in classrooms.

For example, creating predictable classroom routines and allowing wait time for responses can benefit neurodiverse students (Rentenback *et al.,* 2017). These strategies, along with fostering a welcoming and inclusive environment, empower students to learn and thrive.

1.2. Curriculum Differentiation: Recognising Diverse Student Experiences

Lecturers can create inclusive curricula by critically examining what we teach. The curriculum is our primary channel of communication with students, and for this to be effective, it needs to resonate with their diverse experiences.

Student interests significantly impact how they engage with learning materials. Connecting the curriculum to students' experiences help to build upon existing strengths and knowledge, fostering deeper engagement. To achieve this, we need to recognise the diversity of student backgrounds and knowledge. By recognising these differences, we empower students to leverage their strengths, address areas of challenge, and ultimately, take ownership of their learning journey (CAST, 2018).

Understanding each student's background in large classes can be challenging but classroom activities can help. For instance, in an introductory Macroeconomics course, I asked students to "Describe a specific macroeconomic variable that has impacted you the most and perhaps motivated you to study economics?" Technologies like Padlet (padlet.com) allow students, and me, to share responses either anonymously or with their names in a virtual board where everyone can see the diverse experiences represented. The range of responses is always fascinating, revealing the diverse experiences that brought students to economics, and allowing me to tailor examples in future classes and teaching approach to better connect with their backgrounds.

Surveys with targeted questions about student needs and access to resources can be another valuable tool. An example from the COVID-19 online teaching period demonstrates the value of this approach. By surveying students about internet access, technology, study spaces, financial concerns, and time constraints, I gained valuable insights into potential barriers to engagement. Based on the results, I provided a list of university support services and adjusted my teaching pace to offer alternative resources. While this survey addressed the COVID-19 challenges, it demonstrates the value of identifying student needs and challenges in any large diverse class.

We should also consider the examples that we use when teaching, and their impact on different group of students. For instance, research shows that girls are often less motivated by financial rewards and more driven by social and environmental issues (Crawford *et al.,* 2018). Hence, a curriculum solely focused on financial success might fail to engage a significant portion of the student body. We need to be careful to base our examples on traditional textbooks which may have their biases too. Stevenson and Zlotnick (2018) analysed leading economics textbooks and found that 75% of all mentioned individuals in examples were men. Economists, policymakers, and business leaders overwhelmingly portrayed as men, misrepresenting the gender distribution in these roles.

1.3. Embrace Reflexive Teaching Practice

Reflexive teaching involves self-reflection, observation, and improvement of our teaching practices. It contributes to informing what we are doing and the impact of our work on student learning. It includes questioning our underlying assumptions about teaching and learning, experimenting with new methods, and actively seeking out feedback to continuously adapt our approach to better support students.

Through examining and self-reflecting on our teaching, we can rethink our own teaching practices and how these can facilitate (or hinder) the creation of more inclusive teaching environments. This process requires honest observation of your words, actions, and decisions, considering how they impact students. Table 1 provides some questions to guide self-reflexive analysis.

TABLE 1

STARTING OUR SELF-REFLEXIVE ANALYSIS OF OUR OWN TEACHING

Macro-questions	*Follow-ups*
Was my lecture effective?	Why? Why not? How can it be improved?
What were my expectations?	What expectations I had on my own delivery? What expectations I had about the students in the classroom? What expectations I had on students' knowledge? What expectations I made about students who were not in the classroom? Were these expectations realistic? Did I make these expectations explicit to myself? Did I communicate these expectations to students
Which students were more engaged?	Do you feel students were comfortable asking questions? Which students asked most questions? Was there a group who never ask any question?
Did students struggle with the lecture?	Were students comfortable letting me know if they did not understand something? Which students were more comfortable in communicating their lack of understanding? How did I help those students struggling? Did I provide alternative opportunities to communicate lack of understanding?
If I were to do this lecture again, what would I change?	Who would benefit from these changes? How would these changes affect student engagement? How do these changes affect the interaction dynamics in the classroom?

Notes: These questions are adapted from Paredes-Fuentes *et al.* (2022).

Engaging with this process can help us identify unintentional biases that might be hidden in the choice of examples, language, or assumptions about student backgrounds and knowledge. Consider classroom interactions and student engagement to identify situations where students might feel excluded. Reflexive teaching encourages us to create strategies that promote respectful communication and ensure all students feel comfortable expressing themselves. By reflecting on the effectiveness of our teaching methods, we can experiment with new approaches that better engage a diverse student body. This ensures that all students feel welcome, valued, and empowered to learn. If you want to further explore this, Ashwin *et al.* (2020) offer a detailed guide on developing a reflective approach in higher education and Sebolao (2019) shows how to use teaching portfolios for self-reflection.

2. The Importance of Inclusive Assessments

Assessments are arguably the primary way students engage with higher education. They significantly influence how students interact with the learning environment and instructors. Assessments deserve equal consideration as content and teaching methods as a vital component of teaching and learning. However, many academics lack expertise in pedagogy and often rely on traditional practices or personal experience when designing assessments. Limited time dedicated to assessment design, compared to content and delivery, further exacerbates the issue.

Assessments in higher education have indeed remained remarkably unchanged for decades and seem to adhere to consolidated academic conventions rather than their suitability for educational purposes (Bearman *et al.,* 2020). This is despite evidence that common high-stakes assessments, like closed-book final exams, contribute to achievement gaps for disadvantaged students (Madaus and Clarke, 2001; Jones, 2007; Heissel *et al.,* 2021).

For these reasons, assessments have become a central focus in my efforts to create inclusive learning environments. We all strive to create effective assessments that gauge student comprehension, skills, and subject proficiency. However, I argue that to be truly effective, assessments must also be inclusive. If assessments systematically penalise students due to design flaws, they fail to accurately measure learning and create barriers to demonstrating achievement.

Inclusive assessments are intentionally designed to be fair and equitable for all students. Principles of Universal Design for Learning (UDL) can be applied to assessments as well. Accessibility and flexibility are at the core of UDL for assessments. Accessibility ensures all students can understand the assessment instructions. Techniques like avoiding jargon, maintaining consistent formatting, and using headings benefit all learners, especially those with reading difficulties or language barriers. Organising content logically and breaking it up can further aid students with cognitive or attention-related disabilities. Flexibility involves offering alternatives to minimise the impact of irrelevant factors on assessment performance. Engaging with this we should be able to decrease the need of individual accommodations.

In contrast, traditional assessments in higher education tend to be narrow in focus, primarily testing knowledge of a subject. While knowledge assessment is important, this limited focus neglects the broader scope of assessments and the pedagogical reasons for assessing.

2.1. A Framework for Inclusive Assessment Design

In Paredes-Fuentes (2024), I present a framework for inclusive assessment design that uses an inquisitive approach, considering three key aspects: subject, students, and purpose. In addition to knowledge testing and engagement with learning outcomes, it is crucial to acknowledge that students' backgrounds and experiences significantly shape their interest, engagement, and overall approach to assessments. Each assessment should have a clear purpose beyond simply evaluating learning. A well-designed assessment plan incorporates a variety of assessments that foster engagement, nurture passion for the subject, help students scaffold knowledge, and bridge prior knowledge with new learning outcomes.

The framework recommends starting with questions about your current assessment design. While the framework is detailed in Paredes-Fuentes (2024), we can explore its application through two assessment examples:

> *Assessment 1 (Final Year Project – Psychology, 30%):* Write 750 words analysing how different schools of thought in psychology explain the rise of mental health issues among students.
>
> *Assessment 2 (Intermediate Economics, 10%):* Create a 3-min video explaining how an increase in interest rates affect mortgage rates for a general audience.

Understanding the context is crucial. Assessment 1 is part of a final year project on mental health in universities. It aims to prepare students for writing a policy report on the topic. Assessment 2, with a lower weighting, focuses on engagement and communication skills. For each assessment we can enquire on the who/what/when/how, etc that helps us understand its efficacy and effectiveness.

Who Are We Assessing?

Diversity in the classroom is key. Consider how backgrounds influence student responses. For example, in Assessment 1, international students might have different perspectives on mental health. Additionally, under-represented groups might be more impacted by the topic. For Assessment 2, consider the target audience for the video. To avoid favouring some groups of students over others, we may want to present with two or more topics for students to choose from.

Which assumptions I am making about students?

We all have biases about "good answers." Reflect on your own experiences and how they might influence your expectations (see Section on *reflexive teaching*). For Assessment 1, you can ensure students understand what is a "policy report" and how they are used. This may seem obvious to us, but it is not necessarily the case for some 19-20 years old students. For Assessment 2, we can provide context: Who is making the video and why? Role-plays can clarify the task (*e.g.*, "the government aims to launch a campaign explaining interest rates to the public").

Why are we assessing?

Clearly communicate the purpose of each assessment. For Assessment 1, explain how it scaffolds the final project and how they should use this in their final submission. For Assessment 2, emphasise developing communication skills as a skill requested by employers. Understanding the "why" also helps establish marking criteria.

When does the assessment take place?

Consider assessment timing. For Assessment 1, we need enough time for feedback and reflection before the submission of the final project in order to be used as a scaffold. If the main aim of Assessment 2 is to promote engagement, it needs to occur during the term.

What are we assessing?

Both assessments can evaluate a broad range of skills. Assessment 1 can assess understanding of various schools of thought, information synthesis from multiple sources, and/or the use of reference lists. Assessment 2 can assess comprehension of interest rates and their economic impact, communication of complex concepts, and/or use of audio-visual communication tools. Whatever specific skill, or combination of skills, should be explicitly highlighted to students and be reflected in the marking criteria, otherwise we will not be able to fairly mark the assessment.

How does the assessment contribute to learning?

Completing assessments does not guarantee learning. We must make the connection explicit. Explicitly indicate how assessments links to learning outcomes of the module.

No matter the assessment you chose, there are some basic considerations that can be applied to all type of assessments:

- *Clear instructions:* Provide clear, concise, well-structured assessment instructions and criteria. Students should understand expectations, how the work connects to learning outcomes, and how it will be graded.

- *Accessibility:* While often not in the lecturer's control, alternative formats like larger print or audio recordings should be provided when needed. Students with disabilities might benefit from extended exam times, assistive technologies, or breaks. These may be established by university policies, and these should be communicated clearly to students.

- *Financial Accessibility:* Consider the financial implications of completing the assessment. For instance, if you are required to produce a printed version, how the cost of this affects the potential of students to complete the assessment? What are the resources available? When creating some outputs (videos, etc.), what resources are available to students? What could be the financial constraints?

- *Clear and Actionable Feedback:* Feedback does not need to be very long, but it must be constructive and provide a guide for future improvement. Sometimes we focus too much in justifying our mark, rather than explaining how to get to the next level.

Finally, remember that inclusive assessments are not about making things easier. The goal is to ensure assessment outcomes reflect student learning and engagement with the subject, not factors like disability, financial means, or irrelevant personal characteristics. If you have systematic awarding gaps in your assessments, it is likely that these factors are influencing your students' performance.

3. The Holistic Student Experience

As discussed earlier, the student experience extends beyond learning environments and assessments. Non-academic activities are an integral part of university life, enriching it in various ways that contribute to diversity, inclusivity, and a rewarding experience. These activities foster both formal and informal networks among economics students, which can have long-term implications for their academic progression and overall outcomes. Additionally, such activities contribute to students' sense of belonging to the institution (Anh and Davies, 2020).

Universities can take several steps to create more inclusive environments beyond classrooms.[12] Some institutions have launched initiatives to:

- *Reconsider the alcohol-centric nature of many events*: Common in many Western universities, offering alternatives could involve a wider variety of activities with varying social atmospheres and at different times of the days.

- *Create spaces for different groups to network*: This might involve creating specific events or clubs for students from under-represented backgrounds or with shared interests. These spaces have shown to help by addressing feelings of isolation and provide spaces to discuss challenges, but also to propose solutions.

- *Promote understanding of cultural differences in social interaction*: This could involve workshops or discussions that explore how different cultures approach large group settings.

Furthermore, improving support services, reporting systems, and creating safe spaces are crucial. Financial inclusion also requires significant consideration in the current environment. These are only some ideas to start the conversation. Each university should study their own culture and how their environments include or exclude certain groups, and how these can be reconfigured to improve the overall experience.

Despite these efforts, students from under-represented groups may still face discrimination and violence. As lecturers, we can foster empathy by acknowledging that students may have experienced such situations in the past. We can provide a classroom environment that promotes healing from these experiences, rather than perpetuating suffering.

[12] We share some ideas for economics in "Economics for All: 7 Action Points to make Economics More Inclusive".

VI. UNIVERSITIES AS WORKPLACES: DIVERSITY AND SENSE OF BELONGING AMONG STAFF

A sense of belonging is not just crucial for students; it's equally important for university staff. Traditionally, academia has constructed a narrow image of the "ideal" academic: upper-middle class, male, and without caring responsibilities (Moreau and Campbell Galman, 2022). This stereotype creates pressure for staff from under-represented groups to suppress their identities to fit in. As discussed earlier, these groups are also more likely to face discrimination and have their contributions overlooked.

While extensive literature explores structural inequalities and diversity challenges within academia, research on effective strategies to foster inclusion and a sense of belonging is less developed. However, there is a growing body of research emerging in recent years. This Section explores some promising practices and invite universities to engage with this process at all levels.

1. What Works and What Does Not in the Workplace

A key challenge to understand "what works" on diversity and inclusion is that diversity itself is contextual. Efforts to cultivate a sense of belonging must consider the specific under-represented and marginalised groups within the institution and society.

A crucial first step for crafting effective strategies is gathering data to understand the challenges faced by under-represented groups and instances of under-recognition. The Chartered Institute of Personnel and Development (CIPD) offers guidelines for data collection in a UK context (CIPD, 2019).

Research demonstrates that diversity, inclusion, and belonging initiatives only succeed with strong leadership involvement at all levels (Green and Young, 2019). Management must set clear data-informed goals and actively promote these activities. They should acknowledge these efforts as core institutional functions and establish clear accountability mechanisms at every stage (Kalev *et al.,* 2006; Castilla, 2015; Richard *et al.,* 2013). Individual initiatives, without strong leadership, may be counterproductive and send unintended signals (Dover *et al.,* 2019).

What does not work? Research suggests that colourblind initiatives that attempt to separate race and ethnicity from issues rooted in structural racism are ineffective (Block, 2016; Portocarrero and Carter, 2022). Colour blindness avoids discussions of inequality and equity and ignores realities of discrimination. Similarly, attempts to frame diversity too broadly as a response to backlash from high-status groups, suggesting their personal attributes contribute more to diversity than demographic characteristics, have little impact on reducing inequalities (Dover *et al.,* 2020). This approach risks falling back into colourblindness and neglecting to address structural inequalities.

The literature on mandatory diversity training is mixed, with some studies showing it to be less effective than voluntary training (Bezrukova *et al.,* 2016; Kalev *et al.,* 2006; Portocarrero and Carter, 2022). In academic contexts, evidence suggests interventions aiming to reduce implicit prejudice habits and empower people to break them may be more successful (Devine *et al.,* 2012; Devine *et al.,* 2017).

More recent efforts focus on creating a culture of belonging where all staff feel empowered to thrive. Kennedy and Jain-Link (2021) define workplace belonging as having four key aspects:

1. *Recognition of unique contributions:* Staff feel their individual strengths and perspectives are valued.

2. *Strong connections:* Strong relationships and a sense of community exist within the workplace.

3. *Support for daily work and development:* Staff receive support for their daily work and career growth.

4. *Pride of organisation's values and purposes:* Staff feel aligned with the institutions' values and mission.

To cultivate a truly inclusive environment, universities can strive for a culture of belonging in which all staff recognise the challenges faced by historically marginalised groups, and everybody understands their role in addressing these inequalities, while also seeing their efforts and contributions recognised. This fosters a sense of shared responsibility for addressing inequalities and working towards common goals. A culture of belonging can also help to the co-creation of solutions for challenges–including increasing diversity–faced by the institution.

Universities are large and complex structures. To seriously address structural inequalities and foster a culture of belonging for staff, these objectives need to be embedded in all practices at all levels. While listing all potential areas is impossible, we can follow a staff member's journey through the academic system from recruitment to promotion. This allows us to consider how to embed inclusive practices at each stage, identify managerial responsibilities, accountability procedures, and recognition policies.

We can engage with successful practices from other institutions to draw inspiration, starting by actively revising current *hiring practices.* Bias can be embedded in recruitment materials through subjective terms like "culture fit" and unstated expectations for specific candidate characteristics. Research shows that using inclusive language and actively promoting diversity initiatives attracts a wider range of qualified applicants (Gaucher *et al.,* 2011; King *et al.,* 2012; Cunningham *et al.,* 2019; Phillips *et al.,* 2023).

Mentorship programmes are another well-established strategy, particularly when designed effectively. Mentors can significantly contribute to the professional and personal development of new staff, offering support, advocating for their growth, and providing valuable insights on navigating the university's complexities (Lunsford *et al.,* 2017). *Induction practices,* while less emphasised, offer a crucial opportunity to introduce new hires to the university's culture, processes, and resources. A well-designed induction programme can ensure new colleagues not only understand but also embrace the institution's values and become active contributors.

Finally, significant work is needed to address *promotion* practices in universities, particularly in the UK context where there are documented gaps in the pipeline from junior to senior positions. A narrow focus solely on research publications neglects the multifaceted contributions of academics which are needed for the successful running of the institutions: excellence in teaching, service to the university community, and contributions to university's strategy, including fostering diversity.

University managers must adopt a proactive approach to fostering a culture of belonging and equitable environments, moving beyond mere checkbox exercises. University leadership must set clear goals for middle managers, develop consultative actionable plans. It is crucial that staff understand how their individual contributions will be resourced, acknowledge, and integrated into the overall vision. Ambiguity in any of these aspects can lead to disagreements among staff members about the direction of the institution, potentially resulting in conflict and disputes over accountability. Leaders must be fully invested in the desired outcome: a future where universities are inclusive, there are no structural inequalities, have dismantled ivory walls, and are actively connected to local communities.

VII. THE ROAD AHEAD: TOGETHER WE CAN DISMANTLE IVORY TOWERS

Writing this chapter has filled me with hope. It has reminded me of the transformative power of education and the role we play in creating more inclusive academic environments. It reinforced my commitment to supporting students and colleagues on their academic journeys and create a true sense of belonging.

We must acknowledge the historical perception of universities as "ivory towers" –bastions of privilege, isolated from social concerns. Although modern universities are now positioned as a driver of social mobility and equality, the persistent realities of awarding gaps, limited diversity, and disconnection from local communities threaten to push them back towards that elitist image. We also should acknowledge the structural barriers and inequalities that affect some groups in our societies, and do not water down any efforts on addressing these as response to backlash.

To truly serve as a force for positive change, universities must ensure fair access, participation, and achievement for students and staff. Education should encompass not just narrow employability skills, but also personal development and cultural awareness, including educating staff and students about the experiences of historically marginalised and under-recognised groups in our communities. Dismantling these barriers requires a multi-pronged approach, with both systemic change and individual actions.

University management must lead the change. Simply making public pronouncements is insufficient. Leaders must acknowledge that creating an inclusive environment demands dedicated investment of time and resources. Ultimately, establishing a true sense of belonging hinges on cultivating a supportive community that promotes psychological safety, dismantles structural inequalities, and eliminates feelings of isolation. This requires establishing clear expectations for academic responsibilities as well as recognition schemes that value contributions beyond just research publications. Failure by management to address these issues can lead to conflict and resentment, undermining any goals of creating inclusive environments.

The challenges faced by academics themselves cannot be ignored. The "publish or perish" culture along with increasing workloads devalue the real contributions that academics make in supporting universities. University management must address these issues by prioritising staff well-being, addressing workload issues, and other concerns like casualisation and financial insecurity. Staff with low morale and limited resources struggles to foster inclusive environments for others. Employment conditions for staff undoubtedly affect the quality of education students receive, highlighting the interconnectedness of the structural issues in academia.

Despite these challenges, I firmly believe that we can still take steps to foster more inclusive learning environments, particularly for students from under-represented backgrounds. The road ahead requires a collective effort, and by embracing individual responsibility, we can make this a more achievable goal. I hope this chapter provided inspiration to empowering academics and do not fall victims of the system, but resource ourselves to address challenges and contribute to a more inclusive academic environment.

BIBLIOGRAPHY

ADHD, A. (n.d.). *Neurodiversity and other conditions.* https://adhdaware.org.uk/what-is-adhd/neurodiversity-and-other-conditions/

ALLEN, K. A., KERN, M. L., ROZEK, C. S., MCINERENEY, D., and SLAVICH, G. M. (2021). Belonging: A review of conceptual issues, an integrative framework, and directions for future research. *Australian Journal of Psychology, 73*(1), 87–102. https://doi.org/10.1080/00049530.2021.1883409

ALLEN, L., COWIE, L., and FENAUGHTY, J. (2020). Safe but not safe: LGBTTIQA+ students' experiences of a university campus. *Higher Education Research & Development, 39*(6), 1075–1090. https://doi.org/10.1080/07294360.2019.1706453

ALVARES, C., and FARUQI, S. S. (Eds.). (2012). *Decolonising the university: The emerging quest for non-Eurocentric paradigms.* Penerbit Universiti Sains Malaysia.

ASHWIN, P., BOUD, D., CALKINS, S., COATE, K., HALLETT, F., LIGHT, G., LUCKETT, K., MCARTHUR, J., MACLAREN, I., MCLEAN, M., and TOOHER, M. (2020). Reflective teaching in higher education. Bloomsbury Academic.

AURIOL, E., FRIEBEL, G., and WILHELM, S. (2019). *Women in European Economics* [PDF]. https://women-economics.com/download/Auriol.Friebel.Wilhelm_2019_Women.in.Economics.pdf

BAERT, S. (2018). Hiring discrimination: An overview of (almost) all correspondence experiments since 2005. In S. M. GADDIS (Ed.), *Audit studies: Behind the scenes with theory, method, and nuance* (pp. 63–77). Cham, Switzerland: Springer.

Baumer, N., and Frueh, J. (2021). *What is Neurodiversity? Mind & Mood. Harvard Health Publishing, Harvard Medical School.* https://www.health.harvard.edu/blog/what-is-neurodiversity-202111232645

Bearman, M., Boud, D., and Ajjawi, R. (2020). New Directions for Assessment in a Digital World. In D. Boud and R. Ajjawi (Eds.), *Re-Imagining University Assessment in a Digital World* (pp. 7-18). Switzerland: Springer.

Bennett, S., Banyard, V. L., and Edwards, K. M. (2017). The impact of the bystander's relationship with the victim and the perpetrator on intent to help in situations involving sexual violence. *Journal of Interpersonal Violence, 32*(5), 682–702. https://doi.org/10.1177/0886260515586373

Bennett, S., Banyard, V. L., and Garnhart, L. (2014). To act or not to act, that is the question? Barriers and facilitators of bystander intervention. *Journal of Interpersonal Violence, 29*(3), 476–496. https://doi.org/10.1177/0886260513505210

Bezrukova, K., Spell, C. S., Perry, J. L., and Jehn, K. A. (2016). A meta-analytical integration of over 40 years of research on diversity training evaluation. *Psychological Bulletin, 142*(11), 1227–1274. https://doi.org/10.1037/bul0000067

Bhambra, G. K., Gebrial, D., and Nişancioğlu, K. (2018). *Decolonising the university.* Pluto Press.

Block, C. J. (2016). The impact of color-blind racial ideology on maintaining racial disparities in organizations. In H. A. Neville, M. E. Gallardo and D. W. Sue (Eds.), *The myth of racial color blindness: Manifestations, dynamics, and impact* (pp. 243–259). American Psychological Association. https://doi.org/10.1037/14754-015

Boring, A. (2017). Gender biases in student evaluations of teaching. *Journal of Public Economics,* 145, 27-41. https://doi.org/10.1016/j.jpubeco.2016.11.006

Bosquet, C., Combes, P., and Garcia-Penalosa, C. (2019). Gender and Promotions: Evidence from Academic Economists in France. *Scandinavian Journal of Economics, 121*(3), 1020-1053. https://doi.org/10.1111/sjoe.12300

Bromme, R., Mede, N. G., Thomm, E., Kremer, B., and Ziegler, R. (2022). An anchor in troubled times: Trust in science before and within the COVID-19 pandemic. *PLOS ONE, 17*(2), e0262823. https://doi.org/10.1371/journal.pone.0262823

Burnett, T., and Paredes-Fuentes, S. (2023). Lack of diversity in economics holds back its relevance and value to society. *LSE Policy Blog*, May. https://blogs.lse.ac.uk/impactofsocialsciences/2023/05/12/lack-of-diversity-in-economics-holds-back-its-relevance-and-value-to-society/

Carr, E. W., Reece, A., Kellerman, G. R., and Robichaux, A. (2019). The value of belonging at work. *Harvard Business Review.* https://hbr.org/2019/12/the-value-of-belonging-at-work

CAST. (2018). *UDL & the learning brain.* Wakefield, MA. https://www.cast.org/binaries/content/assets/common/publications/articles/cast-udlandthebrain-20220228-a11y.pdf#content

Castilla, E. J. (2015). Accounting for the gap: A firm study manipulating organizational accountability and transparency in pay decisions. *Organization Science, 26*(2), 311–333. https://doi.org/10.1287/orsc.2014.0950

Ceci, S. J., Ginther, D. K., Kahn, S., and Williams, W. (2014). Women in academic science: A changing landscape. *Psychological Science in the Public Interest, 15*(3), 75–141. https://doi.org/10.1177/1529100614541236

Chartered Institute of Personnel and Development (CIPD). (2019). Diversity management that works: An evidence-based view. *Research report.* https://www.cipd.org/globalassets/media/knowledge/knowledge-hub/reports/7926-diversity-and-inclusion-report-revised_tcm18-65334.pdf

Cordiroli McMaster, N. (2021). Ethnicity awarding gaps in UK higher education in 2019/20. *Advance HE Report.* https://www.advance-he.ac.uk/knowledge-hub/ethnicity-awarding-gaps-uk-higher-education-201920#:~:text=Much%20of%20the%20overall%20awarding,points%20between%20the%20two%20groups.

Corsi, M., D'Ippoliti, C., and Zacchia, G. (2017). Gendered careers: Women economists in Italy. *Working Papers* CEB 17-003. ULB – Universite Libre de Bruxelles.

Coulter, R., Mair, C., Miller, E., Blosnich, J., Matthews, D., and McCauley, H. (2017). Prevalence of past-year sexual assault victimization among undergraduate students: Exploring differences by and intersections of gender identity, sexual identity, and race/ethnicity. *Prevention Science, 18*(6), 726–736. https://doi.org/10.1007/s11121-017-0762-8

Coulter, R., and Rankin, S. R. (2020). College sexual assault and campus climate for sexual and gender-minority undergraduate students. *Journal of Interpersonal Violence, 35*(5–6), 1351–1366. https://doi.org/10.1177/0886260517696870

Craig, G., Atkin, K., Chattoo, S., and Flynn, R. (2012). *Understanding 'race' and ethnicity: Theory, history, policy, practice.* Policy Press.

Crawford, C. (2014). Socio-economic differences in university outcomes in the UK: Drop-out, degree completion and degree class. *IFS Working Papers,* No. W14/31). Institute for Fiscal Studies (IFS). https://doi.org/10.1920/wp.ifs.2014.1431

Cunningham, S. J., Guss, S., and Stout, J. (2019). Challenging the 'Good Fit' Narrative: Creating Inclusive Recruitment Practices in Academic Libraries. In D. M. Mueller (Ed.), *Recasting the Narrative: The Proceedings of the ACRL 2019 Conference* (pp. 12-21). Cleveland, Ohio: ACRL.

Devine, P. G., Forscher, P. S., Austin, A. J., and Cox, W. T. (2012). Long-term reduction in implicit race bias: A prejudice habit-breaking intervention. *Journal of Experimental Social Psychology, 48*(6), 1267–1278.

Devine, P. G., Forscher, P. S., Cox, W. T., Kaatz, A., Sheridan, J., and Carnes, M. (2017). A gender bias habit-breaking intervention led to increased hiring of female faculty in STEMM departments. *Journal of Experimental Social Psychology,* 73, 211–215. https://doi.org/10.1016/j.jesp.2012.06.003

Dover, T. L., Kaiser, C. R., and Major, B. (2020). Mixed signals: The unintended effects of diversity initiatives. *Social Issues and Policy Review,* 14, 152–181. https://doi.org/10.1111/sipr.12059

Drury, B. J., and Kaiser, C. R. (2014). Allies against sexism: The role of men in confronting sexism. *Journal of Social Issues, 70*(4), 637–652. https://doi.org/10.1111/josi.12083

Equality and Human Rights Commission (EHRC). (2019a). *Universities oblivious to the scale of racial abuse on campus*. https://www.equalityhumanrights.com/en/our-work/news/universities-oblivious-scale-racial-abuse-campus

Equality and Human Rights Commission (EHRC). (2019b). *Racial harassment in British universities: Qualitative research findings.* https://www.equalityhumanrights.com/sites/default/files/racial-harassment-in-british-universities-qualitative-research-findings.pdf

Equality and Human Rights Commission (EHRC). (2019c). *Tackling racial harassment: Universities challenged.* https://www.equalityhumanrights.com/sites/default/files/tackling-racial-harassment-universities-challenged.pdf

Este, J. (2017). Decolonising research methodology must include undoing its dirty history. *The Conversation.* https://theconversation.com/decolonising-research-methodology-must-include-undoing-its-dirty-history-83912

Fosnacht, F., and Broderick, C. (2020). Religious intolerance on campus: A multi-institution study. *Journal of College and Character, 21*(4), 244–262. https://doi.org/10.1080/2194587X.2020.1822875

Gaucher, D., Friesen, J., and Kay, A. C. (2011). Evidence that gendered wording in job advertisements exists and sustains gender inequality. *Journal of Personality and Social Psychology, 101*(1), 109-128. https://doi.org/10.1037/a0022530

Gillen-O'Neel, C. (2021). Sense of belonging and student engagement: A daily study of first and continuing-generation college students. *Research in Higher Education, 62*(0), 45–71. https://doi.org/10.1007/s11162-019-09570-y

Ginther, D. K., and Kahn, S. (2004). Women in economics: Moving up or falling off the academic career ladder? *Journal of Economic Perspectives, 18*(3), pp. 193–214. https://doi.org/10.1257/0895330042162386

Gopal, P. (2021). On decolonisation and the university. *Textual Practice, 35*(6), 873-899. https://doi.org/10.1080/0950236X.2021.1929561

Gov.uk. (2022). *Population of England and Wales.* https://www.ethnicity-facts-figures.service.gov.uk/uk-population-by-ethnicity/national-and-regional-populations/population-of-england-and-wales/latest/

Green, M., and Young, J. (2019). *Building inclusive workplaces: Assessing the evidence on inclusion.* London: Chartered Institute of Personnel and Development. www.cipd.co.uk/inclusiveworkplaces

Heissel, J. A., Adam, E. K., Doleac, J. L., Figlio, D. N., and Meer, J. (2021). Testing, stress, and performance: How students respond physiologically to high-stakes testing. *Education Finance and Policy, 16*(2), 183–208. https://doi.org/10.1162/edfp_a_00306

Hengel, E. (2017). Publishing while female: Are women held to higher standards? Evidence from peer review. *Cambridge Working Paper Economics.*

ING-Economics Network. (2019, November). Public understanding of economics. *The Economics Network.* https://doi.org/10.53593/n3247a

Jackson, Z. A., Harvey, I. S., and Sherman, L. D. (2023). The impact of discrimination beyond sense of belonging: Predicting college students' confidence in their ability to graduate. *Journal of College Student Retention: Research, Theory & Practice, 24*(4), 973-987. https://doi.org/10.1177/1521025120957601

Jones, B. D. (2007). The unintended outcomes of high-stakes testing. *Journal of Applied School Psychology, 23*(2), 65-86. https://doi.org/10.1300/J370v23n02_05

Kalev, A., Dobbin, F., and Kelly, E. (2006). Best practices or best guesses? Assessing the efficacy of corporate affirmative action and diversity policies. *American Sociological Review, 71*(4), 589–617. https://doi.org/10.1177/000312240607100404

Kennedy, J. T., and Jain-Link, P. (2021). What does it take to build a culture of belonging? *Harvard Business Review.* https://hbr.org/2021/06/what-does-it-take-to-build-a-culture-of-belonging?registration=success

King, E. B., Dawson, J. F., Kravitz, D. A., and Gulick, L. M. (2012). A multilevel study of the relationships between diversity training, ethnic discrimination and satisfaction in organizations. *Journal of Organizational Behavior, 33*(1), 5–20. https://doi.org/10.1002/job.728

Kniffin, K. (2007). Accessibility to the PhD and professoriate for first-generation college graduates: Review and implications for students, faculty, and campus policies. *American Academic,* 3, 49-79. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2957342

Lee, E. M. (2017). 'Where people like me don't belong': Faculty members from low-socioeconomic-status backgrounds. *Sociology of Education, 90*(3). https://doi.org/10.1177/0038040717710495

Lundberg, S., and Stearns, J. (2019). Women in economics: Stalled progress. *Journal of Economic Perspectives, 33*(1), 3-22. https://doi.org/10.1257/jep.33.1.3

Lundine, J., Bourgeault, I. L., Clark, J., Heidari, S., and Balabanova, D. (2018). The gendered system of academic publishing. *Lancet,* 391, 1754-1756. https://doi.org/10.1016/S0140-6736(18)30950-4

Lunsford, L. G., Crisp, G., Dolan, E. L., and Wuetherick, B. (2017). Mentoring in higher education. In *The SAGE handbook of mentoring,* 316-334.

Madaus, G. F., and Clarke, M. (2001). The adverse impact of high-stakes testing on minority students: Evidence from 100 years of test data. In R. Kahlenberg (Ed.), *Raising standards or raising barriers? Inequality and high-stakes testing in public education* (pp. 30-45). New York: The Century Foundation Press.

Maldonado-Torres, N. (2011). El pensamiento filosófico del "giro descolonizador". In E. Dussel, E. Mendieta and C. Bohórquez (Eds.), *El pensamiento filosófico latinoamericano, del Caribe, y "latino" (1300-2000): historia, corrientes y filósofos* (pp. 683-697). México: Siglo Veintiuno.

Matz, R. L., Koester, B. P., Fiorini, S., Grom, G., Shepard, L., Stangor, C. G., Weiner, B., and McKay, T. A. (2017). Patterns of gendered performance differences in large introductory courses at five research universities. *AERA Open, 3*(4). https://doi.org/10.1177/2332858417743754

Meyer, E. J. (2008). A feminist reframing of bullying and harassment: Transforming schools through critical pedagogy. *McGill Journal of Education, 43*(1), 33–48. https://doi.org/10.7202/019572ar

Moghli, A. M., and Kadiwal, L. (2021). Decolonising the curriculum beyond the surge: Conceptualisation, positionality and conduct. *London Review of Education, 19*(1), 1–16. https://doi.org/10.14324/LRE.19.1.23

Morber, J., and Vartan, S. (2023, June 10). *Sexual harassment still pervades science. Scientific American.* https://www.scientificamerican.com/article/sexual-harassment-still-pervades-science/

Moreau, M. P., and Campbell Galman, S. (2022). *Fostering a sense of belonging for higher education staff and students with caring responsibilities: What works?* AdvanceHE. https://www.advance-he.ac.uk/knowledge-hub/fostering-sense-belonging-higher-education-staff-and-students-caring-responsibilities

Morgenroth, T., Ryan, M. K., and Peters, K. (2015). The motivational theory of role modeling: How role models influence role aspirants' goals. *Review of General Psychology, 19*(4), 465-483. https://doi.org/10.1037/gpr0000059

Mountford-Zimdars, A., Sabri, D., Moore, J., Sanders, J., Jones, S., and Higham, L. (2015). Causes of differences in student outcomes. *HEFCE Report.* https://dera.ioe.ac.uk/23653/1/HEFCE2015_diffout.pdf

Nadal, K. L., Wong, Y., Griffin, K. E., Davidoff, K., and Sriken, J. (2014). The adverse impact of racial microaggressions on college students' self-esteem. *Journal of College Student Development, 55*(5), 461-474. https://doi.org/10.1353/csd.2014.0051

Nicksa, S. C. (2014). Bystander's willingness to report theft, physical assault, and sexual assault: The impact of gender, anonymity, and relationship with the offender. *Journal of Interpersonal Violence, 29*(2), 217–236. https://doi.org/10.1177/0886260513505146

Office for Students. (2021). *Degree attainment: Black, Asian and minority ethnic students.* https://www.officeforstudents.org.uk/advice-and-guidance/promoting-equal-opportunities/effective-practice/black-asian-and-minority-ethnic-students/

Oxford English Dictionary. (n.d.). Diversity. Retrieved February 26, 2024. https://www.oed.com/search/dictionary/?scope=Entries&q=diversity

Paredes-Fuentes, S., Bhatia, M., Etuwewe, A., Gnaoure, I., Hoyland, C., and Panchal, D. (2022). *How to Start Decolonising Social Sciences: A Workbook.* https://warwick.ac.uk/fac/soc/decolonisingss/decolonising_social_sciences_workbook_-_final_draft.pdf

Paredes-Fuentes, S., Burnett, T., Cagliesi, G., Chaudhury, P., and Hawkes, D. (2023). Who Studies Economics? An Analysis of Diversity in the UK Economics Pipeline. *Royal Economic Society Diversity Report,* March. https://res.org.uk/wp-content/uploads/2023/03/Who-studies-economics-Diversity-Report.pdf

Paredes-Fuentes, S. (2024). Fostering Inclusive Excellence: Designing Effective Assessment for Teaching Economics Online. In P. Chaudhury, A. Al-Bahrani, and B. Sheridan (Eds.) (forthcoming), *Teaching Economics Online.* Edward Elgar Publishing Teaching Guides.

Patton, L. D., and Bondi, S. (2015). Nice White men or social justice allies?: Using critical race theory to examine how White male faculty and administrators engage in ally work. *Race Ethnicity and Education, 18*(4), 488–514. https://doi.org/10.1080/13613324.2014.1000289

Pedler, M. L., Willis, R., and Nieuwoudt, J. E. (2021). A sense of belonging at university: Student retention, motivation and enjoyment. *Journal of Further and Higher Education, 46*(3), 397–408. https://doi.org/10.1080/0309877X.2021.1955844

PHILLIPS, J. M., GRISWOLD, K. R., SHIVERDECKER, L. K., and CASTELLANO, W. (2023). Wilkommen, bienvenue, welcome: Language and national culture diversity messages as strategic recruiting tools for diverse organizations. *The International Journal of Human Resource Management, 34*(1), 154-196. https://doi.org/10.1080/09585192.2021.1961163

PORTOCARRERO, S., and CARTER, J. T. (2022). Diversity initiatives in the US workplace: A brief history, their intended and unintended consequences. *Sociology Compass, 16*(7), e13001. https://doi.org/10.1111/soc4.13001

POWELL, C., DEMETRIOU, C., and FISHER, A. (2013). Micro-affirmations in academic advising: Small acts, big impact. *The Mentor: An Academic Advising Journal.* https://dus.psu.edu/mentor/2013/10/839/

RAZAI, M. S., OSAMA, T., MCKECHNIE, D. G. J., and MAJEED, A. (2021). Covid-19 vaccine hesitancy among ethnic minority groups. *BMJ,* 372, n. 513. https://doi.org/10.1136/bmj.n513

RENTENBACH, B. L., PRISLOVSKY, L., and GABRIEL, R. (2017). Valuing differences: Neurodiversity in the classroom. *Phi Delta Kappan, 98*(8), 59-63. https://doi.org/10.1177/0031721717708297

REVELL, K., and NOLAN, H. (2023). Do medical students with a disability experience adverse educational outcomes on UK medical courses? *Medical Teacher, 45*(4), 388-394. DOI: https://doi.org/10.1080/0142159X.2022.2136518

RICHARD, O. C., ROH, H., and PIEPER, J. R. (2013). The link between diversity and equality management practice bundles and racial diversity in the managerial ranks: Does firm size matter? *Human Resource Management, 52*(2), 215–242. https://doi.org/10.1002/hrm.21528

RUSSELL, S. T., POLLITT, A. M., LI, G., and GROSSMAN, A. H. (2018). Chosen name use is linked to reduced depressive symptoms, suicidal ideation, and suicidal behaviour among transgender youth. *Journal of Adolescent Health, 63*(4), 503-505. https://doi.org/10.1016/j.jadohealth.2018.02.003

SEBOLAO, R. (2019). Enhancing the use of a teaching portfolio in higher education as a critically reflexive practice. *The Independent Journal of Teaching and Learning, 14*(2), 20-28. http://hdl.handle.net/11462/2174

SHAHJAHAN, R. A., ESTERA, A. L., SURLA, K. L., and EDWARDS, K. T. (2021). Decolonizing Curriculum and Pedagogy: A Comparative Review Across Disciplines and Global Higher Education Contexts. *Review of Educational*

Research, 92(1), 73-113. https://doi.org/10.3102/00346543211042423

Sharma, J., and Poole, D. N. (2018). Gender bias in publishing. *The Lancet, 392*(10157), 1515-1516. https://doi.org/10.1016/S0140-6736(18)32000-2

Smith, C. D., and Bath, D. M. (2006). The Role of the Learning Community in the Development of Discipline Knowledge and Generic Graduate Outcomes. *Higher Education,* 51, 259-286. https://doi.org/10.1007/s10734-004-6389-2

Smith, H. J., Jaurique, A., and Ryan, D. (2016). The Mistreatment of Others: Discrimination Can Undermine University Identification, Student Health, and Engagement. *Soc Just Res,* 29, 355–374. https://doi.org/10.1007/s11211-016-0274-x

Smith, S. L., Sevilla, A., and Gamage, D. (2021). Women in Economics: A UK Perspective. *Oxford Review of Economic Policy, 36*(4), 962-982. https://doi.org/10.1093/oxrep/graa048

Stevenson, J. (2013). Discourses of inclusion and exclusion: Religious students in UK higher education. *Widening Participation and Lifelong Learning, 14*(3), 27-43. https://doi.org/10.5456/WPLL.14.3.27

Stonewall. (2019). Delivering LGBT-Inclusive Higher Education. *Stonewall Service Delivery Briefings.* https://www.ucl.ac.uk/womens-health/sites/womens-health/files/delivering_lgbt_inclusive_higher_education-2019.pdf

Tenbrunsel, A. E., Rees, M. R., and Diekmann, K. A. (2019). Sexual Harassment in Academia: Ethical Climates and Bounded Ethicality. *Annual Review of Psychology,* 70, 245-270. https://doi.org/10.1146/annurev-psych-010418-102945

Todd, P., and Bird, D. (2000). Gender and promotion in academia. *Equal Opportunities International, 19*(8), 1-16. https://doi.org/10.1108/02610150010786166

Tram, K. H., Saeed, S., Bradley, C., Fox, B., Eshun-Wilson, I., Mody, A., and Geng, E. (2022). Deliberation, Dissent, and Distrust: Understanding Distinct Drivers of Coronavirus Disease 2019 Vaccine Hesitancy in the United States. Clinical infectious diseases: An official publication of the *Infectious Diseases Society of America, 74*(8), 1429–1441. https://doi.org/10.1093/cid/ciab633

UCU. (2022). *The Impact of Social Class on Experiences of Working in Post-16 Education University and College Union*. July 2022. https://www.ucu.org.uk/media/13180/Social-class-report/pdf/Social_class_report_Jul22_2.pdf

Universities UK. (2022). *Closing ethnicity degree awarding gaps: three years on #closingthe gap*. July. https://www.universitiesuk.ac.uk/sites/default/files/uploads/Reports/closing-the-gap-three-years-on.pdf

Washington, J., and Evans, N. J. (2000). Becoming an ally. In M. Adams, W. J. Blumenfeld, R. Castaneda, H. W. Hackman, M. L. Peters and X. Zuniga (Eds.), *Readings for diversity and social justice.* New York: Routledge.

UNIVERSITY FINANCING: SUSTAINABILITY, EFFICIENCY AND REDISTRIBUTION

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Abstract

Students across the globe employ a diverse array of financial mechanisms to fund their higher education: from grants to subsidies. Even within Europe, there is a significant variance in financing systems. For instance, the Nordic countries rely on a model of generous scholarships. Conversely, in the United Kingdom and the Netherlands, loan based financing is more prevalent. Meanwhile, nations such as Austria, France, and Spain, among others, exhibit less developed financial instruments –private or public– and have long used direct subsidies to educational institutions funded with general taxes. When the main part of university resources is publicly and directly provided, government budget cuts have a strong impact on the survival and quality of tertiary education institutions. In the face of an ageing population and large and increasing public deficits, we analyze whether a subsidized system of progressive Income Contingent Loans (ICL) is feasible in Spain, and how it would impact different strata of the population. We find that (i) our proposed structure is highly progressive under all specifications, with the top quarter of the distribution paying close to the full amount of the tuition and the bottom 10% paying almost no tuition; and (ii) the share of total university education subsidized by the government is between 16 and 56 percentage points less than under the current system.

Keywords: Income contingent loans, returnable fellowships, university quality, progressivity.

JEL classification: I22, I23, I24.

I. INTRODUCTION

Europe is going to face in the coming decades intense pressures on the fiscal outlooks of many countries. The continent is becoming older very fast, and that affects health and pensions' expenses. There will be also need for additional expenses toward a quick green transition, and defense because of external military threat. This will most likely create a threat to sustain a competitive higher education system, because in many OECD countries relies mostly on tax-financed subsidies, at a time when the digital transition will make it even more necessary for the citizens.

In addition, tuition fees are flat across the income distribution of students and the subsidy to institutions is financed with taxes from both college and non-college educated families, making the system regressive. This repressiveness might have been acceptable at a time when public funds were abundant. When that stop being true, the countries will need to study alternatives that circumvent the main issues of the current systems, such as graduate taxes or income contingent loans (see Diris and Ooghe, 2018).

In this paper, we focus on Income Contingent Loans, which offers flexibility in different dimensions and puts more weight on private resources while enhancing progressivity with respect to the prevailing system. This paper offers a general analysis of the economics of ICL, followed by an application to Spain.

In a nutshell, an ICL can be characterized as follows. University students obtain a loan from the government to pay their fees (this could also cover maintenance costs). Repayments start upon graduation and depend on ex-post labor income and are paid at zero or low interest rates. There is a minimum exemption income level below which graduates do not need to pay. Repayments are made for a certain number of years up to a maximum established. It is worth noticing that these loans are very different to traditional students' loans, which in general have no insurance aspect, payments are not dependent on actual income after graduation and market determined interest rates. To ease the introduction of this scheme, a natural starting point for the government would be to consider a zero interest rate, which is the baseline policy in our analysis. In this sense, a more appropriate name for this scheme is Returnable Fellowships.

We first offer a simple theoretical framework to understand how the general-tax-financed subsidies and the ICLs systems work, as well as their comparison from the government, the tax payers and the universities' points of view. This will allow us to understand government spending, subsidies in both systems and tax burdens in both systems. This simple framework allows to comprehend, among other things, why a general-tax-financed subsidies system is highly regressive, while terminating free universities would make the system more progressive. It would also become clear that moving from a general-tax-financed subsidies system to an ICL system would free public resources. We discuss the case in which these resources could be used for other public spending as well as the case that these could be used to increase university quality.

We will then offer a quantitative illustration of the implications of our model that uses real data to show how Spain could transit to a model more similar to the one currently used in the UK. For context, some figures of Spain in the OECD context are useful. Based on *Education at a Glance 2023,* Spain is at the tail regarding budget efforts towards tertiary education compared to other OECD countries. Indeed, in 2020, 2.1% of total government expenditure was spent on tertiary education, well below the OECD average (2.7%).

The evolution of expenditure has not been good either. In 2010 public university spending reached its peak, 0.94% of GDP. With the crisis this indicator went down, reaching 0.75%. It recovered only slightly afterward, to 0.87% in 2021, still far from pre-crisis levels. This is not surprising. Spain is suffering an extreme case of the European malaise of an ageing population, insufficient public finance, and early climate change effects.

But the need for education is still strong. According to Statista, the number of students enrolled at universities in Spain from the academic year 2008-2009 to 2022-2023 has increased 20% (reaching about 1.73 million students). But, interestingly, the number of students in private universities have been increasing steadily, and they are almost 3 times more in 2022-2023 than in 2008-2009. This seems a clear reaction from the citizens to the budget tightness in public institutions. Clearly, if one wants to prevent inequalities from growing even more, some reaction from the public sector is needed and ICL seems a possibly solution.

Another reason why a quantitative application to Spain is interesting has to do with and important challenge to the viability of ICL systems: the functioning of the labor market for university graduates. To the extent that the labor market features high unemployment rates for the youth and/or high incidence of temporary employment with low and unstable incomes, as in several European countries, a switch from a general-tax-financed subsidies system to an ICL system is non-obvious. Spain offers a particularly extreme example of these situations. In dysfunctional labor markets, the high volatility that characterizes flows in and out of temporary employment poses a challenge to expected future income and repayments.

In contrast to Spain, the United Kingdom (UK) has been working on increasing university resources through a series of reforms implemented during the last two decades. Among other countries in Europe, the UK was one of the precursors in designing a progressive loan system subsidized by the government to finance higher education. The UK has undergone three main reforms during the last 20 years[1] that included increasing fees and designing an income-contingent-loan system. While it is still relatively early to evaluate the long-run effects, the evidence so far reveals that the system has been working reasonably well in the UK, especially in its progressive nature (Dearden *et al.,* 2008; Azmat and Simion, 2017). Our reference application is to study how a loan system similar to that in the UK 2007 reform would work to finance higher education in Spain and study the distributional implications for lifetime income, the burden of repayments on workers, and the cost to the government.

A common feature of countries with the prevailing financing system is the lack of credit markets for university loans. Beyond the extensive participation margin, which is outside the scope of this paper,[2] the availability of borrowing against future human capital can determine the earnings distribution of the skilled workers by improving the allocation of talent. An example relevant to a case like Spain would be geographical mobility.

Indeed, the main objective of this study is to set up a *loans laboratory* to explore different loan policies and the effects along the income distribution. As mentioned above, one challenge of this exercise will be adding the specifics of the dysfunctional labor market in Spain. In this sense, unlike previous literature, a contribution of this paper is to model permanent and temporary contracts separately.

There is a substantive literature on university funding (see for instance García-Peñalosa and Walde (2000), Diris and Ooghe (2018) and references within) and several studies have looked into university financing in Spain.[3] Of those, very few have analyzed alternative arrangements to the general-tax-financed status quo. The analysis of the impact of education loans in Spain has been limited to one paper, which focuses on the specific case of loans-to master's that was implemented in 2007 and lasted only until 2011 (see Collado

[1] In 1998, 2007 and 2012.

[2] Azmat and Simion (2017) show that in the UK the increase in university fees together with the introduction of ICL did not affect the participation margin. Related, de Silva (2023) shows, in the context of Australia's ICL structure, that there are some labor supply responses to lower payments but are too small compared to the welfare gains from this repayment structure.

[3] See, among others, de la Fuente and Jimeno (2011); Beneito *et al.* (2016); Mora *et al.* (2002); Escardibul and Perez-Esparrells (2014).

Muñoz *et al.,* 2017).[4] For a complementary review of the university financing literature and institutional framework (see Montalbán Castilla, 2019).

The literature does not find concluding evidence to indicate that the level of enrollment fees alone has a clear effect on a greater access or more equitable access (such as for example in individuals from more disadvantaged contexts). Dynarski (2003) analyses the effect of a subsid removal in the access to university, which was granted during 1965-1982 to the children of dead, retired or disabled parents. The results show that access rates decreased very significantly (almost one third) for the children with a dead parent while for the other categories the decrease was very insignificant. Since the children of retired or disabled people can still be helped by their parents, the result reinforces the idea of that inefficiencies in the credit market prevent the access to university for students without resources. Joensen and Mattana (2021) explore the Swedish reform in 2001 which changed the financial aid system in several dimensions: scholarships increased, the tax income at the end of studies was reduced and the initial conditions to obtain a loan and the repayment system changed as well. They conclude that a mixed scholarship-loan system does not affect the student behavior when there is a greater weight on loans.

A fundamental element in our loan laboratory are the dynamics of earnings over life. In our analysis, we use simulated lifetime earnings of graduates matching the dynamics of employment and earnings, as well as the earnings cross-sectional distribution, in the Spanish administrative social security data (*Muestra Continua de Vidas Laborales* y el *Módulo Fiscal*). Employment transition probabilities are modeled using probit regressions on a set of covariates, including past income and contract duration.

Our framework can replicate the dynamics of employment and earnings in Spain. We use the simulated profiles to calculate the burden of introducing public loans for individuals at different points of the earnings distribution and for the government under different combinations of the afore mentioned parameters. We find that (i) our proposed structure is highly progressive under all specifications, with the top quarter of the distribution paying close to the full amount of the tuition and the bottom 10% paying almost no tuition; and (ii) the share of total university education subsidized by the government is between 16 and 56 percentage points less than under the current system.

[4] The loans-to-master's program did not prove to be very successful, partly due to the lack of consistency of the conditions (interest rate, repayment horizon, and the like) across years. There was also a grace period stipulated independently of the income level and a monthly fixed repayment, which imposed a heavy burden to graduates at the lower end of the income distribution.

II. INSTITUTIONAL FRAMEWORK AND INTERNATIONAL COMPARISONS

The OECD (2014) classifies the countries into four financing models in university, depending on two factors: the level of tuition fees and financial aid available through the national aid system for students enrolled in tertiary education programs.[5] Next, we briefly describe these models.

Model 1: Countries with low or without tuition fees and generous support systems for students

The countries that are included in this model are typically Nordic countries, namely, Denmark, Finland, Iceland, Norway and Sweden. These countries have a more progressive tax structure and students do not pay tuition fees, while they benefit from very generous aid systems. However, individuals have to pay very high taxes. For example, in these countries, more than 55% of students benefit from public scholarships, public loans or a combination of the two (Tables B5.1 B5.2 and figure B5.1 in *Education at a Glance 2014*). Besides, the average rate of access (which represent the percentage of an age cohort entering an education program throughout its life) to type A tertiary education is 74%, well above the OECD average (59%).

The mentality that the government should provide its citizens free access to tertiary education is a prominent feature of the culture of education in these countries: the financing of institutions and students are based on the principle that access to tertiary education is a right, and not a privilege. In addition, aid to students allow them to study anywhere in the world country they want, which, it is very beneficial for the competition, and therefore the quality of universities. However, in recent years, Sweden and Denmark (as of 2011) introduced tuition fees for international students to increase resources available to university institutions. Iceland also considered it. The risk is that this measure could stop the flow of university students to these countries. In fact, in Sweden, the number of international students has been reduced since this reform was implemented: between the fall of 2010 and the fall of 2011, the number of students who came from outside of the European Economic Area and Switzerland fell by almost 80%.

[5] In the OECD report, tertiary education is defined as tertiary education programs type A, which corresponds to the ISCED 5A category of the classification international education ISCED. This level educational corresponds to theoretical programs designed to provide sufficient training to facilitate access to advanced research programs and professions that require special skills, such as medicine, stomatology or architecture. They last like minimum 3 years full time, but most last 4 years or more. These programs are not offered exclusively in universities; and not all programs nationally recognized as university programs can fall into this category. Programs of Type A tertiary education also includes masters from United States.

Finally, in these countries, families do not have tax deductions nor specific aid that can cover expenses of housing, transportation or any other type of associated cost to the student. In these countries, the student is considered as an individual, and is the same individual the one who receives the help.

Model 2: Countries with high enrollment rates and developed aid systems for students

The second group includes Australia, Canada, Netherlands, New Zealand, the United Kingdom and the United States. In these countries there are potential high financial obstacles for access to tertiary education, but at the same time offer significant public support to the students. The rate of access to tertiary education for the countries in this group is 75%, significantly above the average of the OECD and higher than most countries with low tuition fees (except Nordic countries). In these countries, private entities (*e.g.* private companies and non-profit organizations) are the ones that contribute the most to the financing of the tertiary institutions. Therefore, in these countries, the cost of education is distributed between the government, individuals and private companies (Figure B3.2 and Table B3.1 in *Education at a Glance 2014*).

Enrollment rates in tertiary education in these countries exceed $1,500, but more than 75% of university students receive public aid (in Australia, the Netherlands, New Zealand, the United Kingdom and the United States, Tables B5.1 and B5.2 in *Education at a Glance 2014*). The proportion of public spending on tertiary education that is dedicated to public aid in these countries it is higher than the average of the OECD (22%) in 5 of the 6 countries in this group: Australia (35%), Netherlands (29%), New Zealand (48%), the United Kingdom (74%) and the United States (29%). Likewise, the access rate to tertiary education in this group of countries it is above average of the OECD. For example, Australia and New Zealand have one of the highest access rates in education tertiary (96% and 79%, respectively, although these rates also include the high proportion of international students enrolled at this level of education).

Model 3: Countries with high enrollment rates and less developed aid systems for students

In Chile, Japan and Korea, the majority of students have to pay high tuition fees (on average, more than US dollars 4,500), but the support system students are less developed than in countries in Models 1 and 2. Access rates are below the OECD average in Chile (45%) and Japan (52%), but significantly above in Korea (69%). In Japan and Korea, some students who excel academically but have difficulties economic to finance their studies can benefit from admission and/or registration fees reduced or receive a complete exemption. Japan and Korea are among the countries with the lowest level of public spending allocated to tertiary education as a percentage of GDP (Table B4.1 in *Education at a Glance 2014*). This partially explains the low proportion of students who benefit from public loans. However, recently both countries have implemented reforms to improve their aid systems to help students.

Model 4: Countries with low enrollment rates and less developed aid systems for students

This fourth group includes the rest of European countries (Austria, Belgium, Czech Republic, France, Ireland, Italy, Poland, Portugal, Switzerland and Spain) and Mexico. In all these countries it is charged moderate tuition fees compared to those of Models 2 and 3. In these countries, to access tertiary education, financial barriers are relatively low (in Ireland and Mexico there are no tuition fees) and, financial aid to students is very low and intended for specific groups of students. Tuition fees charged by public universities in these countries do not exceed $1,300 US dollars, and, in countries where data is available, less than 40% of students benefit from public aid (Tables B5.1 and B5.2 in *Education at a Glance 2014*).

In the countries of this group, tertiary institutions depend heavily on the funding situation and levels of participation in tertiary education are normally below OECD average. The average rate of access to tertiary type A education is relatively low, of a 56%. Furthermore, spending per student in tertiary type A is also low (Figure B5.2 and Indicator B1 in *Education at a Glance 2014*).

While high tuition fees could be a potential barrier to access to university the experience of the countries in this model suggests that low tuition rates do not necessarily guarantee greater access. Furthermore, the absence of aid for students makes mobility difficult, which is why university students do not abandon the family home. Apart from the consequences of this fact for personal development, the least competition by students reduces incentives of universities to improve the quality of services that they provide.

A possible solution to the problem highlighted in the Figure above is that students and their families can benefit from the help provided by other institutions other than the ministry of education (for example, accommodation subsidies, discounts on taxes and/or credits for studies). In France, rental subsidies (housing allowances) represent approximately 90% of the scholarships, and close one third of students benefit from them. Poland stands out for the fact that studies of the majority of students enrolled in a full-time program are subsidized entirely by the state, while part-time students pay all tuition costs. In a well-defined sense, this makes countries like France or Poland *de facto* look very similar to the Model 1 countries. In the countries of this group, there are no public loans or loans guaranteed by the state, or in case available, they are aimed at a small proportion of students from that country (Table B5.2 in *Education at a Glance 2014*).

Another country is worth mentioning within this international comparison is Uruguay (we will refer to this case later), with low tuition fees and a scholarship system for tertiary students. Indeed, in 1994, the Solidarity Fund (FS) was created with the objective of financing a scholarship system for low-income students at public universities. The system is based on the concept of intergenerational solidarity: graduates of the public tertiary system are the ones who contribute to the financing of the FS. This contribution is made based on the curricular duration of the degree and does not depend on the taxpayers' ability to pay (Doneschi *et al.,* 2014).[6]

1. The viability of a new model for Europe

As we mentioned in the introduction, many countries are already experiencing severe budgetary pressures. The challenges arising from demographic transitions are likely to exacerbate those problems, or to create them in countries that have been exempt from them so far. We have documented in this section that higher education is, in many countries, heavily subsidized by the state. One way to alleviate those budgetary pressures is to transfer more of the cost of higher education onto the students. This is reasonable because they reap a substantial part of the benefits. Doing it via loans or graduate taxes is a good way to achieve this, while taking care of equity issues arising from the imperfect functioning of credit markets.

But the details have to be considered carefully. For example, in many European countries, young graduates may spend a substantial part of their early working life in short-term labor relationships with small wages. This could make a loan system financially unsustainable.

Since there have been no good natural experiments in countries with those characteristics, we propose to study this problem with a quantitative experiment. We first propose a model where graduates become workers with realistic dynamic career paths, and they have to repay their costs of education with a fraction of their salary. Then we choose parameters of the model so the career trajectories match closely those observed in the data. This allows us later to estimate the impact and viability of different loan systems.

6 More information about the system, available at: https://www.fondodesolidaridad.edu.uy/

As mentioned, we will illustrate our exercise using Spain, a relevant country in model 4 above, moving towards a system like the UK, a country in model 2 above.

III. AGGREGATE AND DISTRIBUTIONAL IMPLICATIONS OF UNIVERSITY FINANCING: A CONCEPTUAL FRAMEWORK

In this Section, we introduce a simple framework to understand the changes from moving from models 4 to 2 explained in section II; in other words, how ICLs affect government and university budgets, as well as on the implied cost for families. We begin by laying out a generic setup in which the government, universities, and individuals interact with each other. We then use that setup to compare different higher-education financing schemes along aggregate and distributional measures. We do this in words in the main body of the paper, in the Appendix A we become more formal in our treatment of the problem.

1. A Simple Theoretical Framework

Three types of agents compose our economy: the government, the public university sector, and workers.[7] While the earnings dynamics of the workers play a central role, the policy will be evaluated in terms of present values.

Workers

There are two kinds of workers: skilled and unskilled. Skilled workers are those who have finished college. All individuals live for a finite number of periods: the first period corresponds to the 4 years of college for the skilled agents.

Resources. Within each group, workers are heterogeneous in their earnings. These earnings are exogenous and evolve in a stochastic fashion. The specific dynamics of earnings will be discussed in detail in the next section. For this section, it suffices to assume that the average skilled earnings are higher than the average unskilled earnings at all times. Unskilled workers begin receiving earnings in the first period, while skilled workers have to wait until the second one to receive wages. Depending on the specific financing scheme, skilled workers can receive transfers from the government during the schooling years,

[7] We abstract from unemployed individuals for the moment since the relevant burden measures are not affected by their presence. In the empirical section, workers will be allowed to become unemployed.

in the form of grants or loans to cover fees and maintenance. We assume these transfers are the same for all university graduates. Similarly, unskilled workers can receive transfers from the pool of public resources that are not devoted to financing higher education.

Expenses. All workers pay income taxes. We assume workers in the same group face the same proportional income tax and that is higher for the skilled than the unskilled, which captures the progressive nature of the tax code in a simplified manner. In addition, skilled workers' expenses include college fees whenever they are in college and loan repayments whenever applicable. Workers eat everything left after covering fees, loan, and tax payments.

Government

Resources. The only public resources are the income taxes paid by the workers.

Expenses. Total public spending is decomposed into two components: public spending devoted to financing public higher education and other public spending. It will be useful to further decompose the amount of government spending in education into payments directly made to institutions and transfers to households. We assume the government runs a balanced budget.

Given our assumption that income taxes are proportional to earnings, we can also decompose the resources into those that are used for higher education and those that are not, thus constructing artificial taxes that will depend on the actual income tax rate and the specific higher education financing scheme. This accounting distinction will be useful to define the burden of public financing on individuals.

University Sector

Resources. Public universities get funding from the government as well as out of pocket fees paid for by the individuals directly.

Expenses. Universities need a minimum payment of resources in the form of running costs. They include current professor salaries, maintenance, and the like. In addition, universities could shift extra resources to improve quality. We assume there is a basic level of quality achieved by simply running the university. Higher investment in quality will result in skilled earnings that are higher.

2. Aggregate and Distributional Implications of Different Financing Schemes

Using this framework, we next proceed to introduce the specifics of different higher-education financing systems. We consider three alternative schemes: the general-tax-financed subsidies (*i.e.,* prevailing system in countries in model 4), an intermediate case of a graduate income tax, and finally the ICLs in more detail (*i.e.,* the prevailing system in countries in model 2). For illustration, we will make the following assumptions when comparing the different systems: (1) We keep quality at its base level. (2) The total cost of universities is fixed. (3) Total public spending is fixed and the budget of the government is balanced, so the resources are fixed as well. (4) We take the earnings streams as given. Assumptions (3) and (4) also impose fixed total income taxes. These assumptions mean we will be evaluating the impact of revenue neutral policy changes in terms of burden shifts between agents.

We next compare each financing scheme along three dimensions: (i) the cost born by public and private agents; (ii) between-group progressivity; or the extent to which these shift the cost of higher education to skilled and away from unskilled workers; and (iii) within-group progressivity, referring to redistribution across the income distribution of future university graduates.

More specifically, the different financing systems are going to be compared in terms of how they shift the total cost of higher education between the public and private sector, how much of the public burden is paid by non-university graduates, and the degree of redistribution within university graduates. Whenever comparing systems, to clearly differentiate the different variables corresponding to each scheme, we define the level of fees, taxes to finance education, and remaining taxes, under each system GTF, GT, ICL.

2.1. General-Tax-Financed Subsidies

We begin by discussing the system in model 4 using as example the details currently in Spain, in which university resources come predominantly from direct subsidies from the government, covering around 80% of the total cost of universities. The remaining 20% is paid for by the users at the time of paying tuition. This is also the prevalent system in most Europe.[8] The public subsidies are financed similarly to any public service using general taxes, hence its name. While the government offers some grants and fellowships to students, they

[8] Countries such as England and The Netherlands have transitioned to an ICL scheme, but the majority of the European countries still maintain this system.

are very small, and the big part of the subsidy comes from the direct transfers to institutions. For illustrative purposes, we will assume public transfers to individuals for the purpose of paying for higher education are zero.

Therefore, the total cost of higher education is split between the government and the university-graduates. In other words, everybody, independently of whether they attended university or not, contributes to university resources through the general income tax. In addition to their share of income taxes, skilled workers pay the full amount of fees for attending university, which is the same for all university-graduates.

2.2. Graduate Tax

Before moving on to our proposed ICL policy, it is worth discussing the case of the graduate tax. This type of system is used by some public universities in Uruguay. A graduate tax consists of shifting the total cost of higher education entirely to those that benefit from it through deferred payments in the form of a tax upon graduation and until retirement.

In that sense, the total cost of higher education is financed entirely by the university-graduates through an income tax (in addition to the regular income tax), without upfront or tuition payments. We can think of this as the government paying for the cost initially and then recovering the full amount in the future, so that, in present value there is no subsidy. A consequence of this system is that income taxes of the unskilled workers are never used to subsidy higher education. In addition to their share of income taxes, skilled workers pay the graduate tax. Notice that this amount is again the same for all university-graduates.

2.3. Income Contingent Loans

We propose an income contingent loan (ICL) system. ICLs have become a popular alternative to general-tax-financed (GTF) subsidies among developed countries that is, moving from models 4 to 2 explained in section II.[9] This system is in spirit similar to the Graduate-Tax, but its structure is more complex and flexible, allowing for varying degrees of cost shifting, as will become clear in the subsequent discussion. The key feature of ICLs is the combination of private contributions, in the form of repayments contingent to future income; and

[9] In Europe, Hungary, the Netherlands, and the United Kingdom adopted ICLs in the last decade (see Diris and Ooghe, 2018). Outside Europe, Australia and New Zealand have been pioneers of this scheme.

government subsidies, given directly to the individuals in the form of debt write-off and repayment exemptions.

For the purpose of this description, we will focus on the extreme case where the fees cover the total cost of education in present terms, which makes it comparable to the GT case discussed above. We will briefly comment on intermediate cases in the discussion below. We begin by introducing the elements that characterize the loans and repayments and then proceed to discuss the implied burdens.

3. A Rich Set of Instruments

An attractive feature of ICLs is the flexibility in its design compared to other progressive financing alternatives, such as a graduate tax. A rich number of instruments are combined to achieve varying degrees of public savings and progressivity:

- Principal: total tuition fees overall years + maintenance (maybe).
- Repayment rate: fraction of gross earnings that is used for repayment.
- Exemption level above which workers start repaying debt.
- Write-off year after which the debt is canceled.
- Interest rate of debt.

University students obtain a loan from the government during schooling years to pay their fees and, possibly, room and board. Repayments start upon graduation and are a fraction of ex-post labor income and are paid at low interest rates. There is a minimum exemption income level below which graduates do not need to pay. Repayments are made for a certain number of years up to a maximum established. Because of the nature of this repayment scheme, it will be useful to adopt a life-cycle perspective and think of a period as an age year.

3.1. Comparing the Three Systems

Next, we will use all the information in subsections 2.1., 2.2 and 2.3 to summarize the distributional implications of each system in two results.[10]

[10] Detailed calculations can be found in our previous work Cabrales *et al.* (2020).

Result 1: Between-group progressivity (the ratio of the burden for non-university- and university-graduates) is highest (lowest) under the GT system and provided a minimum level of debt repayment under ICL, lowest (highest) under GTF.

Result 2: Within-group progressivity (redistribution between university graduates) is zero under GTF and GT, beyond the progressivity of the income tax code.

We conclude this section by discussing both the importance of the combination of the between-group and within-group progressivity's in each system. To make our point, we take the extreme case of the US higher education system, where fees cover the total cost and commercial banks offer classic loans. As mentioned in the introduction, these traditional loans are very different to income contingent loans as repayments are not a function of future income nor they allow for write-offs or exemptions. Moreover, these traditional loans are repaid at the market rate. In this sense, as mentioned before, our proposed system resembles more a scheme of *Returnable Fellowships,* provided a zero interest rate, which is our baseline scenario. This system does feature total between-group progressivity, similarly to the GT, but they do not have any progressivity component within the university graduates. Actually, within-progressivity tends to be negative because higher earning graduates repay their loan faster and thus paying less in terms of accumulated interests than the lower earning graduates, who end up accumulating large amounts of debt over time. This example highlights the importance of considering both kinds of redistributions and, while this case is more extreme, is reminiscent of the case of the GT, where the within-group component is not negative, but it is close to zero. In this sense, the ICL offers a balanced combination of both between and within progressivity through a rich set of instruments.

In the rest of the paper, we analyze the distributional implications of introducing ICLs to Spain. In other words, the degree of within-progressivity of different specifications of ICLs. In order to do so, we first need to simulate the life-cycle earnings of graduates using a model of earnings dynamics and employment transitions. We do so in the next section.

IV. SIMULATING LIFE-CYCLE EARNINGS DYNAMICS: PROJECTIONS USING SOCIAL SECURITY DATA

Having established the theoretical grounds of the different financing systems, we next simulate a panel of individual incomes over working ages to evaluate the aggregate and distributional measures of each system. We use estimate a model of employment transitions and earnings dynamics using social security and tax records for Spain.

1. The Data: Social Security and Tax Records

We use administrative data from the Continuous Sample of Working Histories (MCVL hereafter, for its acronym in Spanish) on earnings and working histories of Spanish workers. The data is provided by the Spanish Social Security Administration in cooperation with the IRS counterpart in Spain. In this section we give an overview of the data source and a description of our sample. For the database specifics and more details, we refer to Section II in Bonhomme and Hospido (2013).

The MCVL consists of a 4% representative random sample of all workers affiliated with the social security administration within a given year between 2004 and 2015. We use data starting in 2005, when the sample has a panel design: all individuals present in each wave subsequently remain in the sample. Retroactive information on the whole working history is provided as early as 1962 for work variables and 1980 for earnings. Bonhomme and Hospido (2013) show that the sample is representative at least since the late 1980s. The information from the Social Security records can be obtained at a daily frequency, but earnings are often top-coded at a preset industry-specific threshold. We complement the earnings data with an IRS supplement matched to the Social Security records. The tax supplement contains non-top-coded information on annual earnings. Our baseline frequency will therefore be annual. We select college graduates that are at least 22 and at most 60 years old.

The *earnings* data are extracted from the "Annual summary of retentions and payments for the personal income tax on earnings, economic activities, awards, and income imputations" (known as Modelo 190). All employers are required to fill out Modelo 190 with the total compensation paid to each of their employees during the year, independently of whether or not they pay labor income taxes. To obtain a measure of total annual labor earnings, we add all the incomes that correspond to each worker during the reference year. All amounts are deflated to 2011 euros. We exclude self-employment income. Using the longitudinal dimension of the data, we calculate *lifetime earnings* for every individual assuming no discount rate. This in turn determines in which quantile of the lifetime earnings distribution every individual is. We group individuals according to this variable to understand progressivity in our loan laboratory. Given the annual nature of the earnings data, we define *employment status* in terms of share of annual time spent in each kind of job: permanent, temporary, or none. Workers who have zero annual earnings or earn less that the corresponding amount to a month minimum-wage salary are considered unemployed.

2. Estimating Earnings Dynamics

We adapt the framework of Dearden *et al.* (2008) based on England for the Spanish labor market. A key contribution of this paper is to allow for differentiated levels of labor market attachments to capture realistic job transitions in two-tier markets, as it is the case in Spain. At each point in time, a worker can be in one of three statuses: unemployed (U), employed in a permanent contract (P), and employed in a temporary contract (T). Workers can switch status following a transition matrix with probabilities of entering status s_t from status s_{t-1}, for all statuses. We estimate[11] these transitions using probit regressions by regressing a dummy variable that takes 1 in the case of a transition on a constant, a quartic in age, and additional covariates depending on the type of the transition.

At the beginning of an employment spell within a contract, each worker draws a level of earnings determined by its previous status and age. Whenever the worker changes status, we estimate the new initial earnings as a function of age, duration of previous spell, and earnings in the last contract before the change. If the past status is unemployment, last earnings is replaced by a dummy that equals 1 if the unemployment spell is no longer than a year and 2 the unemployment spell is longer than a year, and 0 otherwise.

If the worker remains in the same job status, earnings follow a flexible age-dependent autoregressive process. The basic statistical framework follows Karahan and Ozkan (2013) and emphasizes the age dynamics of persistence and volatility of earnings. In particular, we allow for the type of contract –temporary or permanent– to influence uncertainty and earnings dynamics in general. In a nutshell, continuation earnings follow an ARMA(1,1) stochastic process with fixed effects and profile heterogeneity. To capture the evolution of uncertainty over life, the persistence of the AR(1) component and the variance of both idiosyncratic shocks are functions of age and contract.

We introduce contract-specific uncertainty by separately estimating the process for a sample of workers that have spent most of their life linking temporary contracts. The idea is to capture that continuation within temporary contracts entails more uncertain earnings than continuation within permanent contracts. This differentiation is important in the case of a

[11] The estimation is performed separately for female and male college graduates.

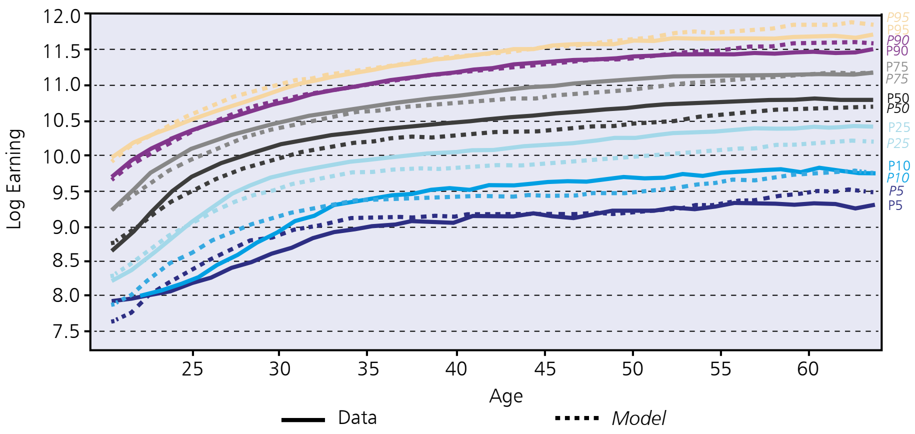
segmented labor market like the Spanish case. The parameters are estimated by minimizing the distance between the empirical and the model-implied covariance matrix using Generalized Method of Moments with efficient weighting matrix. More details on the estimation procedure can be found in Cabrales *et al.* (2020).

3. Earnings Distribution and Simulation Fit

We combine the employment transitions and earnings dynamics estimates to simulate the earnings of 20,000 individuals between the ages of 22 and 60. Figure 1 compares the data (solid) and the simulated (dashed) cross-sectional distribution of earnings at each age. More specifically, Figure 1 plots different percentiles of the earnings distribution, for a given age, and therefore characterizes the evolution of the cross-sectional distribution of earnings for the purpose of comparing the fit to the data. Overall, our statistical model does a good job matching the distribution of earnings at all ages.

FIGURE 1

QUANTILES OF LOG EARNINGS: DATA (SOLID) VS. SIMULATION (DASHED)



Source: Own elaboration based on *MCVL*

V. INCOME CONTINGENT LOANS: A LABORATORY

We next use the panel of simulated lifetime income profiles $\left\{\left\{Y_{i,a}\right\}_{a=22}^{60}\right\}_{i=1}^{N}$ to study the implications of introducing a menu of public income-contingent loans in Spain. Remember the basics of our model: fees can be deferred until starting to work, repayments will depend on ex-post labor income and minimum exemption, and there will be a debt write-off and low interest rates.

We start describing the current general-tax-financed subsidies in Spain in the next subsection. Then, in subsection 2, we consider several policy experiments modifying the different parameters of the ICLs. The advantage of setting up such laboratory is that we start with our baseline case which illustrates the case of the UK as of 2007. And then we change different parameters to understand how ICLs would work in Spain.

1. Current Subsidies in Spain

The current university financing system in Spain is basically characterized mostly by subsidies to universities coming from general income taxes. The following are the key figures of the current costs and subsidies in Spain (see de la Fuente and Boscá, 2014). For 2010, average total expenditure by the government across different universities and programs in Spain is around 8, 900 million euros. That year, households spent around 2,600 million euros in higher education. This means that the share of public resources in public education in Spain, or the subsidy defined in equation [6] below, is around 80%. We will use this benchmark in our policy experiments in the next subsection.

2. Policy Experiments

For each of the parameters defined in Section III, subsection 2, we evaluate different sets of values that can be thought of as reflecting different fiscal scenarios and/or political preferences. For every policy experiment, we will show the following outcomes:

- Burden of the cost of education: As explained in our theoretical framework, the burden of the cost of education is the sum of taxes paid that finance education as well as the repayment of loans in the case of ICLs; or the fees in the case of GTF (see equations [20] and [22], respectively). In terms of the within-group progressivity that each financing system generates, the key lies in the repayments and fees rather than the taxes. We therefore consider two measures of the burden, with and without the taxes. In this quantitative section of the paper, we introduce time discounting denoted as . The corresponding individual burden in each system, that is, net present discounted value of all repayments: is:

$$NPV_i\left(ICL\right) \quad = \sum_{a=1}^{\bar{a}} \beta^a P_{i,a} \tag{1}$$

$$NPV_i^{total}\left(ICL\right) \; = \sum_{a=1}^{\bar{a}} \beta^a P_{i,a} + \sum_{a=1}^{T} \beta^a \underbrace{\tau_e^s(ICL)}_{\frac{G^E}{\bar{G}}\bar{\tau}^s} y_{i,a} \tag{2}$$

$$NPV_i\left(GTF\right) \quad = f \tag{3}$$

$$NPV_i^{total}\left(GTF\right) = f + \sum_{a=1}^{T} \beta^a \underbrace{\tau_e^s(GTF)}_{\frac{G^E}{\bar{G}}\bar{\tau}^s} y_{i,a} \tag{4}$$

- Public subsidy, as defined by share of higher education financed with public resources. We find the share more appropriate for the empirical section than the that we used in Section 3 given that the total aggregate amounts will be sensitive to the specifics of the simulation.

$$Sub\left(ICL\right) \equiv \frac{G^E}{\bar{C}} = \frac{\bar{C} - \int_{i \in S} \Sigma_a^{\bar{a}_i} \beta^a P_{i,a}}{n} \tag{5}$$

$$Sub\left(GTF\right) \equiv \frac{G^E}{\bar{C}} = \frac{\bar{C} - F\left(GTF\right)}{\bar{C}} \tag{6}$$

In addition, for the case of the ICL, we define an individual counterpart of equation [5] in order to capture the distributional differences implied by the repayments structure. The share of the total cost for the university-graduates not repaid by individual is defined as:

$$Sub_i = \frac{d - \Sigma_a^{\bar{a}_i} \beta^a P_{i,a}}{d} \tag{7}$$

- Repayment year, as defined by equation [14].

In what follows, we present the individual measures in equations [1] to [7] aggregated by percentiles of the lifetime income distribution, and the aggregate ones in equations [5] and [6] as reference flat lines. We will display these outcomes in three different Figures. In all experiments shown, we assume time discounting is equal to β = 0.978, which corresponds to a discounting interest rate of 2.2%.[12]

[12] Following Dearden *et al.* (2008), we set $\beta = 1/1 + dr$, where dr is the discounting interest rate, set to 2.2% to approximate the interest rate the government faces when borrowing.

Baseline (UK)

We start with our baseline scenario which follows broadly the 2007 UK reform that established a loan system to finance higher education.

In particular, we set:

d =21,000 euros

r = 0%

p = 10% annual earnings

x = 15,000 euros

m = 25 years

A level of debt of 21,000 euros is close to the current cost for the government of degrees that last 3 years in Spain. We assume for now that the loan interest rate is 0% (*i.e.,* a returnable fellowship) and that the repayment rate is 10%. There is an exemption income level at 15,000 euros. This means that university graduates pay 10% of their earnings once income is above 15,000 euros. Finally, the debt write-off is such that there is a maximum of 25 years of repayment. If after 25 years the loan has not been fully returned, then the university graduate does not need to pay any more.

First, we display the *net present value of repayments* in the top Figure in Figure 2 with and without the taxes paid to finance general education. Let's focus first on the ICL repayments. As expected, the NPV of repayments (without taxes) is an increasing and concave function of income, with the lowest percentile paying around 1,000 euros in total, while the median pays around 13,000 euros and the top percentile pays near 18,000 euros. Notice that there is a subsidy for everyone, including the lifetime-richest. This is due to an *interest rate subsidy,* or the presence of time discounting when interest rates are 0. The repayment with taxes displays a similar profile, which is shifted upwards for all income levels. Note that the shift is a bit higher the higher the income reflecting the nature of the progressive income tax.[13] This shows that the bulk of the progressivity in the ICLs comes from the repayments to the debt rather than income taxes devoted to higher education. We next look at the profile for GTF. The NPV of repayments without taxes are simply the university fees which are flat. The NPV of repayments with taxes show a slight disproportionate increase for the richest, which shows that the only source of progressivity in

[13] To mimic the Spanish tax code, we have proxied income taxes with a step function with 5 income thresholds.

the GTF system is inherited from the progressivity of the income tax. Besides being overall smaller, the rate at which it increases with the level of income is very slow, indicating that the flatness of the fees dominates for most of the distribution. Overall, we confirm result 3, that the bulk of the progressivity of the ICLs comes from the repayments without taxes. In the next ICL experiments we will therefore concentrate on the NPV if repayments without taxes.

Next, we display the *public subsidy* in the bottom panel in Figure 2. The solid line is the subsidy coming from the ICLs by income levels. As expected, it is decreasing in lifetime income, as the higher-percentile workers are able to repay a larger amount of the loan. The two flat lines correspond to the average (or aggregate, given that the size of the population is normalized). It is clear to see that the average subsidy after introducing the ICLs (dashed line) is about half of the current subsidy under GTF (dotted blue line), which, as already pointed out, is around 80%.

Finally, we display the *years to repay the loan* since graduation in the middle panel in Figure 2. This indicator is useful to understand the individual burden from a different point of view. As expected, it is decreasing with income. Overall, the range of years we observe for this baseline case ranges from 25 years to 15 years and only the bottom 17% is unable to repay its debt.

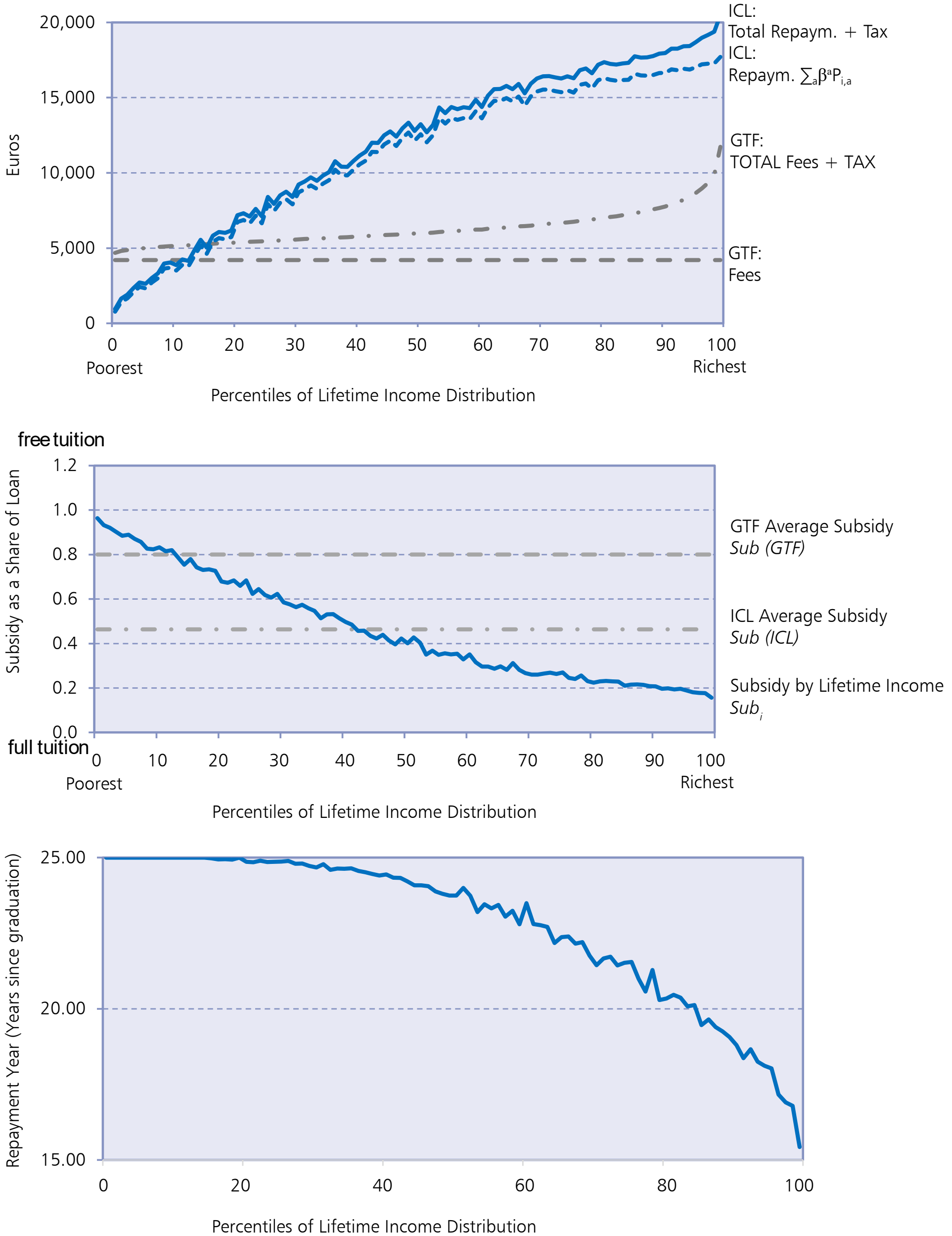
In the following subsection we consider different levels of debt, exemption levels, debt write-off years, repayment rates, as well as different loan interest rates. For each case, we vary one parameter at a time, leaving the remaining values fixed at the baseline level.

2.1. The impact of the total amount of debt (fees)

In this subsection, we consider five different levels of debt, keeping everything else constant. Different levels of debt can be thought of as different levels of fees and/or allowing for the loan to cover maintenance costs and room and board. See Cabrales *et al.* (2020) for a discussion on the case where the additional resources are used to improve the quality of tertiary education. The different levels of debt considered are: (i) 5,000 euros, which is close to the current level of total fees for a degree; (ii) 21,000 euros, which is our baseline and is close to the current level of total cost; and (iii) 40,000 euros, which can be thought of as a loan that covers fees and maintenance. We also consider intermediate cases of 10,000 euros and 30,000 euros, but, for ease of exposition, we highlight the former three in Figure 3 (the others are included with a light grey color).

FIGURE 2

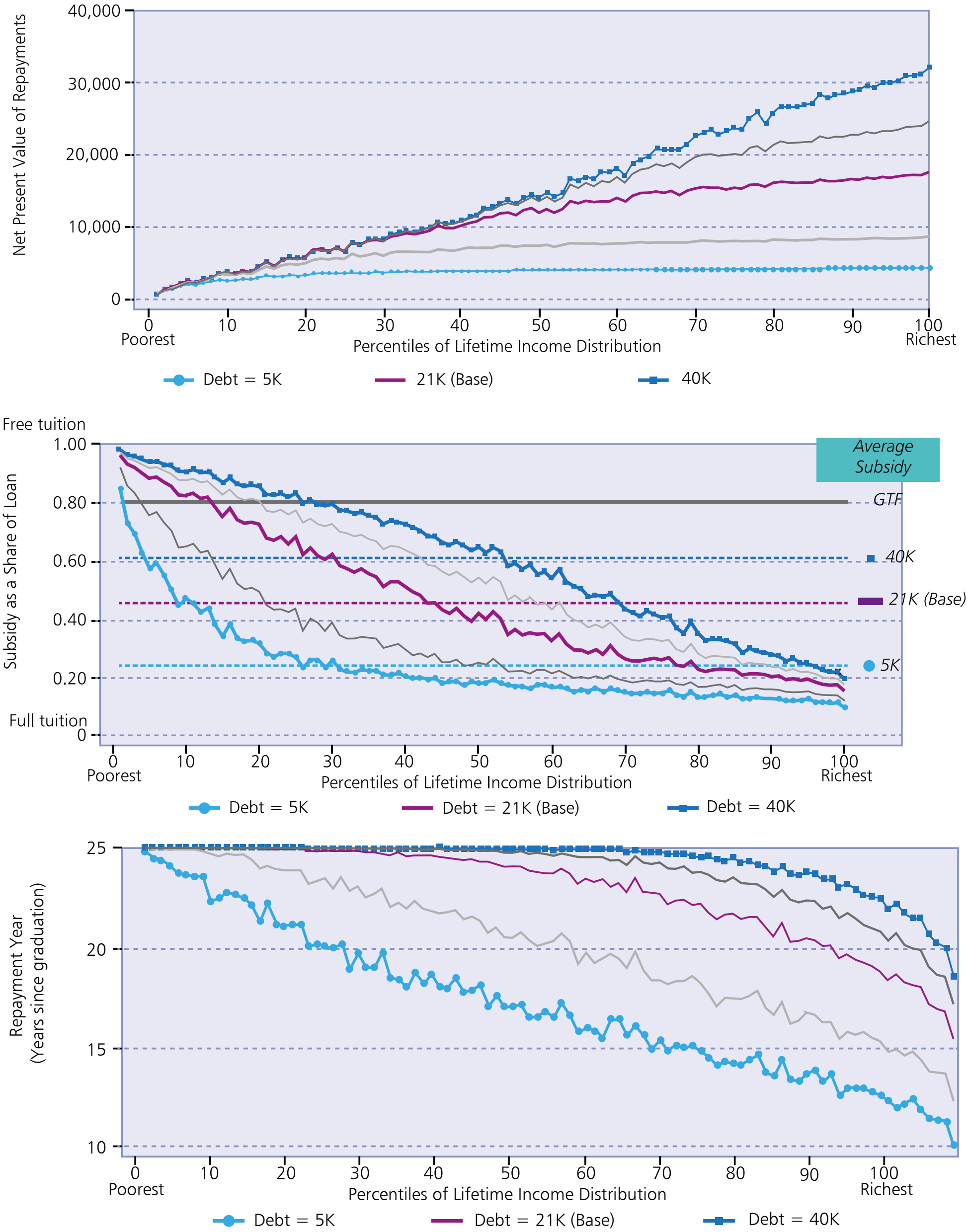
BASELINE



Source: Own elaboration based on MCVL

FIGURE 3

DIFFERENT DEBT LEVELS (ADD HERE)



Source: Own elaboration based on *MCVL*

The main finding from this experiment is that the NPV of repayments, the repayment years and the subsidy all follow similar patterns along the income distribution for the different levels of debt. As expected, we find that the repayments, the number of years to repay and the subsidy are increasing with the level of debt (given that the repayment rate is constant).

2.2. The impact of other policy instruments and robustness

We further explore sensitivity to varying other policy instruments in the ICL scheme. Table 1 summarizes the effects of the different policy experiments, including the change in the size of the loan described above. Columns 1 to 3 indicate the case being considered. Column 4 displays the average subsidy for the total population, that was represented as a flat horizontal line in the Figures. Columns 5 to 7 display the total average repayments, as well as the total repayments for the workers in the lower 10% of the lifetime income distribution and the total repayments for the workers in the top 10% of the lifetime income distribution. Columns 8 and 9, display the within-group progressivity for both the GTF and the ICL systems, as defined in equations [20] and [22].

As expected, within-group progressivity for the GTF does not change with the ICL parameters. A special case is the case of different levels in the principal (d) as we have imposed that the total amount given in the form of ICL adds up to the total cost of higher education. To make things comparable, fees are adjusted accordingly. Therefore, higher debt translates into higher fees which makes the GTF less progressive as the flat component of the burden becomes more important. Finally, column 10 offers a comparison of the ICL progressivity with respect to the baseline case, that is, the difference between each case in column 9 with the baseline, *i.e.,* the first line of such column. More details on each of the experiments are available in Cabrales *et al.* (2020).

VI. DISCUSSION AND CONCLUSION

In conclusion, the challenges facing European countries regarding fiscal sustainability, demographic changes shifts, and the need for investments in various sectors pose significant threats to the maintenance of competitive higher education systems. The reliance on tax-financed subsidies, coupled with flat tuition fees across income distributions, exacerbates repressiveness in funding mechanisms, especially as public funds become scarcer. This necessitates exploring alternatives to the current systems, such as Income Contingent Loans (ICLs), which offer flexibility and progressivity.

Drawing insights from the successful implementation of progressive loan systems in countries like the United Kingdom, in our analysis we focus on Spain. Given that the Spanish labor market is an extreme case in terms of the high levels of unemployment and high incidence of temporary contracts among OECD countries, this can provide an important lesson for other countries. Our analysis reveals the potential feasibility and benefits of transitioning towards a subsidized system of progressive ICLs. By offering a highly progressive structure wherein the top quarter of earners bear the majority of tuition costs while the bottom 10% pay minimal fees, ICLs present a promising solution to address inequality in access to higher education. Additionally, our findings suggest that under the proposed ICL model, the burden of total university education subsidies borne by the government could decrease by a significant margin compared to the current system.

Given the highlighted advantages of ICLs for the median voter, a question remains of why there is not a large demand for these. In the next two paragraph we discuss two justifications for this. One issue is that the ICL are perceived as traditional loans. But as we have discussed, all in all, the ICLs are isomorphic to *returnable fellowships* of different amounts in the sense that the sum of repayments does not exceed the fees except for the case where interest rate is above zero. Also, Diris and Ooghe (2018) offer a discussion from the political economy literature on this exact question. They explain that the transition from a general-tax-financed subsidy to ICL generates winners and losers and therefore it is not obvious to have a majority for the change; also, other key aspects for a majority include the relative usage of higher education versus the relative tax contribution of users and non-users, the presence of private education as well as the importance of risk aversion on future labor market outcomes. Diris and Ooghe (2018) conclude that it is likely that support for ICL comes from parents of talented poor and middle-income families. This highlights an interesting aspect that we would like to highlight that ICLs break the link between parents and children in tertiary education financing because repayments are set as function of children's future earnings, independently of family background. This, in turn, implies that, unlike other social policies, ICL systems represent a transfer from the older cohorts to the younger cohorts. Moreover, it is the richer older cohorts that would finance university the poorer younger cohorts, thus potentially enhancing intergenerational mobility.

Another possible explanation for the lack of ICL support is ignorance by the voters. But given that the example of countries where they exist is quite notorious, and its analysis in Dearden *et al.* (2008) is about a decade old, it is surprising that no political entrepreneur has used it to move up the political ladder. A more intriguing explanation would rely on the fact that real politics are multidimensional, and a coalition of the winner in this issue could have formed

TABLE 1

CASES COMPARISON

Case	*Value*	*Units*	*Avge. Subsidy (%) (Sub_i)*	*Repayment of ICL (∑P/C)*			*Within-group Progressivity*		*Comparison ICLs with baseline*
				Total	*Top 10%*	*Lower 10%*	*GTF* $\left(\frac{\tau_e^s Y_{p90}+F_{ia}}{\tau_e^s Y_{p10}+F}\right)$	*ICL* $\left(\frac{\tau_e^s Y_{p90}+\int_{i\in p90}\Sigma_a \beta^a P_{ia}}{\tau_e^s Y_{p10}+\int_{i\in p10}\Sigma_a \beta^a P_{ia}}\right)$	
Baseline			46.33	70.30	99.84	14.78	1.77	7.05	0.00
Interest R.									
r	0.5	%	44.45	73.06	104.88	14.78	1.77	7.36	0.30
r	0.8	%	43.30	74.75	108.11	14.78	1.77	7.56	0.50
r	2.2	%	37.86	82.82	125.40	14.78	1.77	8.63	1.57
Debt									
d	5,000	Euros	24.05	91.86	100.00	50.86	3.17	2.37	-4.69
d	10,000	Euros	32.75	84.42	99.99	30.40	2.38	3.80	-3.25
d	40,000	Euros	60.90	52.95	98.41	7.76	1.44	11.67	4.62
Exempt									
x	10,000	Euros	35.24	82.87	99.95	31.41	1.77	3.56	-3.50
x	20.000	Euros	56.20	58.41	99.50	7.02	1.77	12.39	5.34
x	25,000	Euros	64.44	48.09	98.54	3.46	1.77	18.01	10.95
Debt Write-Off									
m	15	Years	63.71	44.17	87.35	8.92	1.77	8.80	1.75
m	20	Years	52.83	59.84	98.25	12.15	1.77	7.92	0.87
m	30	Years	41.64	78.73	99.99	18.36	1.77	6.10	-0.95
Repay.Rate									
p	5	%	62.04	51.52	98.11	7.39	1.77	11.24	4.18
p	8	%	51.17	64.74	99.69	11.82	1.77	8.38	1.33
p	15	%	38.37	78.86	99.94	22.10	1.77	5.00	-2.06

with those of other issues on a stable platform. Levy (2005) is an example of how this explanation could work. She models a society in which there are two issues, public education and redistribution. She then shows that when the cohort size of the young is not too large, a coalition between the rich and the young segment of the poor can form with public education used as a political compromise. Future research could explore whether another coalition might have formed around public funding for higher education.

Finally, while in this paper we are focusing on the gains associated to more resources and higher progressivity, there are both limitations and benefits of the ICL system that we find worth mentioning but fall beyond the scope of this paper. On the one hand, our approach is limited in the sense that it ignores endogenous responses to the policy changes. On the other hand, additional benefits of moving away from the GTF system that have not been explicitly analyzed in this paper that we find of particular interest include: (1) The ICL scheme also features an insurance component through the exemption level, the debt write-off, and the repayment factor. While this is partly captured by our measures of within-group progressivity, in the context of a highly volatile and uncertain labor market like the one in Spain, this is likely to provide additional benefits to the workers to the extent that lower uncertainty affects consumption and savings decisions. (2) When the main part of university resources is publicly provided, government budget cuts have a strong impact on the survival and quality of tertiary education institutions. This can have perverse effects such as making university quality cyclical or exposing higher education institutions to political uncertainty and the business cycle. Moving forward, further research and policy discussions are warranted to refine and implement these proposed solutions effectively.

BIBLIOGRAPHY

Azmat, G., and Simion, S. (2017). Higher Education Funding Reforms: A Comprehensive Analysis of Educational and Labor Market Outcomes in England. *IZA Discussion Papers,* 11083. Institute for the Study of Labor (IZA).

Beneito, P., Boscá, J. E., and Ferri, J. (2016). Tuition Fees and Student Effort at University. *Economics of Education Review,* 64, 41.

Bonhomme, S., and Hospido, L. (2013). Earnings inequality in Spain: New evidence using tax data. *Applied Economics, 45*(30), 4212–4225.

Cabrales, A., Güell, M., Madera, R., and Viola, A. (2020). Income contingent university loans: Policy design and an application to Spain. *Economic Policy, 34* (99), 479–521.

Collado Muñoz, F. J., del Rey Canteli, E., and González, N. U. (2017). Estimating taxpayer subsidies and individual repayment burdens of a student loan program in Spain. *Hacienda Pública Española, 220*(1), 89–106.

De la Fuente, A., and Boscá, J. E. (2014). Gasto educativo por regiones y niveles en 2010. *BBVA Research Documento de Trabajo,* 14/02 .

De la Fuente, A., and Jimeno, J. F. (2011). La rentabilidad privada y fiscal de la educación en España y sus regiones. *Working Paper,* 2011-11. Fedea.

De Silva, T. (2023). Insurance versus moral hazard in income-contingent student loan repay ment. SSRN. https://ssrn.com/abstract=4614108

Dearden, L., Fitzsimons, E., Goodman, A., and Kaplan, G. (2008). Higher Education Funding Reforms in England: The Distributional Effects and the Shifting Balance of Costs. *Economic Journal, 118*(526), 100–125.

Diris, R., and Ooghe, E. (2018). The economics of financing higher education. *Economic Policy, 33*(94), 265–314.

Doneschi, A., Novas, V., and Velázquez, C. (2014). Graduate tax in Uruguay: Redesign of the Fondo de Solidaridad. *Páginas de Educación, 7*(1), 88–907.

Dynarski, S. M. (2003). Does aid matter? measuring the effect of student aid on college attendance and completion. *American Economic Review, 93*(1), 279–288.

Escardibul, O., and Perez-Esparrells, C. (2014). La financiación de las universidades públicas españolas. Estado actual y propuestas de mejora. *Revista de Educacion y Derecho,* 8, 1–17.

García-Peñalosa, C., and Walde, K. (2000). Efficiency and equity effects of subsidies to higher education. *Oxford Economic Papers,* 52, 702–722.

Joensen, J. S., and Mattana (2021). Student aid design, academic achievement, and labor market behavior: Grants or loans? SSRN. https://ssrn.com/abstract=3028295

Karahan, F., and Ozkan, S. (2013). On the persistence of income shocks over the life cycle: Evidence, theory, and implications. *Review of Economic Dynamics, 16*(3), 452–476.

LEVY, G. (2005). The politics of public provision of education. *The Quarterly Journal of Economics, 120*(4), 1507–1534.

MONTALBÁN CASTILLA, J. (2019). Financiación Universitaria: Desafíos y Soluciones Potenciales. *Studies on the Spanish Economy,* 2019-16. Fedea.

MORA, J.-G., GARCÍA-MONTALVO, J., and GARCÍA-ARACIL, A. (2002). Higher education and graduate employment in Spain. *European Journal of Education,* 35, 229–237.

OECD. (2014). *Education at a Glance 2014: OECD Indicators.* OECD Publishing, Paris.

A. APPENDIX. CONCEPTUAL FRAMEWORK

In this section, we introduce a simple theoretical framework to understand the changes from moving from models 4 to 2 explained in section II; in other words, how ICLs affect government and university budgets, as well as on the implied cost for families. We begin by laying out a generic framework in which the government, universities, and individuals interact with each other. We then use that framework to compare different higher-education financing schemes along aggregate and distributional measures.

A Simple Theoretical Framework

Three types of agents compose our economy: the government, the public university sector, and workers.[14] Figure 4 summarizes the main features of this section and makes the link between agents explicit. While the earnings dynamics of the workers play a central role, the policy will be evaluated in terms of present values.

Workers

There are two kinds of workers: skilled (s) and unskilled (u), with a mass of N^s and N^u, respectively. Skilled workers are those who have finished college. All individuals live for $T+1$ periods: period $t=0$ is mapped into the 4 years of schooling for the skilled agents.

Resources. Within each group, workers are heterogeneous in their earnings. These earnings are exogenous and evolve in a stochastic fashion. Let y_{it}^{j} denote the individual earnings of a worker i of type j ($j=s,u$) in period t. The specific dynamics of earnings will be discussed in detail in the next section. For this section, it suffices to assume that the average skilled earnings are higher than the average unskilled earnings at all times. Unskilled workers begin receiving earnings in period 0, while skilled workers have to wait until period 1 to receive wages. Depending on the specific financing scheme, skilled workers can receive transfers from the government during the schooling years, denoted by g_H^E, in the form of grants or loans to cover fees and maintenance. We assume these transfers are the same for all university graduates. Similarly, unskilled workers can receive transfers g^{-E} from the pool of public resources that are not devoted to financing higher education.

[14] We abstract from unemployed individuals for the moment since the relevant burden measures are not affected by their presence. In the empirical section, workers will be allowed to become unemployed.

Expenses. All workers pay income taxes. We assume workers in the same group face the same proportional income tax and that $\tau^s > \tau^u$, which captures the progressive nature of the tax code in a simplified manner. In addition, skilled workers' expenses include college fees f whenever they are in college and loan repayments whenever applicable. Workers *eat* everything left after covering fees, loan, and tax payments. We denote this residual consumption of the numeraire good as c_i.

Government

Resources. The only public resources are the income taxes paid by the workers, as described in subsection A. The total resources of the government are therefore given by

$$T = \tau^s Y^s + \tau^u Y^u, \tag{8}$$

where $Y^j = \Sigma_{t=1}^{T} Y_t^j$ and $Y_t^j = \int_{i \in s} y_{it}^j$, for $j = s,u$, where S is the set of skilled workers. That is, Y^j denotes aggregate lifetime earnings of workers of type j.

Expenses. Let G denote total public spending. We decompose G into two components:

$$G = G^E + G^{-E}, \tag{9}$$

where G^E denotes public spending devoted to financing public higher education and G^{-E} all other public spending. It will be useful to further decompose the amount of government spending in education G^E into payments directly made to institutions G_I^E and transfers to households $G_H^E = N^s g_H^E$.

We assume the government runs a balanced budget:

$$T = G^{-E} + G_I^E + G_H^E. \tag{10}$$

Using equations [9] and [10], and given our assumption that income taxes are proportional to earnings, we can also decompose the resources T into those that are used for higher education and those that are not as follows:

$$T = \left(\tau_e^s + \tau_{-e}^s\right) Y^s + \left(\tau_e^u + \tau_{-e}^u\right) Y^u, \tag{11}$$

where τ_e^j and τ_{-e}^j ($j = s,u$) are artificial taxes that will depend on the actual income tax rate and the specific higher education financing scheme. This accounting distinction will be useful to define the burden of public financing on individuals.

University Sector

Resources. Public universities get funding from the government (G_I^E) as well as out of pocket fees paid for by the individuals directly $F = N^s f$.

Expenses. Universities need a minimum payment of C in the form of running costs. C can be thought of as including current professor salaries, maintenance, and the like. In addition, universities could shift extra resources to

TABLE 2

COMPARISON OF THE THREE SYSTEMS: SUMMARY

	GTF		
Fees (upfront)	$F\,(GFT)$ (given)		
G^E	$-F\,(GTF) > 0$		
Public Savings	0		
Financing C	**Gen.-Tax**	+	**Out of Pokcket**
$Burden_e^u$	$\tau_e^u(GTF)Y^u$	+	0
$Burden_e^s$	$\tau_e^s(GTF)Y^s$	+	$F\,(GTF)$
Withing-Group Prog.	**Gen.-Tax**	+	**Out of Pokcket**
$Burden_{e,p10}^s$	$\frac{G^E}{\bar{G}}\bar{\tau}^s = \tau_e^s(GTF)Y^u$	+	$F\,(GTF)$
$Burden_{e,p90}^s$	$\tau_e^s(GTF)Y^s$	+	$F\,(GTF)$
Ratio	$\frac{\tau_e^s(GTF)Y_{p90}^s + F(GTF)}{\tau_e^s(GTF)Y_{p10}^s + F(GTF)}$		
	GT		
Fees (upfront)	$F\,(GT) = 0$		
G^E	$\bar{C} - \Phi = 0$		
Public Saving	$\Phi - F(GTF) = \bar{C} - F(GTF)$		
Financing C	**Gen.-Tax** (G^E)	+	**Out of Pokcket**
$Burden_e^u$	0	+	0
$Burden_e^s$	0	+	$øY^s$

TABLE 2 *(continued)*

COMPARISON OF THE THREE SYSTEMS: SUMMARY

GT			
Withing-Group Prog.	**Gen.-Tax** (G^E)	+	**Out of Pokcket**
$Burden^s_{p10}$	0	+	$øY^s_{p10}$
$Burden^s_{p90}$	0	+	$øY^s_{p90}$
Ratio	$\frac{Y^s_{p90}}{Y^s_{p10}}$		
ICL			
Fees (upfront)	$F(ICL) = \bar{C}$		
G^E	$\bar{C} - \int_{i \in S} \Sigma_a^{\bar{a}_i} P_{ia} > 0$		
Public Savings	$\int_{i \in S} \Sigma_a^{\bar{a}_i} P_{ia} - F(GTF)$		
Financing C	**Gen.-Tax** (G^E)	+	**Out of Pokcket**
$Burden^u_e$	$\tau^u_e(ICL)Y^u$	+	0
$Burden^s_e$	$\tau^s_e(ICL)Y^s$	+	$\int_{i \in S} \Sigma_a^{\bar{a}_i} P_{ia}$
Withing-Group Prog.	**Gen.-Tax** (G^E)	+	**Out of Pokcket**
$Burden^s_{p10}$	$\frac{G^E(ICL)}{G}\overline{\tau}^s = \tau^s_e(ICL)Y^u_{p10}$	+	$\int_{i \in p10} \Sigma_a^{\bar{a}_i} P_{ia} = \varepsilon$
$Burden^s_{p90}$	$\tau^s_e(ICL)Y^s_{p90}$	+	$\int_{i \in p90} \Sigma_a^{\bar{a}_i} P_{ia} \approx \bar{C}$
Ratio	$\frac{\tau^s_e(ICL)Y^u_{p90} + \bar{C}}{\tau^s_e(ICL)Y^u_{p10} + \varepsilon}$		

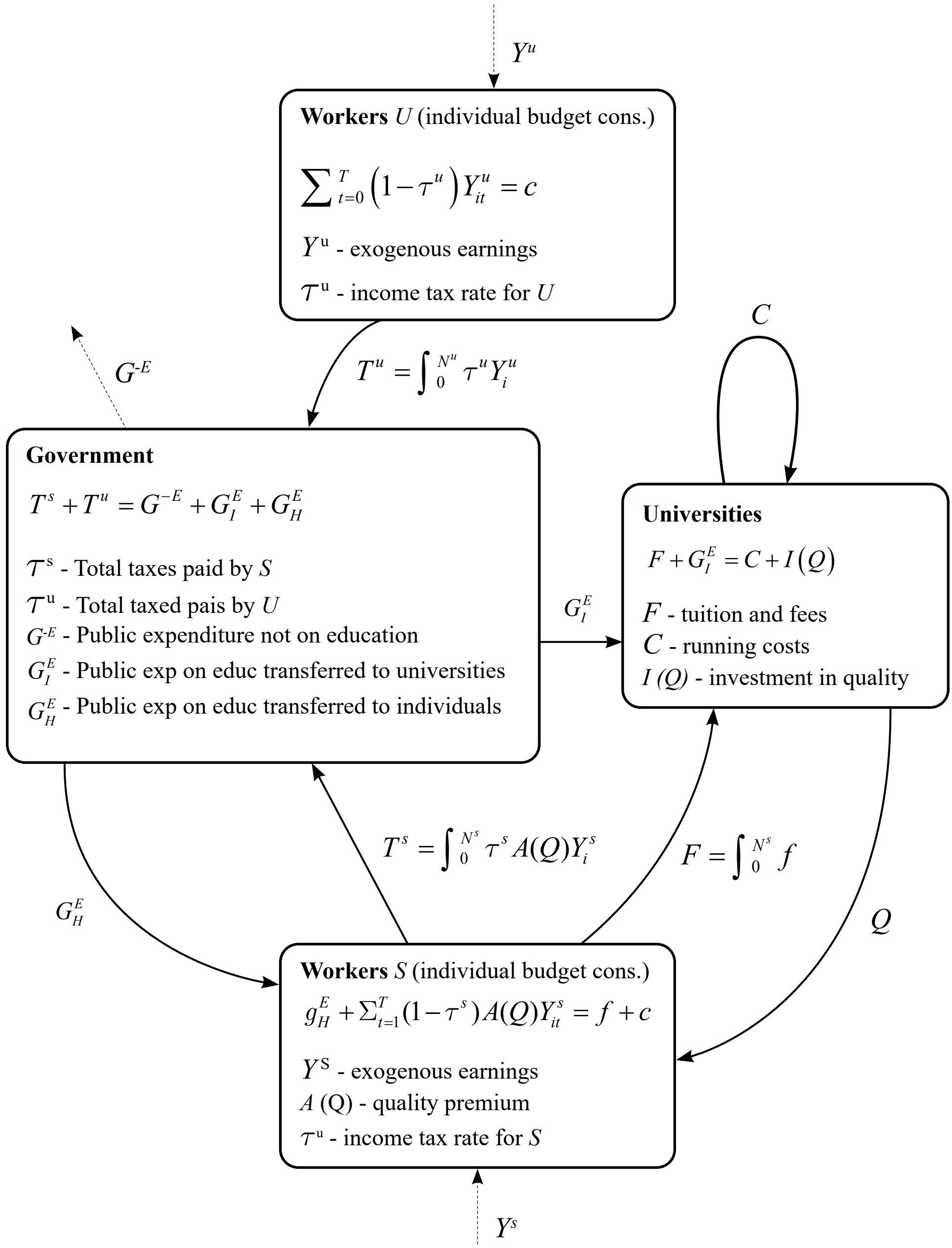
improve quality. Let *I(Q)* denote the investment in university quality. We assume there is a basic level of quality $\underline{Q}$ achieved by simply running the university and paying C. That is, $I(\underline{Q}) = 0$. As a result, *I(Q)* is the amount of university resources, in addition to the maintenance costs, that achieves a level of quality equal to $Q > I(\underline{Q})$. Higher quality will result in skilled earnings that are A (Q) times higher.

The university budget constraint is therefore given by

$$G_I^E + F = C + I(Q) \qquad [12]$$

FIGURE 4

THEORETICAL FRAMEWORK SUMMARY



A.1. AGGREGATE AND DISTRIBUTIONAL IMPLICATIONS OF DIFFERENT FINANCING SCHEMES

Using this theoretical framework, we next proceed to introduce the specifics of different higher-education financing systems. We consider three alternative schemes: the general-tax-financed subsidies (*i.e.,* prevailing system in countries in model 4), an intermediate case of a graduate income tax, and finally the ICLs in more detail (*i.e.,* the prevailing system in countries in model 2). For illustration, we will make the following assumptions when comparing the different systems: (1) We keep quality at its base level so that $I\left(\underline{Q}\right)=0$, which can be understood as $\underline{Q}$ being the current level of value added of university education. (2) The total cost of universities is fixed at $\overline{C}$. (3) Total public spending is fixed at $\overline{G}$ and the budget of the government is balanced, so the resources $\overline{T}$ are fixed as well. (4) We take the earnings streams $\{y_{ia}^{s}\}_{i\in S,a=1,\ldots,T}$ and $\{y_{ia}^{u}\}_{i\in U,a=1,\ldots,T}$ as given. Assumptions (3) and (4) also impose fixed total income taxes $\overline{\tau}^{u}$ and $\overline{\tau}^{s}$. These assumptions mean we will be evaluating the impact of revenue neutral policy changes in terms of burden shifts between agents.

We next compare each financing scheme along three dimensions: (1) the cost born by public and private agents; (2) *between-group progressivity;* or the extent to which these shift the cost of higher education to skilled and away from unskilled workers; and (3) *within-group progressivity,* referring to redistribution across the income distribution of future university graduates.

More specifically, the different financing systems are going to be compared in terms of how they shift the total cost of higher education $\overline{C}$ between the public and private sector, how much of the public burden is paid by non-university graduates, and the degree of redistribution within university graduates. Table 2 summarizes the key dimensions for such comparison that we analyze in detail in the next subsections. Whenever comparing systems, to clearly differentiate the different variables corresponding to each scheme, we define $F(system)$, $\tau_{e}^{j}(system)$, and $\tau_{-e}^{j}(system)$ as the level of fees, taxes to finance education, and remaining taxes, under each system GTF, GT, ICL.

A.1.1. General-tax-financed subsidies

We begin by discussing the system in model 4 using as example the details currently in Spain, in which university resources come predominantly from direct subsidies from the government, covering around 80% of the total cost of universities. The remaining 20% is paid for by the users at the time of paying tuition. This is also the prevalent system in most Europe.[15] The public subsidies

[15] Countries such as England and The Netherlands have transitioned to an ICL scheme, but the majority of the European countries still maintain this system.

are financed similarly to any public service using general taxes, hence its name. While the government offers some grants and fellowships to students, they are very small, and the big part of the subsidy comes from the direct transfers to institutions. For illustrative purposes, we will assume public transfers to individuals for the purpose of paying for higher education are zero. Using the general framework developed above, that means $G_H^E = 0$ and $G^E = G_I^E$.

Therefore, the total cost of higher education $\bar{C}$ is split between the government and the university-graduates: $\bar{C} = G^E + F$. Given a level of fees $F, G^E = \bar{C} - F \geq 0$ is financed with general education resources $\tau_e^s Y^s + \tau_e^u Y^u$. In other words, everybody, independently of whether they attended university or not, contributes to university resources through the general income tax. In addition to their share of income taxes, skilled workers pay the full amount of fees for attending university, which is the same for all university-graduates.

A.1.2. Graduate Tax

Before moving on to our proposed ICL policy, it is worth discussing the case of the graduate tax. This type of system is used by some public universities in Uruguay. A graduate tax consists of shifting the total cost of higher education entirely to those that benefit from it through deferred payments in the form of a tax upon graduation and until retirement.

In that sense, the total cost of higher education is financed entirely by the university-graduates through an income tax (in addition to the regular income tax), without upfront or tuition payments. We can think of this as the government paying for the cost initially and then recovering the full amount in the future. As consequence the income taxes of the unskilled workers are never used to subsidy higher education. In addition to their share of income taxes, skilled workers pay the graduate tax.

A.1.3 Income Contingent Loans

We propose an income contingent loan (ICL) system. ICLs have become a popular alternative to general-tax-financed (GTF) subsidies among developed countries that is, moving from models 4 to 2 explained in section II.[16] This system is in spirit similar to the Graduate-Tax, but its structure is more complex and flexible, allowing for varying degrees of cost shifting, as will become clear in the subsequent discussion. The key feature of ICLs is the combination of

[16] In Europe, Hungary, the Netherlands, and the United Kingdom adopted ICLs in the last decade, see (Diris and Ooghe, 2018). Outside Europe, Australia and New Zealand have been pioneers of this scheme.

private contributions, in the form of repayments contingent to future income; and government subsidies, given directly to the individuals in the form of debt write-off and repayment exemptions.

For the purpose of this description, we will focus on the extreme case where the fees cover the total cost of education in present terms, which makes it comparable to the GT case discussed above: $F = \overline{C} = \Phi$. This implies that $G_I^E = 0$ and $G^E = G_H^E = F = \overline{C}$. We will briefly comment on intermediate cases in the discussion below. We begin by introducing the elements that characterize the loans and repayments and then proceed to discuss the implied burdens.

A Rich Set of Instruments

An attractive feature of ICLs is the flexibility in its design compared to other progressive financing alternatives, such as a graduate tax. A rich number of instruments are combined to achieve varying degrees of public savings and progressivity:

- Principal: total tuition fees overall years + maintenance (maybe).
- Repayment rate: fraction of gross earnings that is used for repayment.
- Exemption level above which workers start repaying debt.
- Write-off year after which the debt is canceled.
- Interest rate of debt.

University students obtain a loan d from the government during schooling years to pay their fees and, possibly, room and board. Repayments start upon graduation and are a fraction p of ex-post labor income and are paid at low interest rates (r). There is a minimum exemption income level x below which graduates do not need to pay. Repayments are made for a certain number of years up to a maximum established (m). Because of the nature of this repayment scheme, it will be useful to adopt a life-cycle perspective and think of a period as an age year, denoted by a. In the remaining of this section, we discuss the main elements of debt repayment in detail.

Income-Contingent Repayment. Repayment is contingent on income and the first x euros are exempt for everyone. That means that those who earn less than x do not repay each year, and the rest pay a fraction of their income above x. We define non-exempt earnings for individual i at age a as:

$$Y_{i,a}^{NE} = \max\left\{Y_{i,a} - x, 0\right\}$$

Let $\bar{a}_i$ be the full-repayment age of individual i. Annual payments for individual i at age a are therefore calculated as

$$P_{i,a} = \begin{cases} pY_{i,a}^{NE} & \text{if } a < \bar{a}_i \\ \min\left\{(1+r)D_{i,a-1,} pY_{i,a}^{NE}\right\} & \text{if } a = \bar{a}_i \\ 0 & \text{if } a > \bar{a}_i \end{cases} \qquad [13]$$

where $D_{i,a\text{-}1}$ is the outstanding debt of individual i at the beginning of age a and, therefore, predetermined in period a–1. Equation [13] states that repayment is fixed and proportional to the non-exempt amount of earnings, resembling a graduate tax. Notice that the only dependence of payments on the outstanding debt $D_{i,a}$ appears in the last period of debt repayment and simply to indicate that, should the fixed payment of pY^{NE} exceed the remaining debt plus interests, then only the remaining debt has to be paid.

Full-repayment age. Graduates pay for a maximum of m years unless they have been able to pay their complete debt before in which case their full-repayment age is when their last payment pays is able to cover their outstanding debt:

$$\bar{a}_i = \min\left\{m, \tilde{a} s.t. \sum_{a=1}^{\tilde{a}} P_{i,a} \geq Di, \tilde{a}\right\} \qquad [14]$$

Debt. Starting from $D_{i,0}= d$, outstanding debt is calculated at the end of each period as $D_{i,a} = (1+r)\, D_{i,a\text{-}1} - P_{i,a}$ until the repayment age. A full description of the repayment structure and explicit formulas for $D_{i,a}$ and $\bar{a}_i$ can be found in Table 3 and equation [14] below.

Therefore, the total cost of higher education $\bar{C}$ is split between the government and the university-graduates: $\bar{C} = G^E + \int_{i\in S} \sum_{t=1}^{\bar{a}_i} P_{it}$. A useful way to think about public financing in this system is to assume university-graduates pay the full amount of fees and can obtain a loan for the same amount immediately. As a result, the fees cancel in the government budget and G^E covers the part of the fees that university-graduates are not able to repay: $G^E = \bar{C} - F + F - \int_{i\in S} \sum_{t=1}^{\bar{a}_i} P_{it} > 0$. In addition to their share of income taxes, skilled workers pay a share of the loan given by their income history, which is different for each university-graduate, adding up to a total burden for university graduates of $\bar{\tau}^s Y^s + \int_{i\in S} \sum_{t=1}^{\bar{a}_i} P_{it}$. Notice that, similarly, to GTF, and in contrast to GT, $G^E \geq 0$ is financed with general education resources $\bar{\tau}_e^s Y^s + \bar{\tau}_e^u Y^u$. We will discuss in the next subsection how τ_e^u (*GTF*) and τ_e^u (*ICL*) compare, as well as the conditions under which ICLs imply a public savings compared to GTF and the advantages over GT.

TABLE 3

ICL REPAYMENT SCHEME

Period	*Initial debt*	*Resources*	*Payments*		*Outstanding debt*	*Eat*
			Educ related	*Other*		
$a = 0$ (College)	0	d (principal)	f (tuition and fees)	0	$D_{0=d}$	$c_{0=}d-f$
$a = 1$	$(1+r)\,D_0$	Y_1	$P_1 = pY_1^{NE}$	$\tau^s Y_1$	$D_1 = (1+r)D_0 - P_1$ $= (1+r)d - pY_1^{NE}$	$c_1 = Y1 - pY_1^{NE} - \tau^s Y_1$
$a = 2$ ⋮	$(1+r)\,D_1$	Y_2	$P_2 = pY_2^{NE}$	$\tau^s Y_2$	$D_2 = (1+r)D_1 - P_2$ $= (1+r)^2 d - p\left[(1+r)Y_1^{NE} + Y_2^{NE}\right]$	$c_2 = (1-\tau^s)Y_2 - p(Y_2 - x)$
⋮ a	$(1+r)\,D_{a-1}$	Y_a	$P_a = pY_a^{NE}$	$\tau^s Y_a$	$D_a = (1+r)D_{a-1} - P_a$ $= (1+r)^a d - p\Sigma_{j=1}^{a}\left[(1+r)^{a-j}Y_j^{NE}\right]$	$c_a = (1-\tau^s)Y_a^s - p(Y_a - x)$
: $a = \overline{a}$ (Full repayment	$(1+r)D_{\overline{a}-1}$	$Y_{\overline{a}}$	$P_{\overline{a}} = \{\min\{(1+r)$ $D_{\overline{a}-1}, pY_{\overline{a}}^{NE}\}$	$\tau^s Y_{\overline{a}}$	$D_{\overline{a}} = 0$	$c_{\overline{a}} = (1-\tau^s)Y_a^s$
$T \geq a - \overline{a}$	0	Y_a	0	$\tau^s Y_a$	0	$c_a = (1-\tau^s)Y_{\overline{a}}^s - P_{\overline{a}}$

A.2. Comparing the Three Systems

Next, we will use all the information about the different systems explained above informally and in more detail in subsections 3.1.1, 3.1.2 and 3.1.3 to summarize the distributional implications of each system in two results.[17] Here we only outline the results. We give more details and intuitions with the formal derivation in the Appendix.

Result 1: *Between-group progressivity (the ratio of the burden for non-university- and university-graduates) is highest (lowest) under the GT system and provided a minimum level of debt repayment under ICL, lowest (highest) under GTF.*

While this result is practically a consequence of the previous one, there are important insights to be learned from formalizing the burden for each type of private agent.

We focus on the total burden of each system for the workers, defined as $Burden^j$ ($j=u,s$), that measures the cost of financing the public sector $\bar{G}$, including the financing of the university sector G^E, the non-university-sector G^{-E}, plus possible out of pocket spending on the payment of fees. At this point, it is necessary to make an assumption about the use of the resources shifted out of the public sector when moving away from the GTF system. One option is to think of it as investment in other public services, such as primary public education, which could benefit both types of workers. For simplicity and without affecting our main results, we will assume that the extra amount of G^{-E} will entirely be used as transfers to low-income families. For comparison, we take fees in the GTF as given by the status quo and write the formulas as a function of these, as well as of previously defined fixed policy parameters.

We first define $PublicSavings$ is defined for each system with respect to the current GTF system:

$$PublicSavings(GTF) = 0 \quad [15]$$

$$PublicSavings(GT) = \Phi - F(GTF) = \bar{C} - F(GTF) \quad [16]$$

$$PublicSavings(ICL) = \int_{i\in S} \sum_{a=1}^{\bar{a}_i} P_{ia} - F\left(GTF\right). \quad [17]$$

We can now concisely define the ratio that characterizes between-group progressivity:

[17] More detailed calculations can be found in our previous work Cabrales *et al.* (2020).

$$\frac{Burden^u\left(system\right)}{Burden^s\left(system\right)} = \frac{\overline{\tau}^u Y^u - PublicSavings\left(system\right)}{\overline{\tau}^s Y^s + F\left(GTF\right) + PublicSavings\left(system\right)} \qquad [18]$$

Assuming the repayment share in the ICL case is sufficiently large so that Result 1 holds, it is easy to see that:

$$\begin{aligned} &PublicSavings(GT) \geq PublicSavings(ICL) \\ &> PublicSavings(GTF) \end{aligned} \qquad [19]$$

with equality if there is full repayment, which concludes our discussion of Result 2.

Result 2: *Within-group progressivity (redistribution between university graduates) is zero under GTF and GT, beyond the progressivity of the income tax code.*

Let $Burden^s_{prc}$ denote the corresponding burden for a subgroup of skilled workers in the percentile prc of the earnings distribution. We will define within-group progressivitiy as the ratio of the burden for those university-graduates on the top 10% of the income distribution (group $p90$) and the burden for those university-graduates on the bottom 10% of the income distribution (group $p10$), as follows:

$$\frac{Burden^s_{p90}\left(GTF\right)}{Burden^s_{p10}\left(GTF\right)} = \frac{\overline{\tau}^s Y^s_{p90} + F\left(GTF\right)}{\overline{\tau}^s Y^s_{p10} + F\left(GTF\right)} \qquad [20]$$

$$\frac{Burden^s_{p90}\left(GT\right)}{Burden^s_{p10}\left(GT\right)} = \frac{\overline{\tau}^s Y^s_{p90} + \Phi}{\overline{\tau}^s Y^s_{p10} + \Phi} = \frac{\left(\overline{\tau}^s + \phi\right) Y^s_{p90}}{\left(\overline{\tau}^s + \phi\right) Y^s_{p10}} = \frac{Y^s_{p90}}{Y^s_{p10}} \qquad [21]$$

$$\frac{Burden^s_{p90}\left(ICL\right)}{Burden^s_{p10}\left(ICL\right)} = \frac{\overline{\tau}^s Y^s_{p90} + \int_{i\in p90} \sum_a^{\overline{a}_i} P_{ia}}{\overline{\tau}^s Y^s_{p10} + \int_{i\in p10} \sum_a^{\overline{a}_i} P_{ia}} \approx \frac{\overline{\tau}^s Y^s_{p90} + \overline{C}}{\overline{\tau}^s Y^s_{p10} + \varepsilon}, \qquad [22]$$

where $Y^s_{pcr} \equiv \int_{i\in p10} Y_i$, for $pcr = p10, p90$, and ε is used to denote a small amount, always smaller than $F(GTF)$. The last relation in equation [22] follows from our empirical results in the next section for all reasonable parameter combinations.

It is very easy to see in equations [20] and [21] that there is no redistribution from top to bottom earners under the GTF and GT systems, beyond the intrinsic differences in income and income taxes. Looking at the same part of equation [22] for ICL, however, the top earners end up paying nearly the full amount of the cost of universities while the bottom earners pay even less than in the GTF case.

We conclude this section by discussing both the importance of the combination of the between-group and within-group progressivity's in each system. To make our point, we take the extreme case of the US higher education system, where fees cover the total cost and commercial banks offer classic loans. As mentioned in the introduction, these traditional loans are very different to income contingent loans as repayments are not a function of future income nor they allow for write-offs or exemptions. Moreover, these traditional loans are repaid at the market rate. In this sense, as mentioned before, our proposed system resembles more a scheme of *Returnable Fellowships,* provided a zero interest rate, which is our baseline scenario. This system does feature total between-group progressivity, similarly to the GT, but they do not have any progressivity component within the university graduates. Actually, within-progressivity tends to be negative because higher earning graduates repay their loan faster and thus paying less in terms of accumulated interests than the lower earning graduates, who end up accumulating large amounts of debt over time. This example highlights the importance of considering both kinds of redistributions and, while this case is more extreme, is reminiscent of the case of the GT, where the within-group component is not negative, but it is close to zero. In this sense, the ICL offers a balanced combination of both between and within progressivity through a rich set of instruments.

In the rest of the paper we analyze the distributional implications of introducing ICLs to Spain. In other words, the degree of within-progressivity of different specifications of ICLs. In order to do so, we first need to simulate the life-cycle earnings of graduates using a model of earnings dynamics and employment transitions. We do so in the next section.

CAN PRIVATE UNIVERSITIES COMPETE WITH PUBLIC UNIVERSITIES IN SPAIN? UNIVERSITY FINANCING AND POLITICAL ECONOMICS

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Abstract

This article analyzes various models of university education financing, comparing theoretical aspects and practical applications, and focuses on the competition between public and private universities in Spain. It begins by discussing significant corporate activities and the rapid growth of private university enrollment over the past two decades. It examines the effectiveness and equity of financing methods such as general taxes, graduate taxes, traditional loans, and income-contingent loans (ICL). The article highlights the growing competition between private and public universities, focusing on differences in student demographics, quality, and employability. A survey conducted in Catalonia in 2017 evaluates students' perceptions and knowledge about costs and financial aid. It reveals a significant lack of accurate information among students, affecting their decisions. The findings suggest that adopting ICL or graduate tax systems could improve equity and efficiency in university financing in Spain.

Keywords: University education financing, income contingent loans, university results, university fees, scholarships.

JEL classification: D06, H23, I22, I23, I26.

I. INTRODUCTION

In 2018, in an unprecedented transaction in Spain, Permira investment fund acquired *Universidad Europea de Madrid* from the Laureate Group for €770 million. A few months later, private equity manager CVC acquired *Alfonso X el Sabio University* (UAX) for €1.1 billion for its Fund VII. In April 2024, Permira put a minority stake (30%) in *Universidad Europea* up for sale. EQT won the bid, valuing the university at 2.2 billion, competing with funds such as KKR, Mubadala and Partners Group. CVC valued the sale of UAX at €2 billion.[1]

This corporate activity around universities in Spain is an example of the importance of the private tertiary sector, which is evolving at a very different level from the public sector. While enrollment in public universities has decreased by 200,000 students in the last twenty years (from school year 2000-2001 to school year 2020-2021), enrollment in private universities has increased by 230,000 students. Thus, the percentage of students in private universities has increased from less than 10% to 20% over the same period. In the case of master's degrees, the increase in the proportion of official master's degrees in private universities is even more significant, representing 46.1% of the total in the 2020-2021 school year.

Traditionally, public universities in Spain have been considered better than private universities, and therefore little attention has been paid to the impact that the private tertiary sector could have. Student numbers seem to indicate that this perception may be changing. Increased competition from the private tertiary sector requires public universities to be able to adapt to new forms of teaching and to the needs of the productive system and society in order to compete. However, the lack of flexibility, stifling regulation, diminishing autonomy, perverse governance, lack of incentives for staff and the little interest from public authorities, which believe that there is no need to improve funding in the face of declining enrollment, make it difficult for public universities to compete with private institutions.

The public sector's response to the growing private competition has been to modify the regulations in order to make it more difficult for private institutions to compete (Royal Decree 640/2021), instead of increasing the flexibility, governance and autonomy of public universities.

It is interesting to compare this reaction with the actions of the Obama administration which, concerned about the high cost of many private universities of dubious quality, launched a Scoreboard available online that

[1] For more details on corporate operations in the Spanish tertiary sector, see Aunión (2023).

lists the cost of attending each school,[2] its graduation rate and the average annual income earned after graduation. The Scoreboard provides information on public and private colleges, including the scholarships and grants they offer. The Obama plan to make college more accessible, especially to the middle class, included encouraging states to fund public universities based on their outcomes, providing transparent information about the outcomes of each institution, encouraging innovation, eliminating unnecessary regulations, and holding students accountable for their academic outcomes if they receive public funds. In short, encourage a race to the top among public universities for higher value and lower cost.

A comparison of tuition by family income level shows that even at prestigious private universities, tuition does not cover the cost of education up to very high-income levels. At the Massachusetts Institute of Technology, for example, families with incomes up to $75,000 pay the same percentage of the actual cost as at a university in Spain, while students from families with incomes below $48,000 receive aid, including wage subsidies. The price of tuition exceeds the cost of education only for families with incomes above $110,000. At public universities, the full cost of education is generally paid from a family income of $75,000. For example, at the University of California at Berkeley or UCLA, the full cost of attendance begins at approximately $75,000. Families earning above that amount pay a larger share of the cost, which increases with income.

This article analyzes the financing of higher education, comparing the theoretical aspects of different financing options as well as their application in practice and in political economics. Special emphasis is given to the situation in Spain and the comparison between private and public institutions.

II. UNIVERSITY FINANCING SYSTEMS

1. University financing models

University financing models must be interpreted in the context of the high profitability of tertiary education relative to lower levels of education, as we show in one of the sections of this article, and a fundamentally private appropriation of this profitability by the graduate. This situation is quite different from, for example, education before the age of 3, which generates significant externalities and social returns.

[2] https://collegescorecard.ed.gov/

There are two main approaches to financing higher education. The first involves using the tax system (either through general taxes or specific taxes for graduates) to finance transfers both to students (through universal or income/qualification-based scholarships) and to institutions to keep tuition costs down. The second approach involves direct payment of public university fees, either directly from the income of students and their families or through loans. These methods are not mutually exclusive, and in most cases university funding is a mix of public subsidies and private contributions. There are four main funding models for university education:

- GET. The state collects taxes to support higher education institutions. These funds generally come from global taxes paid by all taxpayers, regardless of their use of the higher education system.

- GRT. In this model, taxes come only from those taxpayers who have used the university system.

- LOA. The government can offer loans or facilitate a private loan market. If the amount to be repaid is constant, it is a traditional loan.

- ICL (income contingent loans). The amount to be repaid by the graduate is calculated as percentage of the individual's future income. Students borrow money to finance their college education, and the amount to be repaid is based on their future earnings in the labor market, with a generally low interest rate. If their income is high, they repay more of the loan. Typically, there is an income eligibility threshold and payments are limited to a maximum number of years.

Table 1 summarizes the characteristics of each financing model. Both tax models (GET and GRT), which are mandatory and not limited to a specific amount that could exceed the total individual cost of study, are calculated as percentage of income and are paid over a lifetime. The main difference between them is that the GRT is financed only by individuals who have been in the higher education system, so the risk is shared only among the students. On the other hand, the two loan models (LOA and ICL) differ from the tax system in several ways. They are voluntary, the total amount to be repaid cannot exceed the sum of the loan plus interest (they are capped), they depend on the type of degree and they are used to cover the annual cost of study. LOAs require the loan to be repaid over a fixed period, while ICLs vary the amount to be repaid according to the individual's income, making the repayment period flexible (shorter if future income is high and longer if it is low).

TABLE 1

FINANCING MODELS. CHARACTERISTICS

Concept	*General Taxe (GET)*	*Graduated tax (GRT)*	*Classic loan (LOA)*	*Income Contingent Loan (ICL)*
Mandatory	Yes	Yes	No	No
Limited	No	No	Yes	Yes
Linked to income	Yes	Yes	No	Yes
Linked to the degree	No	Yes	Yes	Yes
Duration	Lifetime	Lifetime	Fixed	Variable (limited)
Who pays?	All taxpayers	Students	Especially students	Mainly students
Risk of non-payment	Shared	Combined	Shared	Shared

Sources: Diris and Oogue (2018) and Montalbán (2019)

Most countries prefer a university financing model supported by general taxation, known as GET. However, there are significant differences in the way the costs of higher education are shared between taxpayers, students and private institutions, and in the type of financial support offered to students. The financing models used in different countries tend to integrate two main instruments: (i) tuition fees, which may vary in the percentage of the cost that is generally subsidized, depending, inter alia, on the field of study or the institution; (ii) financial support mechanisms for students facing these fees and/or related living costs. These instruments may include university grants –tax-funded subsidies that may be general or targeted at students with certain characteristics (such as those from low-income families or those with high academic performance)– or government loans. In Nordic countries such as Denmark, Finland, Norway and Sweden, university costs are financed almost entirely by taxpayers. In countries such as Spain, France and Belgium, the subsidy is around 80%, while in the United Kingdom and the United States, it is reduced to around 25%.

2. Income-contingent lending (ICL) as a theoretically desirable model

Diris and Oogue (2018), among others, argue that it would be beneficial for most countries to adopt an ICL or GRT system instead of the current GET model, taking into account equity and efficiency factors. According to these researchers, countries with a higher share of private financing, including those that have implemented the ICL, tend to have more progressive systems, while those that rely almost exclusively on general taxation tend to have more regressive systems. In Spain, the system is perceived as regressive from the students' perspective and as progressive from the parents' perspective from the middle of the distribution. The adoption of the or the GRT could result in a system that is less regressive from the student's perspective and more neutral from the parent's perspective. As with all financing systems, the ICL has both advantages and disadvantages. In order to consider its implementation in Spain, it is crucial to analyze the various efficiency and equity implications of switching to the ICL system.

The potential advantages of integrating the ICL into the Spanish university system, compared to the current model, are as follows: i) It would increase the neutrality of the system from the student's point of view, improving its progressiveness. ii) It would increase the progressiveness from the regressive parent's point of view, or make it more neutral if it is already progressive. iii) It would reduce the moral risk during the course of the degree, thanks to the possibility of adjusting the loan payment to the duration of the degree. iv) It would reduce the moral hazard during the course of the study, thanks to the possibility of adjusting the loan payment according to the duration of the study. v) It would protect the student against risk, since the payment is conditional and varies according to future income. vi) It would facilitate the universalization of the ICL. vii) The ICL would facilitate universal access to university, without being subject to the constraints of family loans. viii) It would reduce the problems of hyperbolic discounting in families, since the payment of university fees is postponed to the future, which could increase the participation of students with less rational choices. ix) It would reduce the problems of hyperbolic discounting in families, since the payment of university fees is postponed to the future, which could increase the participation of students with less rational future prospects, while students with rational future prospects would not be affected.

On the other hand, the disadvantages of the ICL compared to the current system include: (i) Although higher education has positive externalities, the ICL may not encourage student participation because the costs are directly allocated to students. However, studies show that these effects are small and variable, so they would not be sufficient per se to rule out the ICL; (ii) It could encourage moral hazard in the labor market because the amount of the payment is gradually adjusted according to future earnings, although there is no clear empirical evidence of this; (iii) There is a risk of non-payment; however, in a theoretical scenario where all students do not pay, the system would simply revert to the current GET model; (iv) The concept of "borrowing" could discourage debt-averse students. Research suggests that the negative effects of this perception are minimal. A possible solution would be to rename the system to something like *Beca retornable* or Refundable Grant (Cabrales *et al.,* 2019), in addition to carrying out an information campaign to clarify the details of the system and minimize information bias about its features.

III. THE FINANCING OF UNIVERSITY EDUCATION IN PRACTICE

Decisions on the higher education financing model are crucial given the high cost of each university student and the relationship between private and social profitability in higher education. Expenditure per full-time equivalent student in tertiary education in the OECD average reached $16,350 in 2020 (OECD, 2023) in constant 2015 prices and adjusted for purchasing parity. In the case of Spain, the expenditure was 22.3% lower ($12,704). The comparison with the EU is also negative, with expenditure in Spain per full-time student 19.1% lower than the EU25 average. In comparison, expenditure per full-time student in Sweden, Norway and the United Kingdom is $23,110, $21,619 and $25,617 respectively.

The distribution between public and private funding of higher education is highly politically charged and is often used as an element of confrontation between political parties. A basic principle is that public funding should be higher the higher the social benefit of the level of education and lower the higher the private profitability. The OECD (2023) notes that the share of public funding decreases as the level of education increases. In 2020, the OECD average share of private funding was 7% at the primary level, 8% at the lower secondary level, 10% and 11% at the vocational and upper secondary levels, and 16% at the tertiary level.[3]

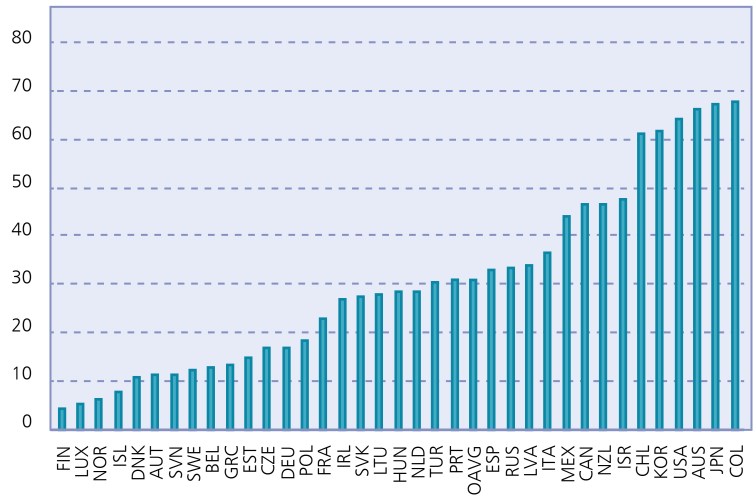
Panel A of Figure 1 shows several groups of countries. The first group, consisting mainly of English-speaking countries, shows a level of private funding above 60% (United States, United Kingdom, South Korea, Australia, Japan and Chile), while in Northern European countries it is below 15% (Finland, Norway, Iceland, Denmark, Austria and Sweden). Panel B of the same figure shows that among the countries with the highest ratio of investment in tertiary education to GDP, there are representatives of both groups. Of the top seven countries, four are dominated by private funding and three by public funding.

[3] It is important to note that the discussion in this section does not take into account the distribution of funding between different levels of education. It could be argued, for example, that since the social returns to education from 0 to 3 years of age are much higher than those to university studies, public funds should be directed primarily to this segment of education, to the detriment of the level of education where private returns dominate. This type of argument will not be discussed in this article.

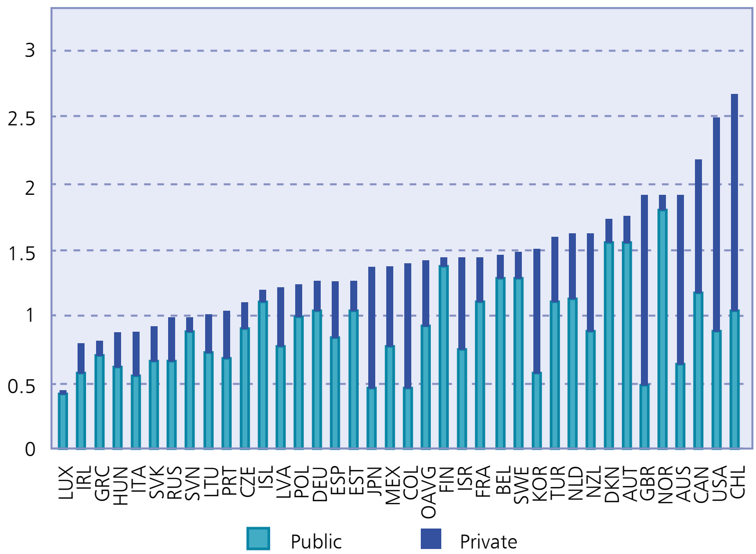
FIGURE 1

SHARE OF PRIVATE EXPENDITURE OVER THE TOTAL TERTIARY EDUCATION EXPENDITURE AND PUBLIC AND PRIVATE FUNDING OVER GDP 2019

Panel A. Private expenditure over tertiary education expenditure



Panel B. Public and private financing over GDP 2019



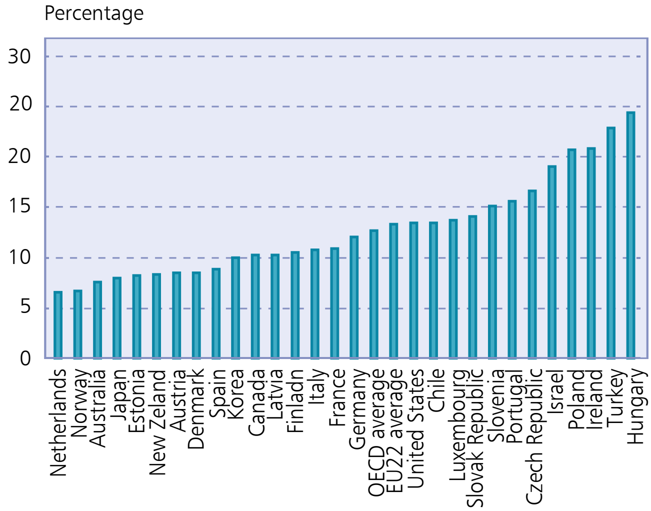
Source: By the authors, based on OECD (2023).

The distribution of funding for tertiary education between public and private should be related to the ability to make the benefits of university education privately profitable. It is well known that in most countries the employment situation of tertiary graduates is significantly better than that of graduates from other lower levels of education. In 2021, OECD tertiary graduates aged 25-64 had an employment rate 10% age points higher than those with upper secondary or post-secondary non-tertiary education. The proportion of 25-29-year-old who were neither studying nor working was 12%, well below the proportion of upper secondary or post-secondary non-tertiary graduates. They also have lower long-term unemployment rates than all other education levels. On average, OECD tertiary graduates with continuous full-time employment earn about 55% more than upper secondary graduates.

Figure 2 shows the result of calculating the internal rate of return of higher education in OECD countries (OECD, 2017). The graph compares the private costs and benefits of a male with a tertiary education *versus* a male with a secondary education in equivalent dollars, converted using purchasing power parity for GDP. The calculation shows that in countries where the direct cost of university education is low (Germany, Norway) the total cost of studies is high because of the high opportunity cost. On the other hand, in countries where university graduates receive higher salaries they

FIGURE 2

INTERNAL RATE OF RETURN ON TERTIARY EDUCATION



Source: Education at a glance (OECD, 2017).

also pay more taxes, which reduces the differences between countries when calculating net benefits. The average rate of return in both OECD and EU countries is 13%, while in Spain the return is lower (9%). In the case of female tertiary graduates, the average profitability of OECD and EU countries is lower, at 11%. However, Spanish female graduates have an above-average profitability (13%).[4]

Another way to calculate private returns of tertiary education is to use a Mincerian regression (Card, 2001). The classic benchmark for international cross-country comparisons is the work of Psacharopoulos (1994), who finds a return of 8%for each additional year of tertiary education in developed countries. Psacharopoulos and Patrinos (2018) update these estimates and obtain a return of 9% for all 135 countries analyzed, although the return remains anchored at 8% in developed countries.[5] Bhuller *et al.* (2017) propose to overcome the limitations of Mincerian regressions due to non-compliance with key assumptions of this methodology. Using procedures to mitigate sample selection problems, Bhuller *et al.* (2017) show that the internal rate of return to education is around 11%. These rates of return, which are higher than interest rates, would justify more people pursuing higher education.

Spain belongs to the group of countries with a high level of public subsidy of university tuition. The system provides free tuition to students from families with low income levels relative to family size. All other students pay between 10 and 15% of the cost of university studies. In 2012, the Ministry of Education, Culture and Sports proposed an increase in tuition fees by capping the maximum price paid by students at 25% of the cost of tuition. In addition, it significantly increased the price of second, third and fourth enrollments. Each region or Autonomous Community decided by what percentage the public prices would be increased. While some, such as Galicia and Asturias, increased them very little, Catalonia and Madrid opted for a very substantial increase. In the case of Catalonia, the price increase was progressive and graduated from the so-called equity grants. The full payment of tuition fees only applied to families with income above 67,000 euros. For lower incomes, but higher than those that gave access to free tuition, the equity grants provided greater discounts the lower the income. García-Montalvo (2020) analyzes the impact of this new system of financing university tuition and finds no evidence of a negative impact of the policy change on the dropout rate. He also analyzes the distributional impact of the reform and shows that carefully designed progressive

[4] Fuente and Jimeno (2011) calculate the return on investment in education in Spain and find that virtually all post-compulsory education cycles generate attractive returns from a private and fiscal perspective.

[5] Florentino Felgueroso also analyzes the returns to higher education in Spain using Mincer equations based on annual LFS data from 2006 to 2017. He finds that university education and higher vocational training have a positive impact on workers' wages, increasing them by 33 to 43%.

public prices can generate additional revenue for universities without having a negative impact on the dropout rates of students from low socioeconomic backgrounds. Thus, in this case, the subsidy reduction for students from families with higher purchasing power had no impact on enrollment rates and reduced the regressiveness of the system from the students' perspective.

Beneito *et al.* (2018) focus on the increase in the cost of second and third enrollments, showing that the increase in the price of tuition increases student effort. Montalbán (2023) shows that need-based scholarships have no effect on academic outcomes when academic performance requirements are standard in most countries. The provision of a small grant has a much larger impact on academic outcomes and the likelihood of graduating from university, when it is combined with demanding minimum academic requirements, although this effect only occurs when the grant is announced at the beginning of the school year. Increasing the amount of aid does not lead to additional improvements in academic outcomes. On the other hand, increasing the academic requirements does not lead to an increase in the dropout rate.

IV. PUBLIC AND PRIVATE UNIVERSITIES IN SPAIN

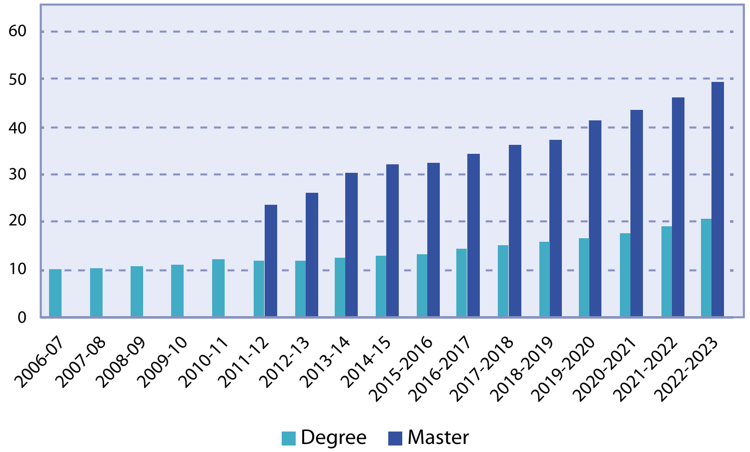
In many countries, a relevant share of private financing of tertiary education is concentrated in private institutions and not so much in the share of public university enrollment cost financed by families. In the Spanish case, private universities have traditionally represented a small part of the tertiary education system. This situation is changing rapidly. This section compares the evolution of public and private university institutions and analyzes some of the differentiating elements: students, quality, degrees, employability and salaries.

1. Public and private universities: Students

Over the past decade, enrollment in private higher education institutions has grown rapidly, while public universities have lost students. Between the school years of 2011-2012 and 2022-2023, public undergraduate enrollment decreased by 16%, while private enrollment increased by 60% (figures are preliminary). At the master's level, both types of institutions are experiencing growth due to the recent increase in student interest in pursuing postgraduate degrees, but to different extent. While the number of master's students at public universities increased by 57%, the number of private students quadrupled during this period. As Figure 3 shows, the share of undergraduate students at public institutions rose from 10% in 2006-2007 to more than 20% in 2022-2023, while at the master's level, private institutions now account for nearly 50% of the system's students.

FIGURE 3

PROPORTION OF STUDENTS IN PRIVATE UNIVERSITIES OUT OF THE TOTAL NUMBER OF UNIVERSITY STUDENTS



Source: Integrated University Information System (SIIU).

2. Public and private universities: Quality

What factors explain the evolution of the distribution of students between public and private universities? As mentioned in the introduction, the general perception in Spain, unlike in other countries, is that the quality of Spanish public universities is higher than that of private universities. However, as Table 2 shows,

TABLE 2

MAIN ACADEMIC INDICATORS OF THE UNIVERSITIES

Percentage

	Public	*Private*
Performance Rate (2019-20)	83,6	89,7
First year dropout (New entry cohort 2017-18).	21,7	19,3
Change of studies in the first year (New entry cohort 2017-18).	8,8	6,2
Suitability rate (2016-17 cohort)	37,0	49,7
Graduation rate (2015-16 cohort)	50,6	63,4
Efficiency rate (Graduates 2019-20)	88,3	93,3
Average length of study: 4-year degrees (Graduates 2019-20)	5,0	4,6
Average grade (Graduates 2019-20)	7,24	7,39

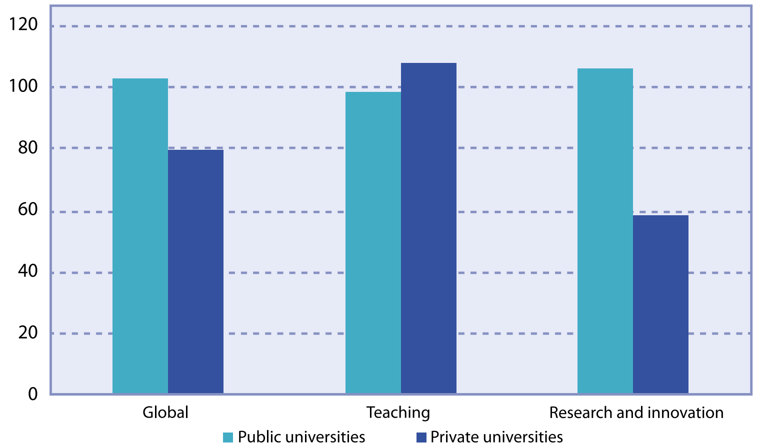
Source: Ministry of Universities (2022). Latest available data.

the main academic indicators are better in private universities than in public ones. Students in private institutions have higher performance, lower dropout and transfer rates, higher aptitude, graduation and efficiency rates. They also take less time to complete their studies and have slightly higher grades than students in public universities.

In any case, comparing the two types of universities is complicated because private universities tend to be younger, smaller and less diversified than public universities. Specialization in degrees with more job opportunities also influences the results of the comparison, especially in the dimension related to subsequent job placement. However, if they are assessed in relation to their size and using a wide range of indicators, a fairly accurate picture of the differences between the two types of university can be drawn. The most comprehensive and rigorous comparison of the quality of Spanish higher education institutions, both in terms of the volume of information handled and the methodology used, as well as the most up-to-date view, is presented by Pérez and Aldas (2023). This information is used to provide society with a ranking of Spanish universities based on a variety of indicators, which, except in two cases, use a six-year rolling average to provide a more stable image of their assessment. The latest edition of the *U-Ranking* (Pérez and Aldas, 2023) shows that, as in previous editions, the overall rating of public universities is higher than that of private universities (see Figure 4).[6] In the latest study, the difference is 23 points. However, there

FIGURE 4

AVERAGE PERFORMANCE OF SPANISH UNIVERSITIES BY TYPOLOGY



Source: BBVA Foundation-Ivie (*U-Ranking*, 2023).

[6] The figure is constructed using the average of the system, weighted by the weight of each university, as a base of 100. In the teaching ranking, many private universities appear at the top of the ranking.

are clear differences in the various factors that make up the overall performance rating. Private universities outperform public universities in teaching (9 points higher), while public universities outperform private universities in research and innovation (48 points).[7] Public universities show greater heterogeneity in the ranking by volume (not adjusted for size) than by performance (adjusted for size), while private universities show the opposite effect, as they are all small in size but very uneven in quality. With regard to the breakdown of the indicator between teaching and research/innovation in both sectors (public and private universities), the greatest heterogeneity in performance occurs with regard to the research/innovation dimension. The heterogeneity is particularly high for private universities.

3. Public and private universities: Employability and salaries

In addition to the quality of universities, students are also interested in the opportunities provided by educational institutions to improve their employability and their prospects in the labor market. Surveys have long shown that most students go to university to improve their employability (García Montalvo, 2001). Therefore, in order to complete the analysis, it is important to analyze the employment prospects of university graduates once they have completed their studies, from the perspective of the public or private ownership of universities.[8]

The latest data from the social security system, referring to graduates from 2017-2018, show that graduates from private universities achieve better integration in the labor market than their counterparts from public universities: there is a higher percentage of affiliates (72.8 *versus* 60.0%), they have a higher average contribution base, which reaches 31,866 euros, exceeding by 2,975 euros the base of graduates from public universities. The percentage of self-employed is almost twice as high in the group of graduates from private universities: 11.7% compared to 6.6% for public university graduates. This difference explains, at least in part, why the share of permanent contracts is

[7] In the *ranking* of universities by research the first private university in position 15.

[8] In the last 25 years, there has been a clear progress in the availability of information on the labor market insertion of university students beyond general labor market surveys such as the Labor Force Survey. The first specific survey, whose questionnaire is still the standard for most labor market insertion surveys in Spain, is part of the European CHEERS project (1999). The Agency for the Quality of the Catalan Higher Education System adopted a questionnaire almost identical to CHEERS and has been conducting job placement surveys every three years since 2019. In 2014, the first exploitation of social security data was published for university graduates from the 2009-2010 academic year, which continues to this day. Finally, the INE has also conducted two surveys on the insertion of university graduates: the EILU (2014), which refers to graduates of the 2009-2010 school year, and the EILU (2019), which refers to graduates of the 2013-2014 year.

higher among public university graduates (62.8% compared to 59.4%). Finally, private university graduates have a much higher rate of matching between occupation and level of study than public university graduates: 72.8% of the graduate group are employed, compared to 60% of public university graduates. The situation is similar for master's graduates. Graduates from private universities have a higher contribution base, a higher proportion of self-employed, less mismatch between education and employment and, in this case, even a higher proportion of permanent contracts.

The information provided by the social security data shows that graduates and master's degree holders from public universities achieve a much more satisfactory integration into the labor market.[9] However, a proper analysis of the effects of graduating from a private *versus* a public university requires a number of controls that could explain other differences beyond the ownership status of the university. For example, the most important factor in the labor market integration of university graduates is the specific degree they obtained. The employment rate for Electrical Engineering graduates is 97.5%, with 78.8% of graduates earning more than €1,500. In Art History, the employment rate is 65% and only 25.4% of graduates earn more than €1,500. Private universities have a greater specialization in degrees with higher professional opportunities, therefore this specialization may explain why private university graduates are more employable, which would have nothing to do with the type of ownership of the institution.[10] The higher socioeconomic level of the families or their contacts may also favor the employability of graduates from private universities.

Taking into account all the factors that can affect the employability of graduates beyond the type of university ownership, it is fitting to study the value of the type of university ownership in relation to the other factors. Therefore, for a more detailed analysis of the relative employability and job quality of graduates from public and private universities, we should use data from the INE (Spanish Statistics Institute) survey (EILU) in 2019. The population scope of the survey is university graduates and university masters graduates in the school year 2013-2014. The theoretical sample includes 42,321 university graduates and 17,624 master's graduates.

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[9] A great advantage of Social Security information is that it allows us to analyze the population as a whole. However, these data also have important limitations. First of all, it does not take into account graduates working abroad or those working in Spain who are not affiliated to the social security system but to a mutual insurance company.

[10] This explanation is mitigated by the fact that, conditional on having studied the same degree, graduates of many private universities are ranked first, as shown by the analysis of the Social Security data by degree. See the synthetic indices in Pérez and Aldas (2023).

In principle, there are a number of factors that can affect employability and job quality. In this section, we analyze three factors: the probability of having a job at the time of the survey, the probability of having a high salary, and the probability of having a job suitable for a university graduate.[11] Among the factors considered are socioeconomic determinants; characteristics of the university where the graduate studied, the activities undertaken during the years of study, and the degree chosen; the geographical area of residence; and the type of job search[12]. Finally, we developed an analysis focused on the added value that each degree contributes to the employability rate and salary at the time of the survey.

It is important to control all factors that may be correlated with the type of ownership of the higher education institution and whose absence may channel their impact through the coefficient of public or private university ownership. First, there is a perception that students who attend public universities tend to have better academic performance. The survey does not include a specific question on high school grades or university entrance exam grades, but it can be estimated by access to an excellence scholarship. Second, the cost of tuition at a private university is much higher than at a public university, so the socioeconomic level of the family is also very relevant. There is also no indicator for family income, but it is common to estimate this variable with the parents qualification level. In particular, it is traditional to use whether the mother has a university degree.[13] Third, it is important to control the type of degree taken, as this is the most relevant factor for the employability and quality of employment of college graduates. For example, Kirkboen *et al.* (2016) use a very detailed database of the Norwegian higher education system to analyze the effect of degree choice. These authors find that different fields of study have very different labor market returns, even conditional on the institution and the academic level of peers. The bias of private universities toward offering degrees with higher employability could confound the effect of degree with type of ownership. Fourth, the geographic factor is relevant as it is well known that there is a wide dispersion of employment and unemployment rates across regions. Finally, it is also interesting to control the method of job search, since, as noted above, one possible explanation for the better employability of graduates from private schools is their families influence to use their contacts to facilitate the job search.

[11] Pérez and Aldás (2023) also analyze the probability of being employed in the same field of study. Other indicators of employability would be the time to find the first job, the probability of having a full-time permanent job, etc.

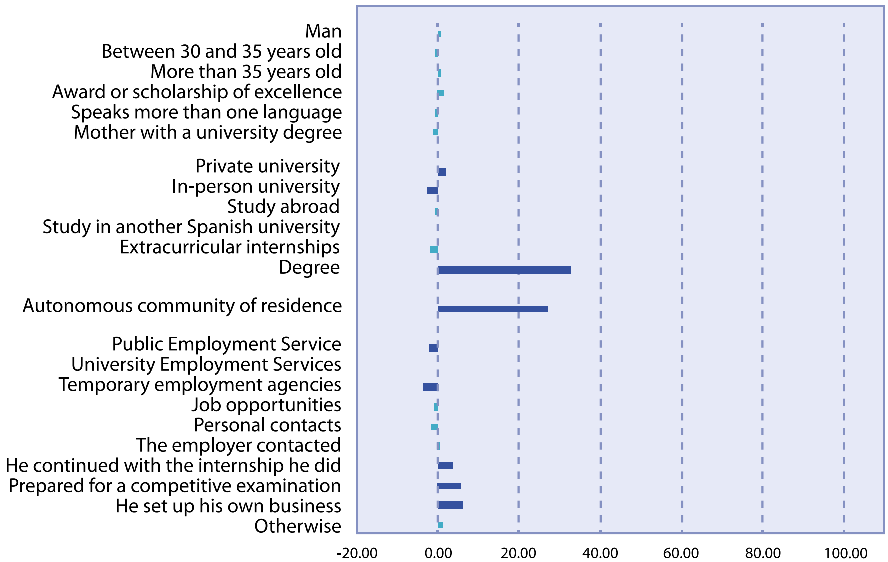
[12] The variables are basically the same as those used by Pérez and Aldás (2023), with the inclusion of variables that estimate the socioeconomic level of the family.

[13] Other definitions, such as the father having a university degree or both parents having a university degree produce the same results qualitatively.

Panels A, B and C of Figure 5 show that, among the demographic variables, only gender has a significant effect on the probability of having a salary equal to or greater than 1,500€. As expected, age also has an increasing effect on wages. Receiving a scholarship linked to academic performance has no effect on employability, but has a positive effect on net income above 1,500€ (7.8 pp) and on job aptitude (4.96 pp). Educational attainment is the most important variable in all three estimates. The range of variation in the employment rate is between 32.6 pp and 76.25 pp in the case of net income of more than 1,500€ and 52.94 pp in the case of educational attainment and occupational aptitude. Another decisive factor is the place of residence. The range of variation of the effect of this variable ranges from 27 pp for the probability of being employed to 42 pp for the probability of earning more than 1,500€ net and 12 pp for the match between educational level and job. Finally, personal contacts do not seem to be a particularly successful procedure for the employment outcome of university graduates. They have no effect on the probability of being employed or adequately trained for the job and have a negative effect (-3.5 pp) on the probability of earning more than 1,500€ net per month.

FIGURE 5

PANEL A. DETERMINANT FACTORS FOR THE PROBABILITY OF HAVING A JOB

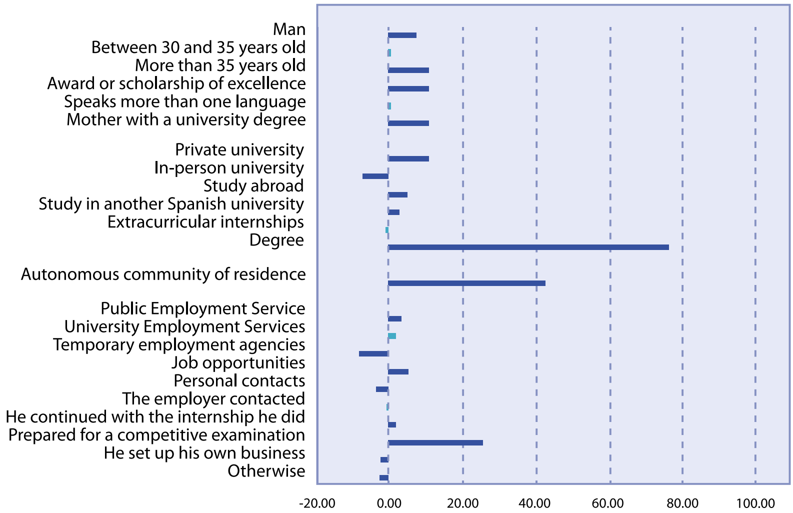


Note: Marginal effect on the probability of finding employment. The effects of variables that are statistically significant at 5 per cent are shown in dark blue.

Source: EILU (2019) and preparared by the authors.

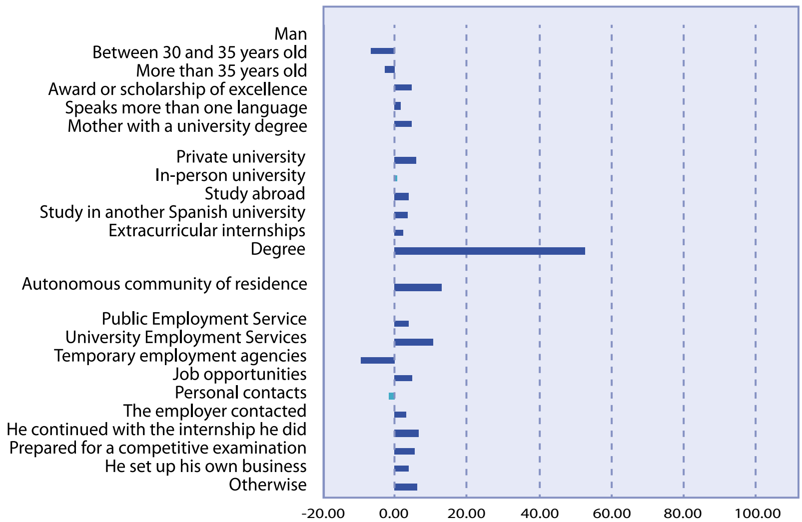
FIGURE 5 (*continued*)

PANEL B. DETERMINING FACTORS FOR HAVING A SALARY HIGHER THAN 1,500 EUROS



Note: Marginal effect on the probability of earning more than €1,500 net per month. The effects of variables that are statistically significant at 5 per cent are shown in dark blue.
Source: EILU (2019) and preparared by the authors.

PANEL C. DETERMINING FACTORS FOR HAVING A LEVEL OF EDUCATION THAT IS IN LINE WITH, OR LOWER THAN, THE POSITION REQUIRES



Note: Marginal effect on the probability of having a job-matched educational attainment level or below. In dark blue are the effects of variables that are statistically significant at 5 per cent.
Source: EILU (2019) and preparared by the authors.

Taking all the above factors into account, having studied at a private university has a positive added value in all the dimensions analyzed. It increases the probability of being employed by 1.9% age points, the probability of earning more than 1,500€ per month by 8.2% age points, and the probability of having a job-related education by 6.1 pp.[14] Certainly, the effect of pursuing university studies in a public or private institution is small compared to the effect of selecting a particular field of study[15] although it is still relevant given that, for the same degree, private universities provide a plus in employability.

4. Public and private universities: Employability and salaries by type of degree

Following the evidence presented, which shows that the degree seems to be the most important factor explaining a larger percentage of the differences in labor market success, the analysis is extended to the degree level. Figure 6 shows the distribution of salaries in the degrees with the highest number of students in various fields of study by type of university ownership. This graph shows, firstly, that not all degrees have the same distribution of salaries, with History having the lowest number of graduates with high salaries and degrees such as Law and Computer Science having the highest. When the distribution is broken down between public and private universities, degrees from private universities tend to appear more at the top of the salary distribution than those from public universities. These differences may be due to several factors that are directly related to the selection of students into public and private universities, such as the income level of parents, the Autonomous Community of residence, or the method used to seek employment. To attenuate such statistical selection, we calculate the value added of each degree by public and private ownership, using the standard methodology in the literature on school or teacher value added (*e.g.*, Chetty *et al.,* 2014). The analysis consists of calculating the fixed effects of the degree-type of ownership on labor market success, measured by employability and wages, controlling for those factors that may be directly correlated with such success, such as academic excellence, socioeconomic factors, nationality, geographic area, or type of job search.

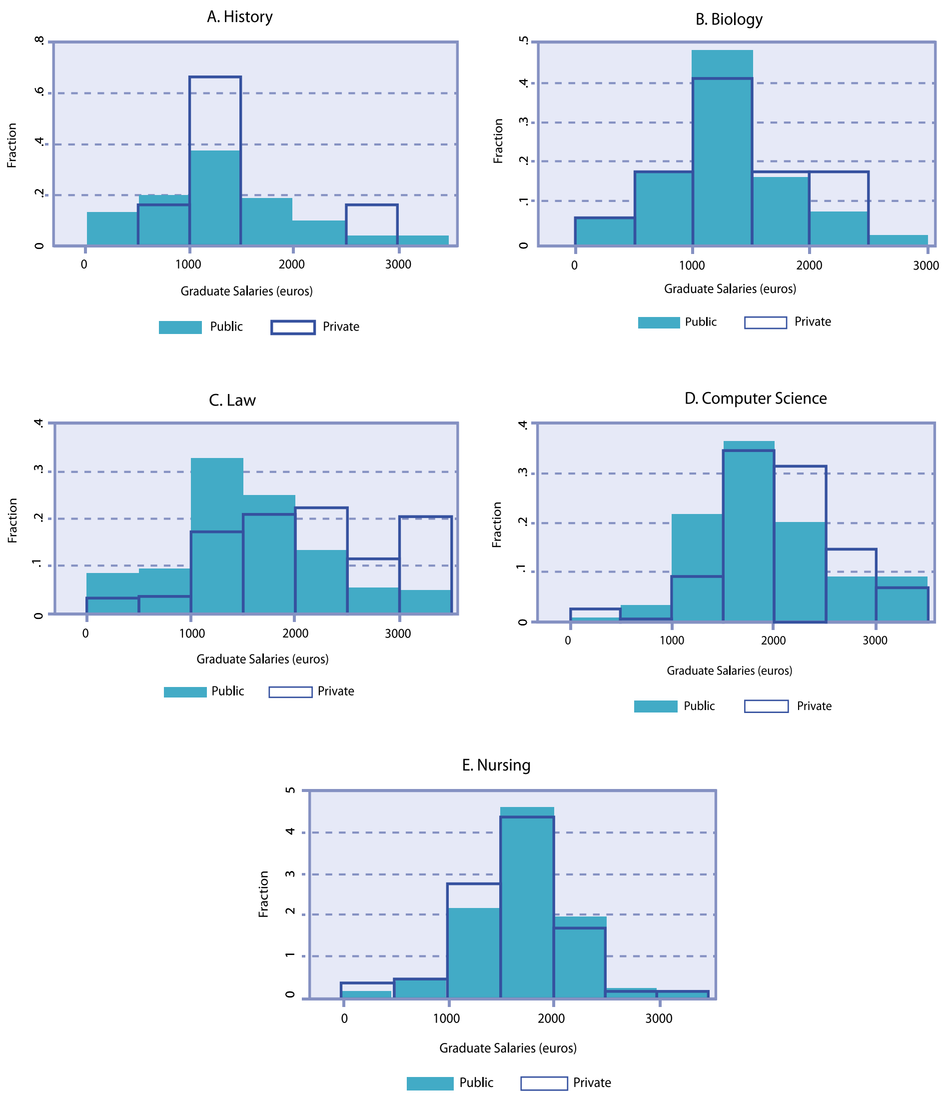
Figure 7 shows the distribution of the value added of all degrees by field of study. The graph shows that Engineering and Architecture and Health Sciences have the highest value added in terms of employability in the labor

[14] It also has an additional positive effect on having a job matched to the field of study. Pérez and Aldás (2023) show that a similar model leads to improved employability, salary, and adjustment of master's graduates in private versus public universities.

[15] Kirkboen *et al.* (2016) shows the same result.

FIGURE 6

DISTRIBUTION OF SALARIES IN THE FIVE DEGREES WITH THE HIGHEST NUMBER OF STUDENTS BY FIELD OF KNOWLEDGE AND BY PUBLIC/PRIVATE UNIVERSITY

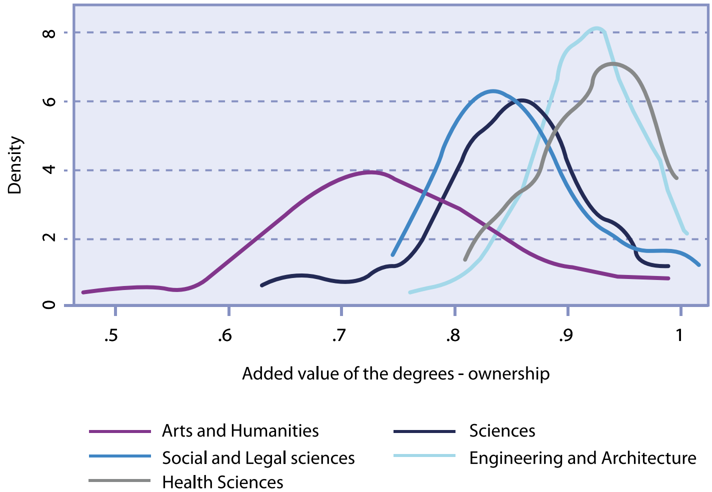


Source: EILU (2019) and prepared by the authors.

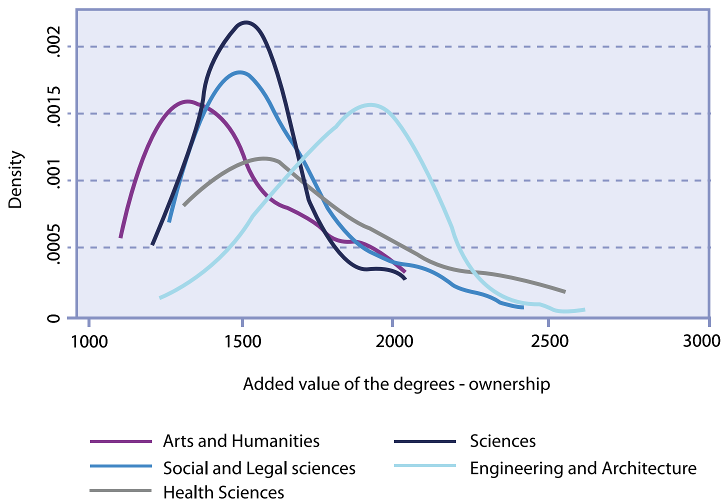
FIGURE 7

DISTRIBUTION OF THE ADDED VALUE OF THE DEGREES IN EMPLOYABILITY AND SALARIES DIVIDED BY SPECIALTY

PANEL A. EMPLOYABILITY



PANEL B. WAGES



Source: EILU (2019) and prepared by the authors.

market, while Arts and Humanities are at the bottom of the distribution and also have the highest dispersion. In terms of salaries in the labor market, Engineering and Architecture are the fields with the highest added value, while Arts and Humanities are at the bottom of the distribution. The differences between fields of education are very large. For example, the difference between the median degree in Engineering and Architecture and that in Arts and Humanities is 18 percentage points in terms of employability and about 500€ net per month (6,000€ per year).

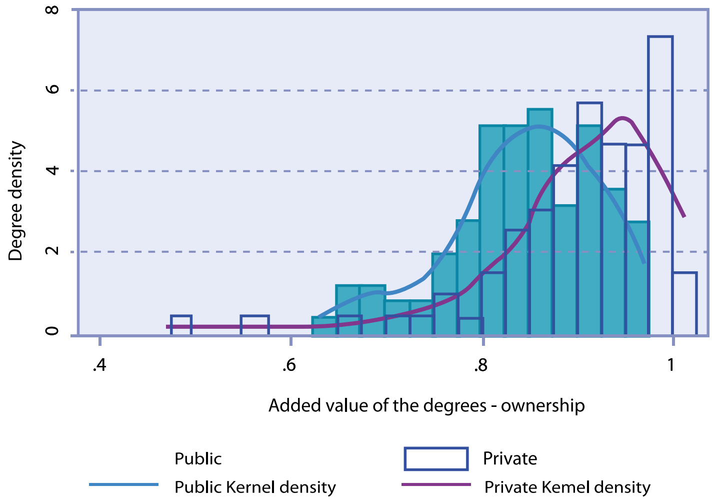
Figure 8 shows the distribution of the value added of degrees in terms of employability (panel A) and wages (panel B), broken down by public and private universities. The figure shows suggestive evidence that the distributions of degree value-added of degrees in private universities are centered around higher values of employability and wages compared to public universities. This suggestive evidence is statistically supported calculating the Kolmogorov-Smirnov test of equality of distributions, whose null hypothesis of equality of value-added distributions between public and private universities is rejected with high statistical significance. Although the value added is higher in private universities than in public universities, the mean and median differences are relatively small. On average, a degree from a private university has a higher value added than a degree from a public university by 5 points of employability and by 184€ per month (2,208€ per year). Moreover, the dispersion in the distribution of private degrees is 20% higher than that of public degrees, showing that there is greater heterogeneity in private universities. This evidence confirms the results presented in the previous paragraphs: degrees from private universities tend to provide a plus in employability and salaries compared to public ones.

This can be explored in more detail by analyzing the heterogeneity by degree of this aggregate statistic. The first analysis to be developed is by field of specialization. In terms of employability, the Kolmogorov-Smirnov test for equality of distributions does not allow us to reject the null hypothesis of equality of distributions of value added between public and private universities for the fields of Arts and Humanities and Health Sciences. Therefore, the differences in employability between public and private universities are concentrated in the fields of Science, Social and Legal Sciences as well as Engineering and Architecture. The picture is different for salary levels. The distribution of value added between public and private universities is equal for degrees in Engineering and Architecture and Health Sciences. Therefore, the differences in salaries between public and private universities are concentrated in degrees related to the fields of Science, Social and Legal Sciences, and Arts and Humanities.

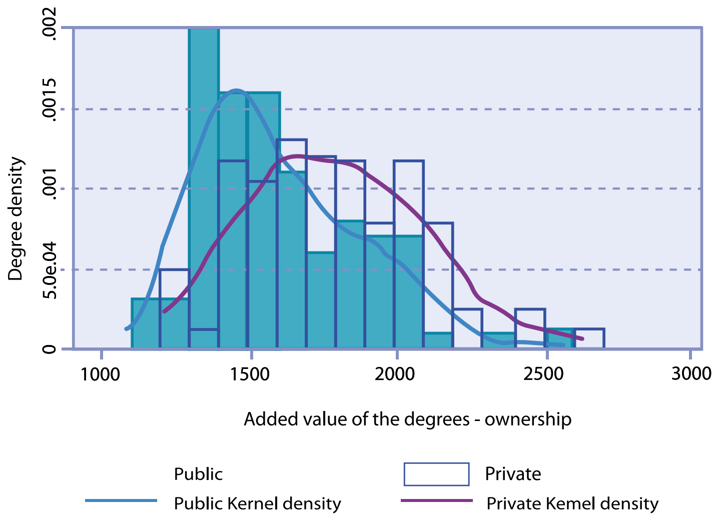
FIGURE 8

DISTRIBUTION OF THE ADDED VALUE OF THE DEGREES IN EMPLOYABILITY AND WAGES DIVIDED BY PUBLIC/PRIVATE UNIVERSITY

PANEL A. EMPLOYABILITY



PANEL B. WAGES



Source: EILU (2019) and prepared by the authors.

The second analysis is by type of ownership at the top of the value-added distribution. In terms of employability, of the seventeen degrees in the top 10% of the distribution, all are taught in private universities. The degrees with the highest value-added in terms of employability are "Finance and Accounting", "Industrial, Chemical, and Environmental Engineering" or "Finance and Actuarial Science". In terms of salaries, of the eighteen degrees in the top 10% of the distribution, twelve are taught in private universities and six in public universities. For private universities, the degrees that add the most value to salaries are "Materials and Textile Engineering" and "Financial and Actuarial Science". For public universities, the degrees that add the most value to salaries are "Medicine," "Nautical and Maritime Transport," and "Dentistry".

The third analysis is by type of ownership at the bottom of the value-added distribution. In terms of employability, of the 17 degrees in the bottom 10% of the distribution, eleven are taught in public universities and six in private universities. The degrees that provide the least value added in terms of employability are taught in private universities and are "Philosophy" and "History". The degrees with the lowest added value for employability in public universities are "Communication" and "Conservation and Restoration". In terms of wages, of the seventeen degrees in the top 10% of the distribution, twelve are taught in public universities and five in private universities. For private universities, the degrees with the lowest added value to salaries are "Marine Sciences" and "Philosophy". For public universities, the degrees with the lowest value added to salaries are "Archaeology" and "Fine Arts".

The differences between low and high value-added degrees are very significant. The difference in salaries between the degree with the highest added value ("Materials and Textile Engineering" in private universities) and the lowest ("Archaeology" in public universities) is 1,529€ net per month (18,348€ per year). In terms of employability, the difference in employability between the degree with the highest added value ("Finance and Accounting" in private universities) and the one with the lowest ("Philosophy", also in private universities) is 53.3 pp.

5. Public and private universities: Discussion

What happens in other countries when private and public universities are compared? United States is the most studied country. Dale and Krueger (2002) analyze the profitability of attending more selective universities in contrast to other comparable but less selective universities. Using a regression with control variables observed by the researchers, they find that the profitability of more selective universities is higher. However, when Dale and Krueger (2002,

2014) correct admission decisions based on students' latent skills and other factors, the results show that attending a more selective college in the United States has little effect on graduates' future earnings. Chetty *et al.* (2023) use a similar methodology and find results consistent with Dale and Krueger (2002): graduates of extended Ivy League universities do not have higher earnings than those who attended a good public university. However, they are more likely to be in the top 1% of the income distribution. Chetty *et al.* (2023) find that there is no heterogeneity in the causal effect of attending an extended Ivy League college *versus* a good college in terms of parental income, SAT scores,or other characteristics of applicants for admission. In contrast, Dale and Krueger (2002, 2014) find that students from low-income families achieve higher returns at highly selective colleges, even after controlling for unobservable student characteristics. In the Spanish case, as shown in the previous figures, the internal rate of return of university education is below the OECD and EU average, but still quite high. Thus, in Spain, as in most countries, there are high private incentives for students to invest in higher education.

A paradigmatic case of very high return of education is the United States. But, are there differences between good private and public universities? Chetty *et al.* (2023) analyze the effect of admission to the best US private universities: Ivy League (Harvard, Princeton, Yale, Cornell, Columbia, Pennsylvania, Brown and Dartmouth College) plus MIT, Stanford, Duke and Chicago. These universities are attended by 0.5% of U.S. students, but their graduates occupy 11.6% of Fortune 500 CEO positions, 41% of presidents (since 1960), 71.4% of Supreme Court justices (since 1963), and 26.1% of *New York Times* and *Wall Street Journal* journalists. The authors of the study (Chetty *et al.*, 2023) compiled five large databases, including income tax returns of parents and children, scholarships and loans received, SAT/ACT scores as well as application and admissions records. The study confirms a well-known finding: attending a highly selective private college has little effect on average future earnings compared to attending a selective public college. However, students who choose and are admitted to a highly selective private college rather than a good public college are much more likely to be in the top 1% of the income distribution and to work for a prestigious company.

The most concerning part of the study is that for the same admission grade, the probability of admission for a high-income family is more than double (triple if in the top 1% of income) that of a middle- or low-income family. At the most selective public universities, the probability of admission is independent of family income. What explains this higher probability of admission for students from high-income families? 20% is due to the fact that, given the same admission grades, a higher proportion of students from high-income families apply to these universities. Twelve percentage is explained by the higher probability of enrollment, once admitted, of students from high-income families. But the remaining 68% is explained by a higher admission rate of students from high-income families due to the use of criteria other than admission grade (being a descendant of a student, being an athlete, or having non-academic credentials such as extracurricular activities, etc.). The authors argue that eliminating these three criteria would produce socioeconomic diversity similar to the effect of racial preferences, recently challenged by the Supreme Court, on racial diversity. Moreover, since admission grades are the most important determinant of average future earnings, this change in admissions policy would have an obvious social benefit.

In a recent study, Barrios-Fernandez *et al.* (2021) combine five decades of data on parents and children in Chile with a discontinuous regression design to show that, in the long run, elite universities help talented students from modest backgrounds join the social elite and help current members of the elite maintain their positions. When low-status individuals gain admission to elite colleges, they transform the social environment of their children. Their children are 21% more likely to attend high-status private schools and 8% more likely to attend elite universities. They live near high-status peers and are more likely to befriend them. However, parental admission to an elite college does not improve children's academic performance in high school or on university entrance exams. Parental exposure to high-status peers in the social and marriage market, rather than to high-achieving peers, is a key mediator of the offspring effects. This paper shows that elite universities simultaneously strengthen the link between social capital and human capital and increase the persistence of elite social capital across generations.

V. THE POLITICAL ECONOMICS OF UNIVERSITY PRICES

The level of tuition fees or even whether university education should be completely free is a matter of considerable political debate. Any attempt to raise tuition fees, even if it is aimed at higher-income families or at graduates with higher salaries at the end of their studies, meets with considerable public opposition in most countries. How can this opposition be explained if excessive public subsidies can have regressive effects? The aim of this section is to comment on the political economics aspects of university pricing.

The first section discussed how a shift in financing to systems of loans contingent on future earnings or taxes paid only by graduates would lead to improvements. For example, in the case of the Nordic countries, whose high level of tax-financed subsidies to the population as a whole makes it a very regressive system, a shift to loans contingent on future wages or taxes on graduates would reduce regressiveness (it prevents graduates who do not benefit from university education from financing those who do) and provide insurance by reducing moral hazard during studies. At the opposite extreme, in countries with very high private contributions, loan restrictions may exclude good students from low-income families from higher education. Again, a system of conditional loans or graduate taxes would have clear advantages (*e.g.*, insurance against ignorance of the impact of higher education on future earnings), although in some cases these advantages need to be balanced against the potential regressive impact of the change.

Given the evidence of efficiency and equity gains from increasing the weight of conditional loans and graduate taxes over traditional approaches (subsidies and private funding), it is difficult to understand why so few countries have moved in this direction. The exceptions are the Netherlands, Hungary, New Zealand, the United Kingdom and Australia. The latter two have introduced a system of loans linked to future earnings, along with an increase in tuition fees. Azmat and Simion (2020) show that in the case of the United Kingdom, the gradual shift from a system of tax-paid free tuition to a system of high tuition fees supplemented by income-related grants and contingent loans had no negative impact on the participation of students from disadvantaged families, with a very limited effect on degree attainment and university choice.

Murphy *et al.* (2019) shows for the case of England that the transition from a system of nearly free public universities to one with the highest prices in the world led to an increase in funding per student and an increase in enrollment, with no effect on the participation of disadvantaged students. The authors argue that, unlike in other countries, because price increases are delayed[16] based on the future earnings of graduates, the observed results are those expected from an ICL system. In the case of Australia, Chapman and Ryan (2005) show that the shift to the ICL system did not reduce participation in the tertiary education system in general, even among students from lower-income families.

Although empirical evidence shows that the shift to ICL systems does not lead to a decline in enrollment among the most economically disadvantaged groups of students, the political economics of university funding limits the expansion of these systems. Indeed, many political parties in some countries that have raised tuition fees in the wake of the financial crisis, with its subsequent impact on public budgets, are proposing a return to almost fully subsidized tuition. The seminal work of Fernandez and Rogerson (1995) shows

[16] Students pay no tuition when they enroll and receive generous tuition assistance during their studies.

how a coalition of the middle and upper classes may prefer to keep subsidies high so that the less advantaged classes cannot access university (because of loan constraints or the opportunity cost of time devoted to studying), but pay through taxes the subsidies from which university students benefit.

Empirical evidence on the determinant factors of voters' preferences on university funding is scarce. An important element of preferences is the information available and its degree of truth. Recently Lergetporer and Woessmann (2023) show the results of representative experiments in which information on university salaries, public tuition subsidy and unequal access to university as a function of family socioeconomic status is provided to a sample of individuals in Germany. The German case is particularly interesting since the Federal Constitutional Court ruled in 2005 that the ban on tuition fees at public universities was unconstitutional. Thereafter, seven states introduced fees at their universities[17]. However, subsequent student protests and public opposition from some political parties ended tuition fees in these states between 2010 and 2014. Lergetporer and Woessmann (2023) show that voters are divided on the use of tuition fees, with a majority opposed. However, there is ample evidence that the public has misconceptions about many policies and providing factual information can change policy preferences. After Lergetporer and Woessmann (2023) provided respondents with information on the wages earned by college graduates *versus* vocational graduates, support for the use of tuition fees increased by 7% percentage points, enough for a majority to shift to favoring fees. However, providing information on the fiscal cost of subsidizing university education or on inequality of access to university had no effect on public preferences.

Lergetporer and Woessmann (2022), using an experimental methodology like the previous study, show that replacing tuition fees with a payment contingent on the graduate's future earnings increases support for tuition fees by 18 percentage points, to a clear majority (62%) against those opposed.

VI. INFORMATION, PREFERENCES AND SATISFACTION WITH UNIVERSITY FINANCING IN SPAIN

The previous section described several surveys that attempt to describe how the information available to voters affects their preferences regarding the price of university tuition. In this section, we analyze a survey available for the Spanish case that attempts to answer the same questions, although the approach is not experimental.

[17] Approximately 500 euros per semester.

The literature on access to higher education suggests that differences in tuition fees between high- and low-income families may be due to decisions that deviate from the classical economic decision-making model. There are several frictions in the university application process that distort students' choices. Factors such as lack of information about university costs, present bias, debt aversion, and the influence of default routines and options on decision making are particularly critical for low-income students, especially in complex and uncertain contexts such as the admission process and the grant and scholarship system. In such circumstances, even small changes in the way the information is presented or the options are structured can have a significant impact on the decisions these students make. These dynamics highlight the importance of designing educational interventions and policies that take into account these psychological and behavioral factors to improve equity in access to higher education.

It is therefore necessary to determine the level of information that students have about university financing and, given this, their preferences regarding the cost of tuition or the level of grant subsidy. In order to shed some light on these issues, we used a survey on perceptions of university costs conducted among students in Catalonia in February 2017. The survey consisted of 1,607 students, 57% of whom were female, with an average age of 21.4 years, and 51% of whom had a parent with some type of higher education qualification.

1. Information

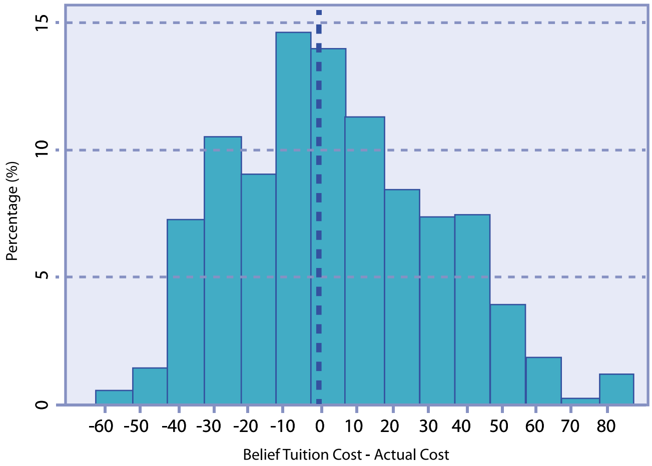
First, we analyze the discrepancy between students' beliefs about the cost of university that they finance and the reality. To do this, we use question 14 of the survey, which asks: *What percentage of the total cost of your program (the sum of what you pay as a student and what the administration pays) do you think the tuition you pay covers?* To determine the actual cost paid by the student, we use individual student data on the program in which they are enrolled and the cost they paid per credit enrolled. To this information we add the actual cost per credit for each degree, depending on the number of times they were enrolled in a subject, using the Catalan public prices for 2016-2017.[18] With this information, we created a variable consisting of the difference between the belief about the cost of enrollment and the actual cost we estimated.Panel A of Figure 9 shows the distribution of responses relative

[18] The source is the statistics of public university prices of the Spanish Ministry for Education, Culture and Sports. Public prices in Catalonia vary according to the number of enrolments per subject (common throughout Spain), and three specialties. Specialty 1 is Engineering, Architecture and Health Sciences. Specialty 2 is Science degrees. Specialty 3 is Arts and Humanities, Social and Legal Sciences. The actual cost per credit depending on the specialty and the number of enrolments is regulated by Law 4/2012.

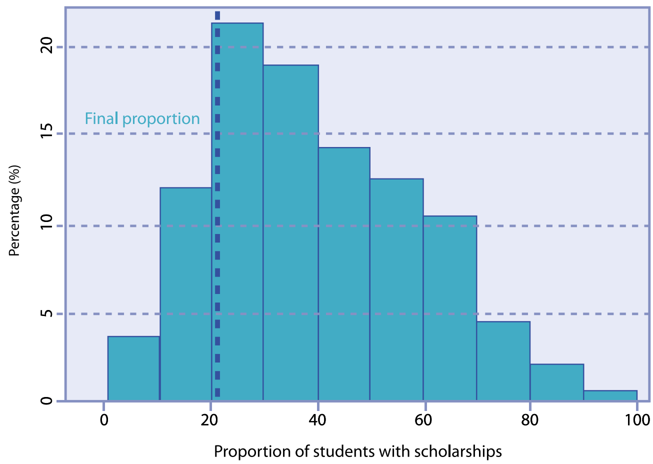
FIGURE 9

BELIEF OF UNIVERSITY COST FINANCED BY STUDENTS AND PROPORTION OF STUDENTS RECEIVING SOME KIND OF SCHOLARSHIP VS. ACTUAL DATA

PANEL A.



PANEL B.



Source: Own elaboration.

to reality. The results show that only 14%, 31%, and 50% of students predict the cost of college with an error interval of 5 pp, 10 pp, and 20 pp, respectively. Thus, this graph indicates that their understanding of the actual cost of college tuition is not very accurate. This provides suggestive evidence of a significant lack of information about the cost of university.

Question 18 asks about students' understanding of the proportion of students who receive financial aid to attend university: *What proportion of university students do you think receive some kind of grant or public aid to pay for their university studies in Catalonia?* Panel B in Figure 9 shows the distribution of answers. On average, students think that 36% of university students receive some type of aid or grant, while the proportion in Catalonia provided by the Ministry of Education for 2016-2017 is 21%.[19] The results show that only 27%, 49%, and 69% of students predict the proportion of students with scholarships with an error interval of 5 pp, 10 pp, and 20 pp. Although these results are not directly comparable to those in Panel A, these results seem to indicate that the information students have about the proportion of students with scholarships is not very accurate, but is slightly higher than their understanding of tuition fees.

2. Preferences

The first question on preferences analyzed is the subjective assessment of the price of tuition. Question 13 provides information about how expensive is the cost of tuition by asking students: *What do you think about the price you have to pay to study at this university?* Students can answer on a scale of 1 to 5, where 1 is "very high" and 5 is "very low". Panels A and B of Figure 10 show the distribution of responses by the socioeconomic level of the student (High SES refers to when at least one of the student's parents has some type of higher education, and Low SES represents the rest) and whether or not they applied for a scholarship in the school year.[20] The graph shows that the vast majority, 77% of students, find the price of tuition "High" or "Very High." A minority of 5.5% of students find the price of tuition "Low" or "Very Low". Students of lower socioeconomic status seem to have a slightly greater tendency to have high scores, although no major differences are observed even when the sample is divided into students who applied for a scholarship and those who did not.

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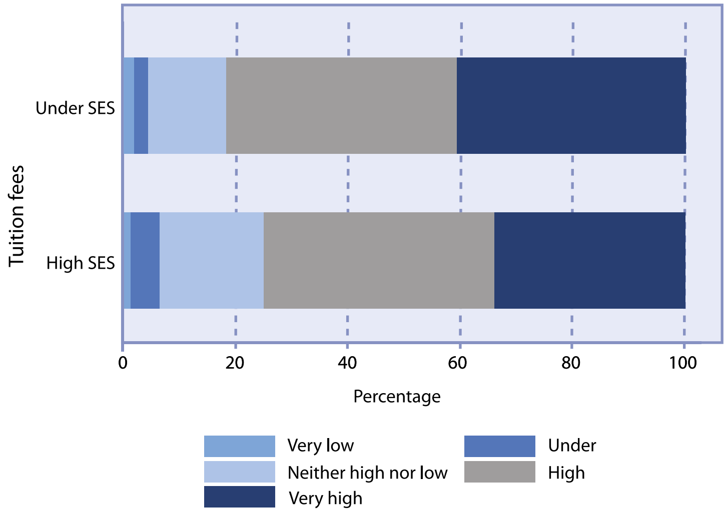
[19] Ministry of Universities (2019). Facts and figures of the Spanish university system 2018/19 (https://www.universidades.gob.es/wp-content/uploads/2022/10/Datos_y_Cifras_2018-2019.pdf).

[20] This variable is calculated using Question 11 which reads *Have you received/applied for any scholarship or aid this school year.* If the answer is "yes", the student is in the category of *Applied for Scholarship*, and if the answer is "no" in Did *not Apply for Scholarship.*

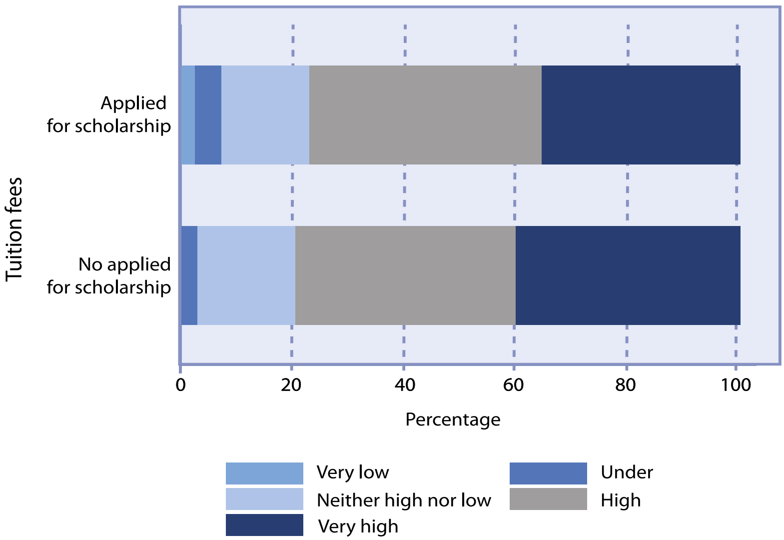
FIGURE 10

OPINION ON THE PRICE OF UNIVERSITY TUITION FEES

PANEL A



PANEL B

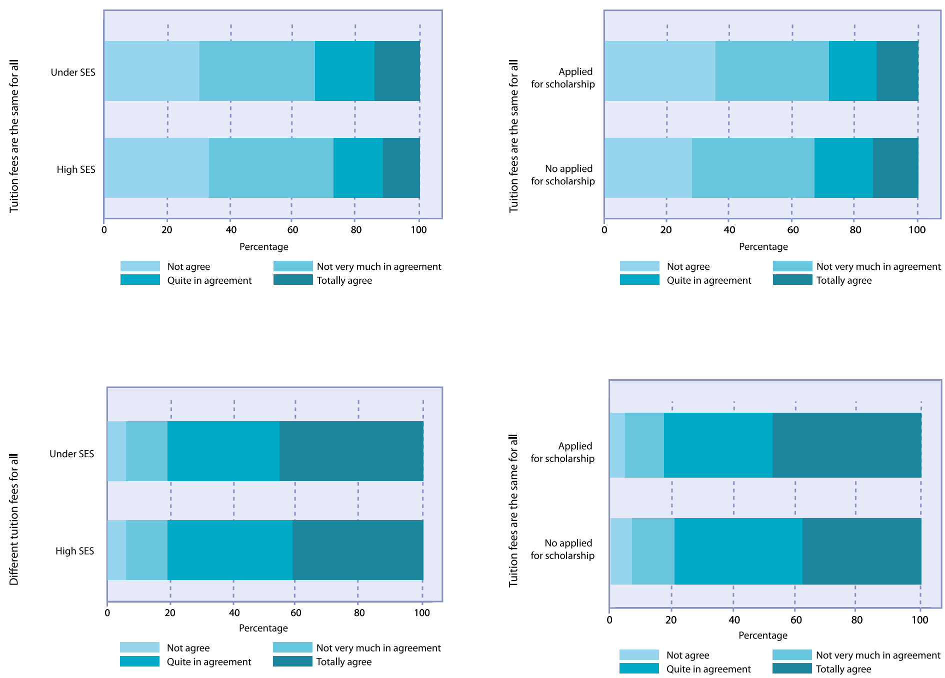


Source: Own elaboration.

The second question on preferences analyzed is the preference for the design of public university prices. Question 15, which is divided into two parts, provides information on students' preferences regarding how university costs should be distributed among students. Question 15, *"The price of university tuition should be"*, where students must answer two questions: *A) the same for all students; B) different according to the income of each family or student.* Students can answer from 1 to 4, where 1 represents the subjective value "strongly agree" and 5 "strongly disagree". Panels A, B, C, and D of Figure 11 show the distribution of responses by student socioeconomic level and whether or not they applied for a scholarship this school year. The results show strong support for a system of public prices in which an important distinction is made by income and not all students bear the same costs. Seventy percentage of students "strongly disagree" or

FIGURE 11

PREFERENCES REGARDING THE PRICE OF UNIVERSITY TUITION: EQUAL OR DIFFERENT ACCORDING TO STUDENT'S INCOME



Source: Own elaboration.

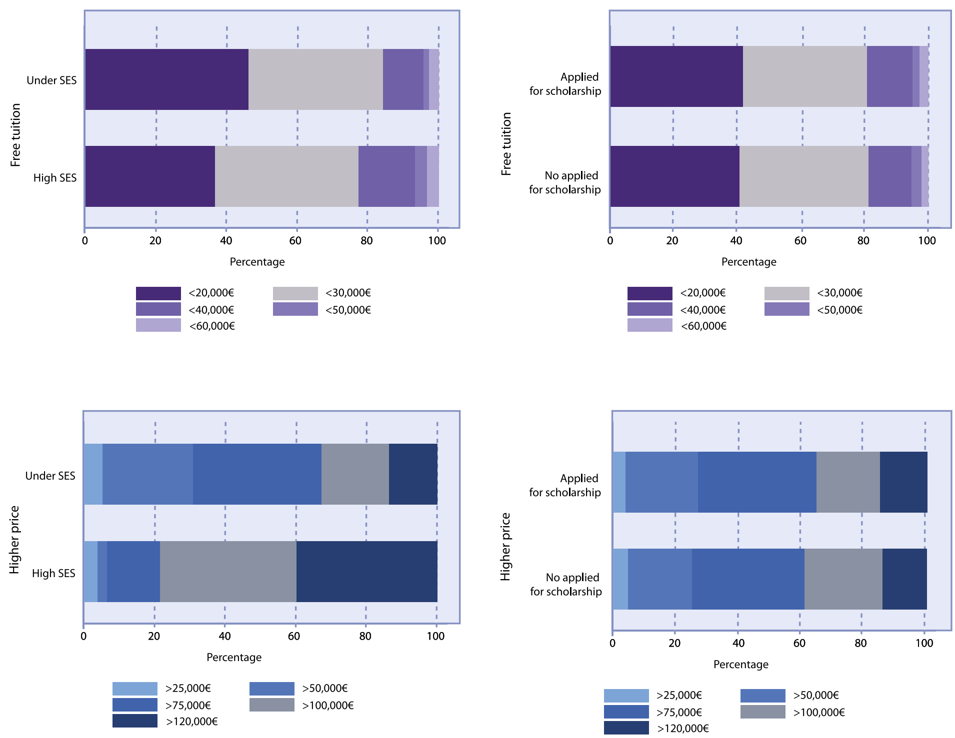
"somewhat disagree" with a pricing system that is equal for all, with slightly higher values for students of high socioeconomic status and those who apply for scholarships. Eighty % of students "strongly agree" or "agree" with a system of public prices that varies according to the income of each family or student. These results indicate clear student support for a more progressive system of financing tuition.

The third question on preferences that was analyzed is the preference on which level of family income should be considered as the threshold to be eligible for full tuition subsidy and above what income the family should pay the higher tuition fees.

Question 16 asks students, "At what annual family income, for example, do you think tuition should be free for a family of 4? Students can answer from

FIGURE 12

PREFERENCES ON UNIVERSITY TUITION FEES: EQUAL OR DIFFERENT ACCORDING TO STUDENT INCOME



Source: Own elaboration.

1 to 5, where 1 means "< €20,000" and 5 means "< €60,000". In 2016/17, the threshold for obtaining free tuition by applying to the National General Scholarship Program was €38,831 for a family of 4 members. Panels A and B of Figure 12 show that this threshold is supported by 95% of the students surveyed, who set free tuition at €40,000. However, the majority of students are stricter when it comes to a general subsidy. 80% of the students surveyed are in favor of a full tuition subsidy if the family income is less than 30,000 euros per year for a family of four, and 42% if the family income is less than 20,000 euros per year. These figures are higher for students of low socioeconomic status, and virtually identical for students who apply for a scholarship and those who do not. This 40,000 euros corresponds approximately to the average income distribution in four-member households (from Spain, 2017).

Question 17 asks students: *For the same family of 4 members, from what annual income do you think full tuition fees should be paid?* Students can answer from 1 to 5, where 1 is "> €25,000" and 5 is "< €125,000". Panels C and D of Figure 12 show that 73% of the students think that the highest fees should be paid starting at €75,000 per year. This value is slightly lower for students of low socioeconomic status and identical for students who apply for scholarships and those who do not. This €75,000 corresponds to about 10% of the income distribution of the highest income households in Spain (from Spain, 2017).

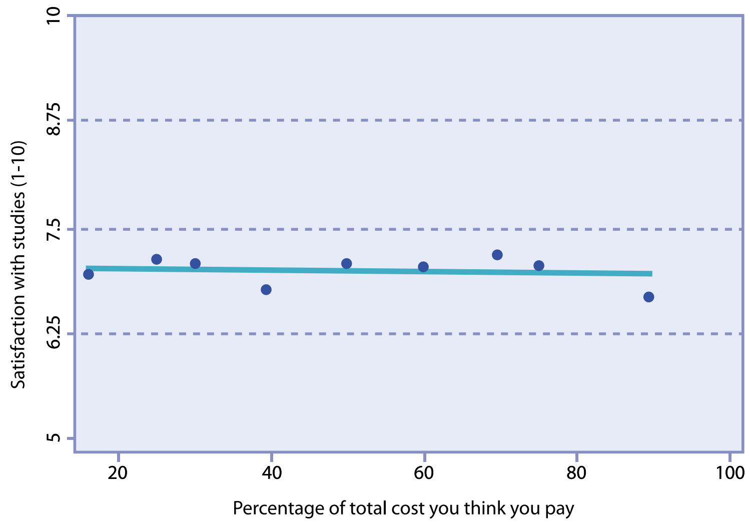
3. Satisfaction

Question 8 allows us to inquire about students' satisfaction with their studies. This question asks students *How satisfied are you with your studies? On a scale of 0 to 10, where 0 is completely dissatisfied and 10 is completely satisfied.* The majority of students show a relatively high level of satisfaction with their studies, scoring 7 out of 10. There are no significant differences between students of different socio-economic levels or between students who apply for scholarships. In addition, Panels A and B of Figure 13 show that there is no direct relationship between what students believe is subsidized tuition and satisfaction, and a positive correlation between student satisfaction and their beliefs about scholarship coverage. However, both what students believe is subsidized tuition and their beliefs about scholarship coverage appear to be directly related to their subjective assessment of the price of tuition. Panels C and D of Figure 13 show that the larger the percentage of the total cost that students believe is subsidized, the more likely they are to rate the price of tuition as higher (see Panel C). However, the more scholarship coverage students believe they have, the less likely they are to rate the price of tuition as high (see Panel D).

FIGURE 13

SATISFACTION WITH UNIVERSITY STUDIES VS. BELIEFS ABOUT UNIVERSITY COST AND SCHOLARSHIP COVERAGE

PANEL A. SATISFACTION AND BELIEFS ABOUT COST



PANEL B. SATISFACTION AND SCHOLARSHIP COVERAGE

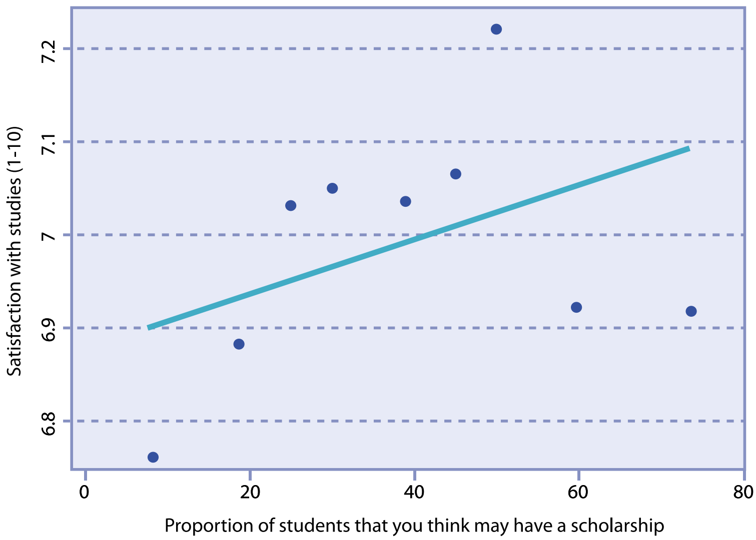
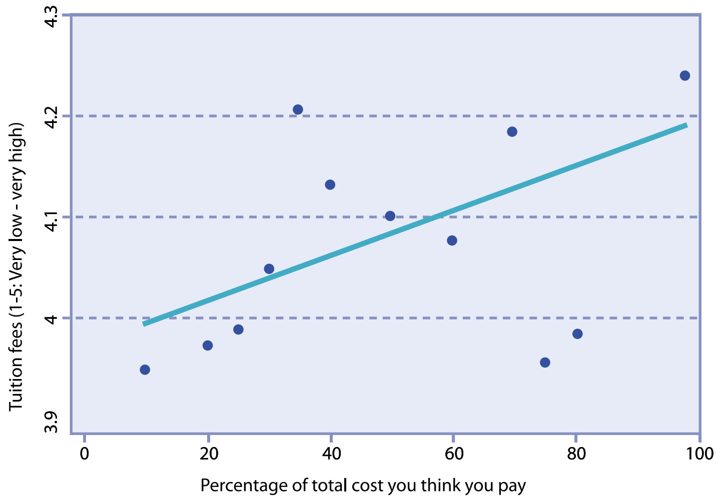


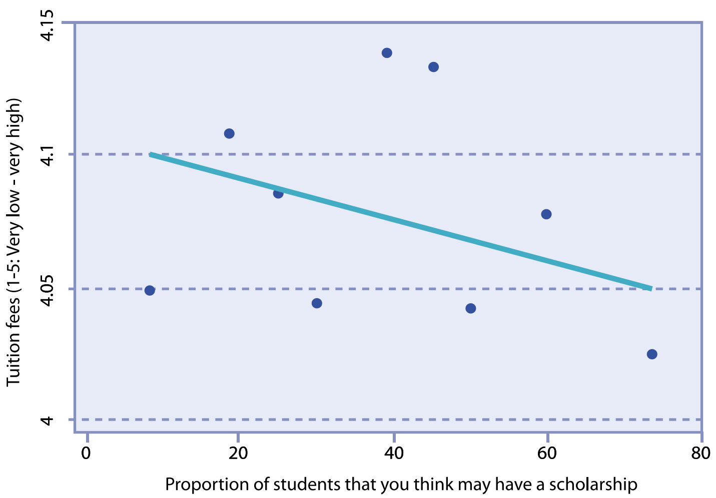
FIGURE 13 (*continued*)

SATISFACTION WITH UNIVERSITY STUDIES VS. BELIEFS ABOUT UNIVERSITY COST AND SCHOLARSHIP COVERAGE

PANEL C. TUITION PRICE AND BELIEFS ABOUT COST



PANEL D. TUITION PRICE AND SCHOLARSHIP COVERAGE



Source: Own elaboration.

VII. CONCLUSIONS

The participation of private funding in university prices is a subject of great political debate. The financing of public universities can take four forms: financing through taxes on the population as a whole; through taxes only on taxpayers who have obtained a university degree; through public or private loans; or through loans conditional on the income of graduates. From a theoretical perspective, loans based on graduates' income are generally the most efficient and equitable mechanism.

However, the political economics of university financing in many countries continues to favor regressive systems that use taxes collected from the middle and lower middle classes to finance the studies of young people from families with higher socioeconomic levels, who are the ones who make the most use of public university services. In other countries, the widespread use of unconditional loans for access to higher education hinders equal opportunities in access to university education.

In the case of Spain, real funding for public universities has decreased significantly in recent years. Between 2010 and 2020 (the last year for which homogeneous data are available), the implementation of the expenditure budget has fallen by 8.8% in real terms. In fact, revenues from current and capital transfers have been virtually identical, despite inflation of 13% between the two periods. Faced with the lack of funds, instead of reducing the huge subsidies received by students from high-income families attending public universities (about 7,000 euros per student per year), it was decided in 2020 that public university prices would be reduced by 30% as of 2022. This limitation of budgets affects, but not only, the capacity of public universities to face the new competitors that are appearing in the Spanish university system: private universities.

It is true that in Spain, unlike other countries, there has always been a perception that public universities are generally better than private universities. However, this perception seems to be changing. Private universities have higher performance rates than public universities and the integration of their graduates in the labor market is more successful, both in terms of employability and in terms of salaries and suitability for the job obtained. In some fields, such as business administration or finance, private universities are highly recognized.

To provide public universities with the necessary tools to compete with private universities, it is necessary to: i) increase funding in an efficient and equitable manner; ii) implement a package of measures that provide greater flexibility, better incentives and accountability.

Regarding financing, the public university students in the survey described in this paper show a low level of awareness about the cost of university studies and abut which part is privately financed. However, they show a clear preference for tuition fees to increase with the income level, as opposed to the current situation. Therefore, increasing private financing by making public university prices rise as income levels increase and covering the full cost for students from high-income families would potentially be politically feasible. In a context where the tax system is criticized of being unprogressive, this policy would increase the overall progressiveness of the system. In addition, this mechanism would make it possible to directly fund more salary scholarships for students from low-income families, whose main barrier to attending university is not the price of tuition, but the opportunity cost of the time they devote to their studies.

As for the package of measures, the ideal solution would be something inspired in the Obama plan mentioned in the introduction. That is, funding public universities based on their results, providing transparent information about the results of each school, encouraging innovation, eliminating unnecessary bureaucracy and regulation, and holding students accountable for their academic results if they receive public funds. In short, encourage a race to the top among public universities by promoting greater autonomy for them.

In a context where most students go to university to improve their employability and future salaries, the progress made by private institutions in terms of the employability of their graduates will give them an increasing capacity to attract students. Under these circumstances, it will be difficult for private institutions not to have sufficient incentives to adapt to more restrictive regulatory conditions. In fact, there is already a trend toward hiring faculty with research potential. In addition, many companies are also becoming competitors of universities by organizing degrees adapted to the needs of the productive system. Therefore, if Spanish public universities do not receive sufficient funding to attract the best teachers and researchers, and if the prevailing lack of flexibility, bureaucratization and uniformity continue, the future could be very different from the past. The best students will want to go to the best universities, which will generally be the private ones, resulting in a growing segregation between private universities, where students from families with more resources or better grades (scholarship holders) will go, and students from families with few resources will go to public universities, which are free and of lower quality.

BIBLIOGRAPHY

AUNIÓN, J. A. (2023). Fiebre del oro en el campus. *Informe CYD 2023*, 318-320.

AZMAT, G., and SIMION, Ş. (2021). Charging for higher education: Estimating the impact on inequality and student outcomes. *The BE journal of economic analysis & policy, 21*(1), 175-239.

BARRIOS, A., NEILSON, C., and ZIMMERMAN, S. D. (2021). *Elite universities and the intergenerational transmission of human and social capital.* SSRN 4071712.

BENEITO, P., BOSCÁ, J. E., and FERRI, J. (2018). Tuition fees and student effort at university. *Economics of Education Review*, 64, 114-128.

BHULLER, M., MOGSTAD, M., and SALVANES, K. G. (2017). Life-cycle earnings, education premiums, and internal rates of return. *Journal of Labor Economics, 35*(4), 993-1030.

CARD, D. (2001). Estimating the return to schooling: Progress on some persistent econometric problems. *Econometrica, 69*(5), 1127-1160.

CHAPMAN, B., and RYAN, C. (2005). The access implications of income-contingent charges for higher education: lessons from Australia. *Economics of Education Review, 24*(5),491-512.

CHETTY, R., DEMING, D., and FRIEDMAN, J. (2023). Diversifying Society's Leaders? The Causal Effects of Admission to Highly Selective Private Colleges. *NBER Working Paper Series* (31492).

CHETTY, R., FRIEDMAN, J. N., and ROCKOFF, J. E. (2014). Measuring the impacts of teachers, I: Evaluating bias in teacher value-added estimates. *American Economic Review, 104*(9), 2593-2632.

DALE, S. B., and KRUEGER, A. B. (2002). Estimating the payoff to attending a more selective college: An application of selection on observables and unobservables. *The Quarterly Journal of Economics, 117*(4), 1491-1527.

DALE, S. B., and KRUEGER, A. B. (2014). Estimating the effects of college characteristics over the career using administrative earnings data. *Journal of Human Resources, 49*(2), 323-358.

De La Fuente, A., and Jimeno, J. F. (2011). La rentabilidad privada y fiscal de la educación en España y sus regiones. *Documento de Trabajo,* 11.

Diris, R., and Ooghe, E. (2018). The economics of financing higher education. *Economic Policy, 33*(94), 265-314.

Fernandez, R., and Rogerson, R. (1995). On the political economy of education subsidies. *The Review of Economic Studies, 62*(2), 249-262.

García Montalvo, J. (2001). *Educación y empleo de los graduados superiores en Europa y en España.* Fundación Bancaja, 340 p.

García Montalvo, J. (2009). La inserción laboral de los universitarios y el fenómeno de la sobrecualificación. *Papeles de Economía Española*, 119, 172-187. https://www.funcas.es/wp-content/uploads/Migracion/Articulos/FUNCAS_PEE/119art12.pdf

García Montalvo, J. (2020). El impacto de la introducción de subvenciones progresivas en la educación superior: el caso de Cataluña. *Papeles de Economía Española,* 166, 123-143. https://www.funcas.es/articulos/el-impacto-de-la-introduccion-de-subvenciones-progresivas-en-la-educacion-superior-el-caso-de-cataluna/

García Montalvo, J., and Saiz, J. (2024). Educación terciaria: acceso, financiación y rentabilidad. In A. Cabrales, and I. Sainz (Ed.), *Handbook de Economía de la Educación* (pp. 365-414).

Kirkeboen, L. J., Leuven, E., and Mogstad, M. (2016). Field of study, earnings, and self-selection. *The Quarterly Journal of Economics, 131*(3), 1057-1111.

Lergetporer, P., and Woessmann, L. (2022). *Income contingency and the electorate's support for tuition.*

Lergetporer, P., and Woessmann, L. (2023). Earnings information and public preferences for university tuition: evidence from representative experiments. *Journal of Public Economics*, 226.

Ministerio de Universidades. (2022). *Datos y Cifras del Sistema Universitario Español, 2021-22.*

Montalbán, J. (2023). Countering moral hazard in higher education: The role of performance incentives in need-based grants. *The Economic Journal, 133*(649), 355-389.

Murphy, R., Scott-Clayton, J., and Wyness, G. (2019). The end of free college in England: Implications for enrolments, equity, and quality. *Economics of Education Review*, 71, 7-22.

OECD. (2017). *Education at a glance 2017*. Editions OECD.

OECD. (2023). *Education at a glance 2023*. Editions OECD.

Pérez, F., and Aldas, J. (2023). *U-Ranking: análisis de la inserción laboral de los universitarios.*

Pérez, F., and Aldas, J. (2023). *U-Ranking: indicadores sintéticos de las universidades españolas.* Edición 11.

Psacharopoulos, G. (1994). Returns to investment in education: A global update. *World Development, 22*(9), 1325-1343.

Psacharopoulos, G., and Patrinos, A. (2018). Returns to investment in education: a decennial review of the global literature. *Education Economics, 26*(5), 445-458.

PART IV

University Governance

THE CHALLENGES FOR UNIVERSITIES: GOVERNANCE MODELS AND THE REINVENTION OF THE TEACHING PROFESSION

Carles RAMIÓ

Abstract

The objective of this document is to present a set of reflections on some of the challenges that public universities currently face. Higher education is becoming an increasingly competitive market due to the greater dynamism of private universities and, also, the potential emergence of new actors that can have a decisive influence in this area. he text focuses on two critical dimensions for the future of the public university system: on the one hand, its regulation, governance and management model and, on the other hand, the need to reinvent the teaching function of face-to-face public universities. as one of the most relevant sources of social legitimation. The new profile of students entering the University and the technological transformation demand a new paradigm that modifies the traditional teaching dynamics, which is currently one of the weakest links in higher education centers.

Keywords: University, higher education, university teaching, governance, management, competitiveness.

JEL classification: I20, I23.

I. THE SURVIVAL OF UNIVERSITIES AT STAKE

Universities (there are an estimated 25,000 in the world) live comfortably on the solvency that comes from having a monopoly on higher education and the strength of being the oldest institutions in the world, along with the Catholic Church. The oldest university in the world was established in Morocco (Fez), the University of Al Qarawiyyiny, whose foundation dates back to 859. Some purists believe that the oldest university is a Chinese university founded in 259 (Nankin), but it cannot formally be considered as such as it did not grant an official degree and its function was to prepare students for the entrance examinations to the Chinese civil service of the time. The oldest university in Europe is Bologna (1088), followed by Oxford (1167) and Cambridge (1209). The oldest in Spain is the University of Salamanca (1218), although the first was the University of Palencia (1212). Every university, even the most recent, feels protected by these historical precedents. It is obvious that private universities are mortal, as they can disappear at any given moment, like any private company would if it is not positioned well in the market. But public universities tend to feel invulnerable and immortal because they are part of the apparently inalterable and invulnerable public institutional framework.

In today's world, this sense of permanence is very unrealistic. Technological, economic, social and political transformations are creating a sense of widespread instability which universities (private and public) should also see they are a part of. What is new is that from now on the environment of public universities will be turbulent and they will have to face new and unprecedented problems and challenges, and it is not obvious that with their current institutional capacities, they will be able to face these new uncertain scenarios. Some experts in prospective analysis have dared to claim that 90% of the world's universities could disappear in the next twenty years. This is undoubtedly an exaggeration, but in the face of this predicted disaster, we should reflect on the matter. Let us take a few examples of the contingencies that could threaten the survival of traditional universities:

- New technologies are transforming the teaching models in higher education through virtual training. The university with the largest number of students in Spain is the UNED (the Spanish Open University with around 145,000 students). It should also be noted that a regional and formally open university such as the *Universitat Oberta de Catalunya* (UOC) has 31,000 students. In the past, distance learning was a residual and complementary activity to in-person universities, but thanks to the technological changes open universities are becoming very competitive and internationalized. A good example of this is South New Hampshire University (US), a distance-learning university that has gone from having around 2,000 students to 180,000 in the last 18 years and is expected to reach 300,000 in the next three years (during the pandemic alone, the number of students increased by 40,000 and the number of staff by 1,000). Its success lies not only in the fact that it is a distance-learning university but also in its innovative method of personalized training, which creates customized training itineraries for each student following a personal interview with one of its more than 300 counsellors and filling in a questionnaire developed in collaboration with Google. Some recent studies suggest that universities that do not opt for a hybrid teaching model (in-person and online) have little chance of survival.

- Companies, especially the most innovative and emerging ones (currently those involved in infoeconomics and shortly those linked to the development of artificial intelligence), are becoming less and less obliged to abide by official university degrees. These companies are only interested in the real skills of their future employees, and these skills can also be acquired through non-formal training, which in many cases is provided by some universities, but also by many non-university institutions.

- Accrediting universities are emerging, they do not directly teach a degree but merely officialize unregulated training that citizens have acquired on their own (through Massive Open Online Courses –MOOCs– or through courses in organizations outside the university system). Some employers consider these degrees to be as competitive, if not more so, than those offered by formal institutionalized in-person universities.

- Large companies linked to info economics (notably Google and Amazon) are expanding their business strategies by penetrating new sectors that were previously considered to be shielded, thanks to protectionist principles, *e.g.,* selling medicines. These types of companies have stated that one of their fields of greatest commercial interest is education and, in particular, higher education. With the arrival of these global companies to the world of higher education, the paradigm shift may be spectacular, and the traditional universities may be left in a marginal position.

- There are large corporations that are not at all satisfied with the contribution of universities in providing professionals with the skills that the market demands. It is a classic divorce between a good undergraduate education and a merely instrumental education. We agree that universities should not only train good professionals, but that their essential function is to train good citizens. It is therefore logical and even healthy that there should be a certain divorce between what companies want and what universities offer. But in recent years this gap has widened and the distance between the market and the university market (especially the public one) is abysmal. The power of the market could be imposed in the short term. There are already many industrial groups that are creating their own universities, and even in conservative and highly regulated countries such as Spain, they can experiment with these initiatives. SEAT, for example, is considering setting up its own university. In this case, SEAT will not talk and negotiate with the university authorities, but directly with the education authorities responsible for secondary education, which could decide to validate higher education outside the traditional university system, as will be explained in the following discussion. If there is a serious confrontation between the education authorities and the university authorities, there is no doubt who will win the battle: the education authorities. There is a growing perception that universities and their authorities live in an idealized, endogamous and corporate world that is poorly attuned to the real world. Beware that it is not only the market that can take away the fragile monopoly of public universities but also our governments.

- Linked to the previous point, there is a growing interest on the part of governments in having vocational training in higher education. It is evident that an advanced country requires trained workers both at the university level and at a high professional and instrumental level. Higher vocational training is attracting more and more students and is achieving a positive link between education and the labor market through dual training systems, sharing traditional training with internships in companies. In this sense, there is a need to deepen and extend this higher vocational training so that it can reach a degree equal to or similar to a university degree. The High-Level Training Cycles are going to be more and more solvent and will claim a space in the higher education sphere next to the universities. Until now, public universities have closed their doors to this option due to old-fashioned classist and elitist reasons. But the dilemma in the near future is clear: either public universities embrace higher vocational training (we could say higher plus) or outside the university system there will outcrop new official public and private degrees equivalent to a university, as it is already beginning to happen in the field of art and design due to the universities' neglect of this type of profile.

- Another new policy promoted by governments is the provision of lifelong learning through a strong offer of specific and shorter courses to update and recycle working professionals (also known as microcredentials). It is clear that a relevant part of this training should be provided by public universities, but not all of them will be flexible enough to offer this new training, nor will they have the capacity to understand the real needs of the labor market and offer truly attractive and timely courses. In this new field, public universities may find themselves competing at a disadvantage with private universities or with private academies that are specialized exclusively in providing this type of training.

- It is well known that traditional universities are highly competitive but this competition tends to focus on research activities and output and the negative externality of this trend is the neglect of teaching. Teaching, which is the source of social legitimacy and public funding for universities, is increasingly becoming a residual activity at a time when serious competitive threats are emerging. It is no coincidence that in recent years a significant number of new national and international private universities have appeared on the university scene, which we at the public universities regard with suspicion and even disdain and superiority because those centers do not carry out research. This is true, but perhaps these centers pay much more attention to teaching, with an instrumental orientation of a professionalizing nature that is increasingly attractive to upper-middle income families. In Spain, for example, 25 years ago there were only sixteen authorized private universities; today there are 43 (compared with 50 public universities, the last of which was created in the distant year of 1988). Over the last twenty years, the number of students enrolled in private universities has tripled, while the number of public universities has fallen by 14%. Today, 30% of students who study at university in Spain do so in private universities. It is striking that the public university system is losing ground to the private system. This is no small matter since it means that a significant part of the upper-middle class prefers private universities to public ones, even though the difference in cost for families can be as much as six times higher. Why do so many families make this economic effort to avoid public universities? Two hypotheses could explain this phenomenon: on the one hand, they believe that the teaching in private universities is of higher quality and more rigorous than in public universities. This is strange as the research production of public universities is overwhelmingly superior to that of private universities, or perhaps this is the reason, and there is a part of society that perceives public university lecturers as heavily involved in research and with little effort in their teaching. On the other hand, they may believe, rightly or wrongly, that private universities are much closer to the business world and focused on providing professionals for that business world. Additionally, they believe that public universities do not have this focus and prioritize the training of educated and critical citizens. In this sense, it is paradoxical that studies on the employment of the future proclaim that the most competitive skills in the current and future labor market will be the capacity for critical analysis and an education that combines different disciplines, in which the humanities should have a relevant presence.

- Everything seems to indicate that the only lifeline for public universities is research excellence. But this lifeline is also very weak because they compete in a very dynamic and changing research market. On the one hand, public administrations themselves have in recent years encouraged the emergence of large research centers outside the universities, and on the other hand, there is increasing private investment in research, which tends to take place outside the university systems. The perceived strength of public universities in research could be rapidly diluted in the coming years.

As a corollary, changes in the university environment from now on will be sudden, unpredictable and unprecedented, and will require new institutional and organizational capacities. The combination of climate change, environmental crises, greater social inequality, new social demands (equity, sustainability), new public health challenges, rapid advances in artificial intelligence, demographic changes, etc., will create multiple unprecedented crises in the immediate future for universities accustomed to stability and routine. The current institutional and organizational capacities are clearly insufficient to address these immediate, medium and long-term challenges with any degree of robustness.

Experts in the history of higher education have likely identified various moments in history when these institutions found themselves at crossroads that were difficult to overcome, and that they emerged from them unscathed and even stronger, without having to introduce any changes. Many may think that the current crisis is just another phase that will be overcome without much difficulty. Universities tend to have an almost Vatican-like conservative culture, born of the sense of invulnerability of centuries-old and almost millennial institutions that have hardly needed to introduce any changes to survive over time. But they are probably wrong now. The current changes and those that are rapidly approaching will create a disruption that will lead to a new way of managing knowledge, new formulas for basic, intermediate and higher education, etc. Emerging technologies, the information society and the future society of artificial intelligence and robotics are challenging many economic and social actors who up to now had played the role of intermediaries. The technology-empowered society will be able to access certain services directly, without the need for intermediaries. Some institutions and organizations will just disappear and new ones will emerge with larger size and a more global scope. Universities are only intermediaries between students and knowledge, between young people and certain labor markets. This privileged position of universities is now being challenged, and perhaps even more so in the future.

We still lack the necessary vision to know what institutional and organizational texture universities will need in order to survive all these profound and radical changes. Probably no one can foresee it today. What we can be sure of, however, is that the current model of governance, organization, and service provision of most universities is outdated. This model certainly seems to doom us to failure, but at least it presents us as failures with great potential. Systems of knowledge transmission that have remained almost unchanged for the last thousand years (perhaps the tentative changes we have seen recently, with the European Higher Education Area's competency model and the COVID-19 pandemic, have been the most significant in a millennium) and have a baroque, fragmented, complex and corporatized system of governance and organization. A self-complacency with a supposed internal democracy that is rather ineffective, impervious to social demands and that follows guild interests and demagogic whims. Therefore, all the efforts we can make now, before the arrival of the great change that is coming, to simplify our organizational models, to practice with the transformations aimed at being contingent and adaptable, to be more understandable in our functioning for the society and the economy, etc., will be essential efforts to stand a chance in the future for our institutional survival. This persistence is not guaranteed for any university but those that show the greatest capacity for adaptation, transformation and innovation will have the best chances of success, and the rest will probably be swept away by the new times.

This text will not discuss all the challenges facing contemporary universities but will analyze only two points that can be considered particularly critical: on the one hand, the governance model of university systems and universities themselves, and on the other hand, the need to reinvent the teaching function, which, in general terms, is one of the major deficits that many universities currently exhibit.

II. REGULATION AND MANAGEMENT MODELS FOR UNIVERSITIES

Private universities have the advantage of having the independence to use the organization model they see fit and are free to transform themselves according to the new demands of the environment, their needs and new priorities. Obviously, they also have to comply with public regulations, more or less strict or lax depending on the country, which try to guarantee minimum quality standards. Therefore, mediocre private universities suffer from this public regulation, but quality private universities are hardly affected by this regulation and enjoy enormous real autonomy to define their strategies, their financing systems, their areas of specialization and market positioning, and their management models.

Public universities, on the other hand, are usually subject to much stricter and more thorough public regulation, in line with their public status and because they are funded by public administrations. This public regulation is very different in each country and the key elements are the following dichotomies: (i) the regulation tends to standardize all public universities in a country or, on the other hand, respects and even encourages diversity of strategies and models; (ii) public funding is uniform (all universities receive the same based on student enrollment) or asymmetric through various incentives to promote excellence through orderly competition; (iii) public regulation is very intrusive in the functioning and management parameters of universities or, on the other hand, respects university autonomy and therefore the capacity for self-organization; and, iv) the governance model imposed by the regulator has a democratic or meritocratic character in the election of academic positions in universities.

Regarding the first vector of uniformity or diversity, in most of the more advanced countries, there has usually been a transition from uniform national models to models that are more open to diversity. Public regulation tends to have a strong tendency toward standardization, but in recent years and in many countries, this orientation has relaxed in the face of a reality that has become much more complex. It does not make sense to think that a single set of institutional rules can cater for the diversity that exists in reality: universities with an international vocation vs. universities with a local vocation, universities located in large metropolitan areas vs. universities located in small peripheral towns, universities with a research vocation vs. universities more geared towards teaching and professionalization (colleges), polytechnic universities vs. generalist universities, etc. The conclusion is that countries with regulations that continue to be anchored in standardizing parameters have university systems of lower quality than those that regulate according to the different roles taken by each university.

The second key issue is the public funding model. Here, too, there is usually a natural inertia towards standardizing the funding of all universities in a national system, by providing the same subsidy based on the number of students enrolled. This is the institutional and political option that creates the fewest problems and tensions in national university systems. However, this egalitarian logic runs up against the diversity described in the previous point, since it is clear that funding should take into account the status and role of each university and, in particular, the results obtained, as their financial needs are very different. It is obvious that research-intensive and/or internationalized universities require more resources than universities with a local and professionalized vocation. It is also clear that more technical universities need more resources than generalist universities. On the other hand, egalitarian funding models do not create incentives for healthy competition among universities, which is what fosters excellence. Egalitarian funding models are not stimulating and promote mediocrity in university systems. It is also true that pure models of totally egalitarian funding do not exist, since there are usually different funding mechanisms depending on whether the degrees are more or less technical, whether the universities have large campuses or historical heritage, whether they are located in more complex or depressed areas, etc. In any case, despite the differences in funding, these systems are conceptually egalitarian, since they do not take into account results and performance, and therefore continue to fail to create incentives for universities to be more competitive and achieve excellence. Therefore, the most appropriate model for the current context is an asymmetric funding system based on incentives according to the results achieved by universities in teaching, research and knowledge transfer. Some countries have gone a step further and decided to overfund some universities in order to make them more competitive at the international level and to achieve prominent positions in international rankings. In many countries, this strategy of privileging some universities is considered anathema, but their university systems will never have world-class public universities. It is therefore necessary to establish a system of asymmetric funding based on the achievement of objectives and on national strategies aimed at excellence and, in order to avoid misgivings, the model should be fully transparent and based on a constant process of accountability through solid indicators.

Another critical issue is whether national regulation should be more or less intrusive in imposing governance and management models on universities. In some countries, regulation is so intense and precise that it goes so far as to undermine the classic principle of university autonomy. The critical issue here is whether a university system is mature or immature. In mature university systems, the starting point is the principle of trust between the principal and the university stakeholders. In these cases, the regulation of university governance and management is very lax or almost non-existent. The strongest idea is that each university governs and manages as it sees fit, according to its needs and projects, under the university's autonomy. As a counterbalance to this freedom, universities must respond with transparency and strict accountability. On the other hand, in immature university systems, the principle of mutual distrust between the regulator and the regulated universities is installed, and the regulator is usually intrusive and determines how universities should be governed and managed, preventing them from being dynamic and contingent. A country with excessive regulation in this area will inevitably have universities that are unsound, outdated, and poorly adapted to the contingencies of the environment. Excessive regulation fosters the immaturity of universities, as they limit themselves to doing the minimum required by the client, without being able to innovate their strategies, either because of the regulatory framework or because they feel they cannot do anything new and therefore will not leave their comfort zone.

Derived from the previous point, the last major dichotomy concerns the governance model inside universities: a democratic model or a meritocratic model. A third option would be a hybrid model that would allow both options in the same university system (the case of Portugal). In many countries, there is a tradition that education (primary, secondary and higher) is based on democratic principles that are channeled through the community (in some cases, such as primary and secondary education, the community is the teachers, and in universities, the community is usually the faculty, administrative and service staff and students), who elect their academic positions (rectors, department heads, deans, etc.). The model of democracy (either by direct vote or through collegial bodies) in the election of academic positions is very seductive to members of the university community, both symbolically and operationally. But this is usually a deception since the university democratic logics tend almost inevitably to degenerate into corporative, demagogic and unprofessional dynamics, and consequently into universities that are totally incapable of designing solid, innovative or disruptive strategies. Universities are very complex organizations (according to the organizational literature, the most complex organizations are hospitals, prisons, and universities) that, for their good governance, require academic positions with managerial competencies and a wide margin of maneuver if they want to be contingent and face new challenges. The democratic model tends to promote institutional misgovernance, facilitating short-sighted corporate logics decontextualized from the social function of the university in an increasingly complex and turbulent environment. The alternative model is meritocracy, where academic positions are elected based on their managerial competencies and governance projects. This is the path followed by universities and university systems in countries such as Denmark, Finland, Austria, Holland, France, Portugal, etc. France and Portugal are particularly noteworthy, as they are countries that are very attached to traditional models but are showing a capacity for evolution. Spain, on the other hand, is clearly not part of this migration towards meritocracy in university management. The meritocratic election of academic positions, especially the figure of the rector, should not shock anyone, since there are various mechanisms to promote this initiative in public universities without having to involve a selection process that the university community perceives as an imposition of external actors (be they political, institutional and/or socioeconomic). The meritocratic system only requires that candidates for academic positions do not run only based on their internal academic category, but that they opt for the position on the basis of a curriculum in university management and a well-elaborated proposal for a government project. Both university lecturers and candidates from outside the university can apply for the position of rector, *i.e.,* it is not always necessary that the rector come from outside the university. The other ingredient is that the evaluation of the candidates is carried out by an *ad hoc* committee specifically created for this purpose. The composition of this committee can be very different: notables or seniors from the university, persons elected by the university community, external rectors or former rectors from prestigious universities, notable persons from the socioeconomic environment, etc. In any case, in this model the rector's selection committee must have a refined composition and internal counterbalances: part of the members should be elected internally, another part by the university's lecturers with the most merit, and great care should be taken in the selection of members from outside the university. These should be people of recognized prestige in the transversal field of knowledge management (powerful lecturers from other national or international universities, prestigious former rectors, institutional and business members who accredit knowledge and skills in knowledge management, etc.). A commission with a mixed composition of personalities from inside and outside the university is a good combination because it achieves internal legitimacy and also external legitimacy of an academic and social nature. In this framework, the new rector is more empowered and freer from corporate, academic and union captures.

The countries with less advanced university systems, on the other hand, tend to opt for the democratic model and are caught in a paradox and vicious circle: with this system of election, the regulator encourages corporatism and endogamy in university governance and, precisely to fight against endogamy, designs all kinds of barriers to the ability of universities to autonomously define a strategy and alternative management models for each university, such as the barriers and filters imposed on the faculty selection processes. It does not seem that the most advanced universities and university systems are going down this path, but rather just the opposite: election of the rector from outside the university itself to free him/her from internal capture and greater autonomy in the ability to design a strategy and a management model of its own, accompanied by powerful accountability.

The transition from a supposedly democratic model to a meritocratic one is complex since university communities are usually enthusiastic about their democratic model for electing academic positions. In this case, as mentioned earlier, the concept of democracy is clearly devalued and is a complete imposture. This system pleases the university community as it encourages all kinds of corporate (faculty), trade union (administrative and service staff) and demagogic (student body) logic. The much-vaunted celebration of democracy basically consists of *de facto* forcing candidates for academic positions (especially the rector) to design clientelist networks among the lecturers of the different academic disciplines to defend corporative and endogamic positions that have little to do with the good performance and social value that the public university should have in its frontispiece. These clientelist networks also ensure that the rector has no real power, but rather that his/her function is merely transactional between the different corporate interests that prevent decision-making with his/her criteria and strategic vision. For the administration and services personnel, the democratic game consists of establishing an auction among the candidates aimed at maximizing benefits and minimizing the labor obligations of the management personnel. For students, the democratic coven consists of the demagogic excitement of a few highly mobilized students in the face of the indifference of the great majority. Student demands usually cover a wide range of reasonable proposals, extravagant but innocuous proposals, as well as proposals that are perverse for the proper functioning of the university. Being a rector in this model is relatively easy: listening to all demands, even if they may seem outlandish; making it clear that you are going to govern by seeking broad consensus, which is a way of stating that you will not take any strategic and delicate decisions; being empathetic; and being very clear that your role is not to govern the university but to mediate between different interests trying to satisfy everyone, even if it is to the detriment of the quality of the system. This is the endogamic model, which accepts meritocracy (the election of academic positions headed by the Rector) only incidentally and exceptionally. It is normal to elect as rector the candidate who is the most conciliatory with the various internal interests, the most sympathetic and, not infrequently, the most demagogic. Rectors choose as vice-rectors the representatives of the various sources of power between departments and disciplines. Strategic vision and good management skills are often marginalized. The endogamic model generates radically conservative dynamics, and the essential function of elected academic positions is to maintain the corporate status quo. The rector is not empowered, nor does he or she want to be. It is clear that this general rule has its exceptions and that there are universities that have escaped this perverse logic and have managed to present and elect very serious rectors with highly professional teams. In these cases, the changes in leadership teams are not traumatic and there is great continuity in their strategies. These exceptions usually occur in small universities that enjoy social peace. But even in these universities, there is always the fear and uncertainty that this good work will be interrupted at some point by unforeseen events and that some extemporaneous candidate will succeed and break this dynamic of institutional stability, reasonable incremental reforms, and solid strategic vision.

As per the example of the Spanish university system, which is still anchored in the democratic model, it is a symptom that the CRUE (Conference of Rectors of Spanish Universities), which is the lobby group of all the rectors in the country, does not strive for more university autonomy but, *de facto,* less. The CRUE discreetly but vehemently demands more standardizing regulation from the state and the regional authorities in order to maintain a certain internal order in their respective universities. The rectors reject the possibility of making strategic and compromising decisions, expecting the public regulators to do the hard work. It is clear that this endogamic, corporate and impotent model of governance is not the most appropriate for the transformation and renewal of universities.

III. REINVENTING UNIVERSITY TEACHING

We are aware of the need to reinvent university teaching since this is the dimension in which a significant number of public universities show the greatest weaknesses and which makes them particularly vulnerable to the increasingly intense competition from a wide variety of actors, many of them emerging, who participate or will participate in higher education. Moreover, it should not be forgotten that the training of students to become good professionals and better citizens is the vector that gives universities their greatest social and institutional legitimacy.

University lecturers tend to show some professional schizophrenia when faced with the institutional requirement to attend to both teaching and research with a more or less balanced intensity. This duality becomes even more complicated when we add the need to cover the so-called transfer of knowledge and the obligation, at certain professional moments, to perform tasks related to academic management. The professional juggling of four spheres usually leads to situations of professional stress and, depending on one's ability, one or two or even three balls may fall on one or two of them, and only one (which tends to be Research) can be safely kept.

In any case, the critical dimension is the complex coexistence of research and teaching. In general terms, there is an almost universal set of incentives in the university environment that favors research over teaching: rankings give weight to publication in indexed journals, faculty evaluations linked to tenure or promotion tend to be almost exclusively channeled into research capabilities, internal power dynamics favor research in the symbolic and instrumental dimension, etc. The result of this combination is the insignificance of the teaching function in the portfolio of university lecturers: the main function of a lecturer is research, and teaching is considered an additional task, an annoying burden (in Spanish the term of teaching duties is carga lectiva or teaching burden, which is rather revealing) to be carried out with more or less thoroughness depending on the personal voluntarist or militant dynamics with teaching and attention to students. The result of all this is to be expected: poor quality of teaching in most public universities. Something is not working, for example in the Spanish public university system, the percentage of students choosing a private university has been steadily increasing in recent years (currently 18% and rising). Private universities no longer act only as a refuge for students who do not achieve sufficient marks in the entrance system, but also attract a considerable number of students with high marks.

On the other hand, teaching has become much more complex in recent years. Students born in the new millennium are completely different from the students from a few decades ago. They have changed conceptually from orderly and disciplined scholars, in the most mediocre cases, and disciples, the most brilliant ones, to infantile schoolchildren and listeners, who are extraordinarily demanding with their university tuition but not very strict with themselves. We do not want to fall into the recurrent lamentation that today's students are worse than those of the past, but simply to note that they are radically different and that they require greater efforts in the teaching work carried out by university lecturers. Keeping the attention and motivation of today's students is a complex task, since they no longer operate in the traditional student/teacher roles that allowed for passive and conventional teaching methods, but now demand active and varied teaching methods. Another relatively recent novelty is the so-called Bologna learning model, of Anglo-Saxon inspiration, also recently implemented in the more traditional universities, which implies less theoretical density through traditional lectures and more practical teaching strategies that allow the emergence of the so-called transversal competencies and skills. This is a new learning model, much criticized by traditional lecturers, but we must celebrate it as it is proving successful in those universities that have implemented it seriously and robustly. Metaphorically speaking, we have moved away from a classical model in which students were like geese or ducks, stuffed with a huge amount of doctrinal nutrients, producing graduates with deep theoretical knowledge, but only the smartest and most self-taught had the skills that made them attractive to the labor market. In contrast, the new learning model assumes that students should play an active role in their education and most of them graduate with remarkable skills and competencies in analytical, presentation and rhetorical skills and, for the most active and self-taught, also with great strength in theoretical knowledge and skills. Today's job market is in a constant state of flux due to technological changes and an increasingly turbulent environment. This labor market prioritizes professionals with the ability to manage knowledge and adapt to change and undervalues theoretical knowledge acquired through formal education.

The conclusion of all these considerations is clear: we are in a period of increased demands on the teaching dimension of university teachers, just at a time when they are drifting away from teaching because of the incentives and obligations stemming from their research, which requires a very high intensity of dedication, sometimes bordering on full-time dedication. Reinventing and strengthening teaching in this context are not an easy task, especially if one wants to preserve one of the positive externalities of the current professional university model, the strength of research. If we want to remain competitive or even more solvent in terms of research, while at the same time strengthening the teaching function, this aspiration is akin to the utopia of squaring the circle. We believe, however, that there is still a long way to go to improve teaching through a series of strategies that are presented and proposed below:

- To establish the obligation that in order to achieve the coveted tenure or to move up the career ladder, it is essential to have a good record not only in research but also in teaching quality. If the requirement is doubled, the faculty will be able to present a neat professional portfolio in both dimensions.

- To strengthen the institution of the Dean's office by promoting their active participation in the selection and promotion processes; giving them effective control over the faculty teaching performance through annual evaluations; and even granting them the ability to veto bad teachers.

- To prevent senior faculty with greater teaching competence from fleeing from the compulsory subjects of the degrees and taking refuge exclusively in electives or master's degrees. This situation is quite common in universities since the compulsory subjects require greater dedication due to the large number of students enrolled in each class and the greater difficulty students have in learning these subjects. It is common for students in the first years and in most of the compulsory subjects to have lecturers who are inexperienced in teaching skills (lecturers at the beginning of their professional careers or part-time external lecturers, as in the case of associate lecturers). The alternative would be to force and/or incentivize the most outstanding lecturers to teach some compulsory subjects, especially in the first years. In fact, this could be established as an obligation (quite difficult in the current system of corporate management and organization under which universities operate) or there could be a new incentive scheme aimed at achieving the same result, in which teaching a compulsory and massive subject is properly weighted in the lecturers' teaching dedication or giving professional prestige to teaching these subjects by establishing meritocratic requirements to be able to teach them, such as *sexenios* or *quinquenios*[1] and good teaching evaluations. If teaching in the first years and in compulsory subjects implies greater professional prestige, the majority of teachers will aspire to teach these subjects.

- Teaching is a complex activity that has attributes of an almost artistic nature (ranging from performing skills, in their capacity of collective seduction, to interpersonal skills, for seminars and individual tutorials), but also of a strictly technical and professional nature in the mastery of a given subject. For this reason, it makes sense to ask whether a good teacher is born or made. There are professional activities that cannot be successfully developed without the ingredients of vocation and innate abilities. This is often the case with teachers as lecturers, and certainly as researchers. This means that there will always be lecturers who, without any prior preparation or training in teaching, become excellent teachers through spontaneous generation linked to practice. There is also the reverse possibility: people who aspire to be teachers and try to learn teaching techniques and skills, and fail because they lack oral communication, leadership, or persuasion skills. But in most cases, in the Gaussian bell, the best strategy is for universities to propose systems of training on teaching skills for younger teachers and retraining for more experienced teachers. Training both in the classical dimensions (communication, voice and breathing, dramatization) and in innovative and alternative formulations of learning systems. At present, these training dynamics are relatively well established in universities and, in many cases, encouraged by the new regulatory framework.

- A good system for overcoming the problems of the lack of dedication and motivation in teaching that university teachers may have could be to overcome the traditional dichotomy between research and teaching. University studies in social sciences (and in other disciplines) could learn from the learning dynamics that have long been implemented in technical fields such as architecture, where subjects are linked to extensive and in-depth theoretical and practical research projects carried out by students under the supervision of faculty. In these cases, the teaching function consists in promoting research and in producing as a result scientific documents created jointly by the teaching staff and the students. Another possibility would be to expand knowledge in the use

[1] In Spain *sexenios* and *quinquenios* refer to six- and five-year periods respectively of evaluation, recognition and compensation of research activity carried out by lecturers.

of teaching innovation techniques that involve other disciplines outside the walls of pure and simple pedagogy. In a professional career in which the publication of papers is an essential condition, both material and almost a fetish, the creation of communicative vessels between teaching and research could be a successful strategy to achieve feedback between these two functions, leaving aside the traditional zero-sum dynamic between the two activities. Another strategy that could promote greater complicity between teaching and research is for each discipline to have a scientific space, through specialized journals or other means of publication, where studies and analyses of teaching innovations related to the different scientific fields can be published. These contributions should be institutionally valued with research incentives, teaching incentives or knowledge transfer incentives.

Some university systems have been designed according to the principle that a lecturer must have and develop a balanced activity between teaching and research functions. In general, this is a good axiom, but in practice, it creates an imbalance in favor of research and to the detriment of the quality of teaching. There are more and more new demands in both teaching and research that strain the amphibious dimension of the faculty with many staff members being unable to maintain a more or less balanced rhythm between these two commitments. If we add to the demands of research and teaching those of knowledge transfer and the inevitable constraints of university management, handling so many dimensions can be very difficult and complex. The rigid seams of our university system tend to be emasculating but they can occasionally be burst by stimulating a greater commitment to research, with researchers who demonstrate greater success in this activity being freed from the demands ("burdens") of teaching, management and knowledge transfer. This dynamic is spreading in our university system because it is favored by career incentives and also by economic incentives. These exceptions are corporately accepted but, on the other hand, there is no tolerance for exceptions that would weight in the teaching function, the management function or the knowledge transfer function. Our system is bursting at the seams not only in terms of research, but also in terms of teaching requirements (especially in this function), management (university management is becoming increasingly complex and requires greater specialization and professionalization) and knowledge transfer (the weakest side of the university polyhedron). Therefore, it may be worth considering whether some faculty should specialize more in teaching, management or knowledge transfer functions, and thus not be penalized by promotion and reward incentive systems, but rather recognized for doing so.

The university system is now so complex that it is impossible to balance its different lines of production with standardized individual demands on its faculty, but the only way to achieve some balance as a system, is to make it more flexible and permeable, in certain cases, to some specialization of university faculty in each of its four main competencies. For this essay, the conclusion is that it should not be anathema for some teachers to choose excellence in their teaching activities and that they can be recognized and respected at the professional and institutional levels for this specialized commitment. A public university of the future can be seen as a flexible and dynamic organization in which the majority of its faculty members fulfill their obligations in research and teaching, but in which there is a percentage that is more oriented towards high-intensity research (as is already the case today), but which also keeps the doors open for greater specialization in teaching, knowledge transfer or management tasks. Only mixed models will be competitive in the future, while uniform models will be in crisis in an increasingly competitive context both within and outside the public university system.

IV. CONCLUSIONS AND PROPOSALS

This paper has tried to show that in recent years universities have been experiencing the most important exogenous and endogenous transformation of the last few centuries. The university is an institution that feels well established and secure in its social, economic and institutional environment. This has been the case throughout its long history, but this sense of comfort has already changed and will change even more in the coming years. Public management theorists argue that since the COVID-19 crisis, the university context is now officially turbulent and public authorities have to deal with unexpected, surprising and unprecedented problems, requiring new models of governance and management that integrate drivers of stability but also of change and transformation (a new model they call robust governance). This is a difficult but unquestionable oxymoron: on the one hand, it is necessary to have a stable governance and management model to ensure legal and institutional security and the effective and efficient management of structural public services. On the other hand, it is essential to have contingent and variable management areas capable of absorbing the new problems and demands associated with a turbulent context. This is the crossroads at which public universities find themselves today. Today, the university (traditional and public) has literally its survival at stake and is mostly unaware of it. The university is a giant with clay feet. The last major change that the public university had to face was the transition from an elite university (5% of society) to a mass university (30% of society). This great change took place in our country in the early 1970s. It was an important but conceptually irrelevant transformation since it only entailed dealing with quantitative dimensions: more students, more lecturers, more infrastructure and, therefore, more funding. With that mutation, the university was socially legitimized since it began to work as a social elevator (and, therefore, ceased to act as a system of reinforcement of the social elites). In fact, in the 1980s, a university degree almost guaranteed employability in a job with a certain quality, in a country with a very complex and deficient labor market. Today, universities can only guarantee that 5% of their graduates have a quality job with a certain level of pay and stability. The public university as a social elevator is currently rather out of order. On the other hand, the private universities ensure that the social elites, even if they produce mediocre and unproductive offspring, maintain their position of social privilege. Many want to go up in the social elevator, but there is not much room left when there is hardly anyone to get off in the context of a labor market that is increasingly restrictive in offering quality jobs.

Everything seems to indicate that the future of higher education will be very plural and fragmented, abandoning, at least in Spain, the former monopolistic logic based on public in-person universities. On the one hand, distance learning universities (private and public) will have a greater presence in the market. On the other hand, we will see the emergence of new universities that are hardly recognizable as such, but which will participate in higher education, such as corporate universities linked to large companies and universities oriented to specific student profiles (for example, the aforementioned South New Hampshire University is a higher education center that has specialized in training ex-military personnel from the wars in Afghanistan and Iraq). Additionally, vocational training (higher vocational education) is pushing for a place in higher education and is struggling to fit into the traditional university model. In this sense, it is noteworthy that there is an increasing percentage of students who, after obtaining a university degree, do not choose to pursue a master's degree, but instead, choose to complement their studies with a higher vocational training course. This dynamic of diversity and a certain amount of chaos will be inevitable regardless of whether the public regulation of higher education is more restrictive or more liberal, since the success of these new actors in higher education will largely depend not on public regulation, but on their level of acceptance by the market and society. A market and a society undergoing profound changes, looking for new professional profiles and new mechanisms for their successful placement in a convulsive and confusing labor market resulting from the technological revolution 4.0.

Now, the public university is facing a perfect storm of profound changes that challenge its central position in the higher education system and its transcendence in its impact on the labor market. It has been argued that the exogenous changes are profound and of potentially high impact, while the endogenous transformations are still tentative and superficial. However, these signs of change in the internal functioning of public universities should not be underestimated, since the most relevant element is that they have voluntarily initiated a process of transformation. Public universities are shaking off their slumber regarding their internal governance model and are initiating transformation processes with modest but complex changes at the corporate level, those are positive signs. This is the way to go, and the legislator in higher education should support it. It would be a good idea for higher education legislation to be plural and flexible, abandoning its traditional conservative and uniform framework. Uniformity implies betting on a single model that will surely lead to the failure of the entire public university system. At a time of profound change, it is foolish to put all our eggs in one basket. The regulatory framework of the public university should be opened up so that each public university can define its own profile: universities wishing to maintain the current model versus universities committed to research and postgraduate and doctoral programs, universities oriented towards certain student profiles (universities with a purely professional orientation versus universities with a more cultural and interdisciplinary vocation, etc.). We must ensure that the public university can be as diverse as society and the market. The public university must be flexible and contingent, able to adapt quickly to changes in its environment (a dimension that only private universities seem to possess today). Only through diversity and flexibility will the public university of the future be able to preserve its social value, accompanying society (and especially the most vulnerable part of it) in navigating a technological, economic, labor and social sea that is dynamic, unpredictable and therefore tempestuous. To finish this discussion, we present a summary of nine proposals for the transformation of the various university systems:

1. *Adapting to the new lifelong higher education.* The strategies promoted by the European Union and by the new Organic Law of the University System in Spain (the last university law approved in a relevant country) show the need to reposition universities and to better connect them with society. This is a wake-up call to the elitist positions and inertia of the sector. For example, a major dilemma is emerging for the near future: either public universities embrace higher vocational training (we could say higher plus), or official public and private degrees equivalent to a university degree will appear outside the university system (this is already beginning to happen in the field of art and design, due to the neglect of this type of profile by universities in some countries).

2. *Increase funding for university systems and avoid a "one size fits all" approach to distribution criteria.* All public universities need more resources. However, the mere addition of more and homogeneously distributed resources would be a suboptimal and even destructive maneuver if the goal is to transform universities. The strategy of

university rectors should be to propose new strategies, transformations and improvements in their internal organizational systems in order to convince policymakers of the good use that universities will make of public resources and their potential positive impact on society. Then it is legitimate to ask for more funding, certainly through individual program contracts for each university, but not before. The idea is simple: strategy, change and results first, then more money.

3. *Simplifying the organizational model.* We must try to avoid systems that are too complex and which we have simply because of the desire to have all the organizational tools available to universities at the same time: departments, schools, campuses, doctoral schools and university research institutes, to which we must add various public and private foundations, consortia, etc. The incentives to choose the most complex model are obvious: the more organizations, the more positions, and hence the continuity with the feudal and smallholder dynamics that characterize the university culture. In any case, a variable architecture with various governance and management models is an opportunity for each university to organize itself according to its role, identity and preferences. There is empirical evidence that public universities operating today are very different and therefore require specificities in their academic governance.

4. *Avoiding neo-bureaucracy in management.* University systems are increasingly complex and are subject to national and international accreditation and evaluation systems. The ability of universities to award official degrees and/or achieve prestigious ranking positions that allow them to access international student markets depends on exceeding these quality standards. These evaluation agencies tend to impose excessively detailed academic management processes that can degenerate into a perverse neo-bureaucracy that should be avoided as much as possible, since it limits the capacity for autonomy in the rapid innovation that some universities can foster.

5. *Exercising autonomy in hiring faculty and accepting the consequences.* Each university must autonomously choose the faculty profile that best suits its interests and be accountable for its results through a system of positive and negative incentives defined by the financing model of the university system, for which the administrations are responsible as coordinators and funders of each territorial system.

6. *Faculty diversification.* The faculty should be composed of professionals with both research and teaching skills, although they may specialize

later in their careers. It is necessary to establish a commitment that in order to achieve the coveted status of tenured faculty or to move up the career ladder, it is essential to demonstrate good performance not only in research but also in teaching quality.

7. *Acknowledging the value of teaching.* Incentives for university faculty should be linked to the quality of their teaching and should be truly selective and competitive. In other words, only those faculty who have truly excelled in teaching should receive them, *i.e.,* those who have received very high student evaluations, shown special commitment to different learning systems and innovation in their teaching methods, etcetera.

8. *Leveraging the talent of top lecturers.* Prevent senior faculty with greater teaching skills from fleeing the mandatory subjects of undergraduate degrees and taking refuge exclusively in electives or master's degrees.

9. *Linking teaching and research.* Establishing communication vessels between teaching and research can be a successful strategy to achieve feedback between these two functions and to leave aside the traditional zero-sum dynamic between the two activities.

PART V

Epilogue

THE SPANISH UNIVERSITY SYSTEM WITHIN ITS EUROPEAN CONTEXT

Rolf TARRACH*

To my little Luna, hoping that, should she wish to study in Spain in 15 years, it would be an excellent choice

Introduction

One wonders if it makes sense to write yet another essay on the Spanish university, given the abundance of literature on the subject and the fact that its influence on the politicians who make decisions and on society in general is asymptotically zero. For someone like me, who has been writing on the subject with some frequency for more than thirty years, the doubts about thepurpose of this task are even more pressing, and my only excuse for putting them aside, *i.e.* the conviction that there is no worthy future for Spain without a better university, remains valid, so, following what our northern neighbors call the Coué method,[1] I forget the more than probable uselessness of the text and throw myself into writing it, which, to add insult to injury, I am doing with great pleasure.

Of course, this task would be superfluous if I thought that the LOSU, the Spanish Law for the Regulation of the University System, passed last spring, was a good enough law which responded to the challenges facing the Spanish university. But it is not, although this opinion is perhaps more subjective than objective, as it is the case with most opinions on complex social issues, and the university is part of this category. In fact, this short essay is not about university legislation in Spain, which, like almost all politics in Spain, suffers from "consensusphobia", in the sense that, very much like Penelope, it weaves in one law and unravels in another, trusting that fate or the gods will sort it out; but this essay is rather about certain aspects that, seen from the outside, could be improved if politics and society wanted to.

Since I know the university systems of different European countries quite well, from my experience as President of the European University Association

* This text has been written exclusively with natural intelligence. The comments kindly sent to me by Manuel Atienza, Domènec Espriu, Andreu Mas-Colell and Pablo Salvador have allowed me to improve it; the errors it still contains are the sole responsibility of the author. I owe to Max Lacruz the substantial improvement of my poor syntax and inelegant style, which give away the multilingual theoretical physicist in me.

[1] It is a technique of conscious self-persuasion based on persuasion by repetition.

(EUA) and from my experience as an evaluator and advisor to several European universities, I would like to make it clear from the outset that the Spanish system is not one of the worst ones, and if measured correctly, that is, in relation to its funding, it holds a relatively correct position.[2]. If my opinion was more radical in the past, it is because circumstances have changed, and also because I have learned or changed, perhaps partly for biological reasons or for reasons of perspective.

Nor will I address very serious current issues, such as the role of artificial intelligence in higher education; partly because I have little to add to what has been written on a subject where the number of experts is close to the number of people living on our *pale blue dot*, as Carl Sagan would have said. Nor will I dwell on classic topics, such as the "two cultures" of another physicist, C. P. Snow, *i.e.* the empirical-scientific-technological culture and the humanistic-social culture, because even though it is important for its implications on the funding and evaluation of research –which must take into account this dichotomy of objectives and methods– I do not think that the European perspective contributes anything new.

I have often spoken publicly about rankings, university rankings or university system rankings, but I have little to add to what is already known:

- They are getting better and better.
- Despite this, they are always subjective, due to the choice of indicators and the weight allocated to them.
- They are very popular, both among university policymakers, students, families and employers, and they should therefore be taken into account, albeit in moderation.

I would like to mention, however, how surprising it is that university authors produce and use meaningless comparative statistics. For example, I recently read a paper stating that Spain ranks third in Europe in terms of the quality of its university system. The criterion used was the number of Spanish universities in the top 500 of some European ranking. This criterion excludes most countries, especially those with few but excellent universities, such as the Netherlands.

[2] The Spanish university is also a system active in European programs, as evidenced by the significant presence of Spanish universities in absolute figures (but modest in relative figures , with respect to the student population) in the European University Initiatives program, financed by ERASMUS+, which was launched on the occasion of a conference held by the French President Macron at the Sorbonne. When will a Spanish president present his ideas for the future at a university?

To state that Spain has a better university system than the Netherlands one has to be very ignorant, plus the fact that these studies are made by university authors is rather worrying. I seem to recall that Spain was also in a better position than France, and although the French system is far from exemplary, it is overall better than the Spanish system. Perhaps the authors were not aware of the results of the policy of university mergers promoted by the various French governments, which has dramatically reduced the number of universities. Do tell me which country you want to be first in Europe, and I will tell you which indicators and weightings should be used to make it so. But relatively meaningful and informative comparisons can also be made using the right type of knowledge and the criteria of scientific methodology applied to comparative studies, which is almost never the case.

I have also spoken and published a number of times about the gender/sex imbalance in the university world. I will not do so here for several reasons, first of all because of its almost unmanageable complexity, which would require an analysis too long for this text. This complexity has increased in this century with the confusion of the very concepts of sex and gender, the multiplication of these genders to astonishing numbers, the combativeness of those who consider biology to be something marginal, and the fact that it has become what English speakers call a red herring, a fallacy that diverts attention from the central issue, which is the presence of women in universities, in leadership positions. In this way, the interest in certain minorities has replaced the interest in a majority: women.

Issues such as the citations received by the scientific work of colleagues, the impact parameters of scientific journals, the millions of publications that no one reads, the “ghost” authors, or the journals that behave like a pop-up shop, will also not be addressed here, since they are global in nature, with no specifically Spanish components. However, it is worth recalling the work of the Coalition for Advancing Research Assessment (CoARA) and the San Francisco Declaration on Research Assessment (DORA) and learning about their recommendations.

The precariousness of a large part of the PhDs employed in universities (postdocs, junior researchers, even assistant professors and tenure-track faculty) is not a typically Spanish problem, so it will not be considered here either, except in a more specifically Spanish aspect, despite its great importance. It is more of a problem of supply and demand, insufficient funding, the relative appeal of academic work, the large number of PhDs graduating from universities and whether one has an elitist or a populist vision of the university.

As I said at the beginning, this essay is based on my opinions, which I believe to be justified, but it is not a study. Therefore, I will only mention a few books and papers that have nourished my thoughts,[3] but almost everything I know about this subject has its origin in a large number of diverse and sporadic readings, conversations and discussions, only some of them formal, that have accompanied my long academic life. These sources will not be acknowledged,[4] I could not do so even if I wanted to. Many Spanish rectors have written on this subject at the end of their tenure; the variety of points of view gives an idea of the complexity of the matter.[5]

Conflict of interest is also a fairly common problem in academia, and I think it is rather serious. The biases that characterize us all to a greater or lesser degree can only be mitigated by applying scientific methodology to the fullest. I would like to believe that I am doing this where possible. In my case, these conflicts or biases come from my capacity as professor and vice-rector of the University of Barcelona, president of the CSIC in Madrid, rector of the University of Luxembourg, president of the commission of international experts that prepared a report on universities for the Spanish government (Tarrach, 2011), president of the European University Association in Brussels, member of the Governing Board of the Nebrija University in Madrid, and president of the Advisory Board of the University of Lorraine in Nancy.

It is to be expected that after almost 20 years living in Luxembourg, my knowledge of Spanish universities has become somewhat blurred, and that despite a hundred or so trips[6] to Spain, I am not familiar with some recent developments. I ask for your understanding and indulgence for these shortcomings.

The University and Research System in Spain: Some General Problematic Aspects

I would like to begin by recalling the importance of primary and secondary education. In fact, they are more important than tertiary education because

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[3] Boulton and Douglas (2008); Elkana and Klöpper (2012) and Weber (2015) are examples of interesting readings. (Aghion *et al.*, 2008) is a pertinent reading. (Salmi, 2009) is for the ambitious reader.

[4] With two exceptions: during my time in Spain, which I enjoyed very much, I learned a lot from Josep Maria Bricall and Andreu Mas-Colell, both economists.

[5] I must also admit that I could not resist this impulse (see Tarrach, 2020), although my text is more anecdotal-humoristic. Academia, because of its peculiarities, lends itself to humor, even to satire: remember the great books by David Lodge or *El virus de la glòria* by Marià Alemany.

[6] I must be contributing with them to the increase of the atmospheric temperature, between a pico and a nanodegree, less so to oceanic one; it seems not much, but it is since I am just an individual.

students are captive there, whereas university students can easily dodge bad teachers by not attending class or by replacing them with excellent courses available online or great books. The increased probability of failure and dissatisfaction caused by incompetent primary and secondary school teachers must have enormous social and individual costs, although I do not know about any serious studies on the subject. A bad math teacher can take away a student's desire to learn or drastically reduce the likelihood of pursuing many of the degrees on offer by poisoning the student's relationship with calculus, statistics, probability, quantification, and understanding of orders of magnitude. In the course of their careers, a thousand students may pass through their hands, causing a real social disaster. In fact, something similar happens with foreign languages. There is knowledge, such as languages, *i.e.* mathematics and foreign languages, that must be acquired in childhood and adolescence because by the time one reaches university, it is too late, as this type this type of learning is ineffective, even impossible for some, in adulthood. There is a bias in the perception of the importance of an activity, which negatively correlates the number of people who do it with its importance and, therefore, with its remuneration. For financial reasons, it is difficult to do otherwise, but a serious analysis would recommend paying primary and secondary school teachers more than university lecturers, except for a minority of the latter: on the whole, society would benefit. Due to its utopian and outdated nature, I will leave this subject here, although I would like to point out that some of the problems of Spanish universities have been inherited from pre-university education.

The massification that characterized the Spanish university decades ago, and which reached its peak in this century, has meant universal access to higher education and, therefore, added value for society, although it has some less positive characteristics that should be taken into account by policymakers:

- The number of students depends excessively on the job offer at the time: when young people can readily secure remunerative employment, many decide to dropout, a decision that can have significant personal, social, and economic consequences in the long term. This behavior reflects a lack of genuine motivation to pursue higher education. However, it can also be interpreted in a positive light, assuming that those who drop out are primarily individuals who are not interested in pursuing a university degree, who would be happier with an activity that does not require a university degree, and who are correcting a wrong decision that would waste more of their time. Those who dropout would therefore be those who decided to study only "because I have to do something."

- The recent and foreseeable demographic evolution, the cheerful and somewhat erratic, overly localistic university founding policies of the past, as well as the rise of hybrid and online teaching, have left classrooms empty. In a state of autonomies, it is unlikely that this problem will be solved by going to the root cause. Therefore, it is necessary to look for the opportunities presented by this situation, such as the implementation of a serious policy of internationalization of the student body. Given the international appeal of Spanish university cities, the climate (although this can change, in fact it already seems to be changing), the *savoir vivre* and the Spanish language, success is almost guaranteed. For the Spanish economy it can mean access to much-needed and welcome international talent.

- The massification of universities logically led to a correlated increase in the number of university teachers and researchers, and inevitably, for statistical reasons (assuming they were always the best possible), to a decrease in their average level. I do not know whether the nonsensical and wokist views of some university lecturers reflect this trend, if they are due to social media, or if they are simply more visible today than in the past, but I cannot help but express my concern about the deterioration of the average level of university lecturers, even if I am considered to be elitist, arrogant, or even worse. Again, one of the corrective measures would be to increase the international appeal of university employment; the benefits to the university and to Spain would be many and too obvious to list them here. The retirement of a large part of the university faculty in the coming years would provide a unique opportunity in this regard.

- Dignifying and strengthening dual vocational training, bringing us closer to the situation in German-speaking countries, the Netherlands, the Czech Republic, Hungary and the Scandinavian countries, where it is not considered a disgrace to have children who follow this type of training, would also solve the problem of unmotivated students but it could increase the problem of empty university classrooms. However, it would be very beneficial for the Spanish economy if the business community were willing to play its part. I suspect that one of the reasons why the attempts of successive governments in this direction have not been sufficient is cultural, and therefore difficult to change. Nevertheless, social acceptance of and interest in vocational training seems to have increased recently.

- I would like to end this section with a warning. It is statistically well known that educational attainment is positively correlated with income and health, but this should not be a reason to push young people to study beyond what they really want or can, because the direct causality is likely to be modest; it is the indirect causality, *the confounding factors* (see Pearl and Mackenzie, 2018), that predominates, and this has little to do with the young person's education.

Thirdly, I would like to address the issue of the mismatch between the supply and demand of university researchers. Two distinct perspectives can be identified: researchers in general and those who stand out for their quality, as measured by some reasonable indicator, such as being in the most cited percentile in their discipline or having benefited from a European Research Council (ERC) contract. The first perspective, although a significant issue, is not the focus of this discussion because it is a universal phenomenon, affecting all developed countries and its origin is mathematically trivial: in a stationary situation, if each senior researcher supervises an average of six doctoral theses during their lifetime, and half of them wish to pursue an academic career, we will have an average of three candidates for each position offered. We are not going to discuss here whether this situation is good, reasonable, acceptable or none of the above.

The second perspective is that of outstanding researchers, a group that is of interest to Spain. Spain is one of the countries experiencing a brain drain, as it generously invests significant resources in training and preparing good researchers. However, a substantial proportion of these researchers will subsequently emigrate to countries with more advanced scientific capabilities, which will benefit from their expertise. This phenomenon represents a form of brain gain that internationalization facilitates. The inability of Spanish universities to retain their most promising scholars is a significant concern. There are a number of reasons for this phenomenon, including union-related issues, corporate concerns, a lack of leadership, a fear of responsibility, and even an extreme endogamic factor. It is notable that almost all of the most outstanding researchers spend years abroad and once they are gone, they are gone for good. There are indeed solutions to this problem. One obvious solution is to select the best candidate for the position in question. Other, more nuanced solutions, can be found in the numerous reports published over the last 20 years on the state of Spanish universities. Of course, this imbalance could be compensated by attracting outstanding foreign researchers, but if we are unable to retain our own, how can we attract those from abroad?[7]

[7] Only in the Max Planck Society, and only in my discipline, physics, have I met three Spanish directors: Manuel Cardona (Stuttgart), Ignacio Cirac (Munich) and Ángel Rubio (Hamburg).

This unbalanced emigration, which does not bode well for the future of economic and social well-being that we wish for future generations, does not seem to be a cause for concern in society, or even among politicians. The value of high-quality research to society is better understood in more advanced societies, which promote it with foresight. Thus, a few years ago, the German government, with its passion for *Planungssicherheit* or planning security and reliability in the medium and long term, included in a law the annual percentage increase in funding until 2030 for the four basic and applied research societies or associations, Max Planck, Fraunhofer, Leibniz, and Helmholtz, each of which already had an annual budget of more than 2 billion euros. Laws can be changed or not enforced, but the symbolic value of this decision, which is a statement of faith in scientific knowledge, is immense. We could learn from it.

The next exercise is difficult to carry out with a sufficiently proven scientific approach, but we will still learn something: the comparison with other European university systems. The reason for this difficulty is the almost impossible *ceteris paribus*, *i.e.* to ensure that all the other variables relevant to the development of universities, such as primary and secondary education, university spending, the legal framework for universities, centralized state or regional distribution of power, social acceptance of alternative studies, the non-university public research system, business R&D activity, technological innovation activity and the presence of foundations active in education and research, are equal or can be weighted in order to quantify and separate their impact on university development. This diversity, on the other hand, is often what allows us to learn from other countries, and in Europe, for every university problem, it is easy to find a country that has also suffered from it and has tried solutions from which we can learn some lessons.

Before turning to Europe, I would like to say a few words about the United States and explain why it is more difficult to learn from a comparison with the United States than with Europe. Simplifying , there are four levels of American[8] universities: community colleges, four-year (liberal arts) colleges, comprehensive universities, and research-intensive universities. The first have no equivalent in Europe and compensate for the lower level of American secondary education compared to Europe. The second type had some equivalent, but these types of schools or institutes have been transformed in Europe by the incorporation of research activities into universities. The third and fourth categories correspond to European universities, but in the US comprehensive universities put more emphasis on teaching, while the last category puts more emphasis on research. Consequently, it makes no sense to compare the research

[8] I don't think the term "American" that I am using will cause any confusion: It refers to the United States.

carried out in an American university with a European university, since in the US it is concentrated in some 100 to 200 institutions, whereas in Europe it is concentrated in some 1,000 to 2,000 institutions. If we in Europe concentrated our research in a number of universities comparable to the number of research-intensive universities in the United States, we would be in a much better position in the international rankings. Other reasons that make a meaningful comparison impossible are the very important role of private universities and the role played by the Land-grant Act of the 19th century, which allowed colleges (later universities) to sell federal land[9] and use the proceeds. That said, there is no doubt that many of the best universities in the world are in the U.S., so we have a lot to learn from them, closing our eyes, of course, to the nonsense like trigger warnings, safe spaces, cancellation culture, and sensitivity reading that have been all the rage across the Atlantic lately and should be respectfully ignored, though I doubt that respect is deserved.

In Europe, the prevailing university model is Wilhelm von Humboldt's,[10] which holistically combines teaching and research and cultivates all disciplines as well as *Bildung*, culture, and general enlightenment. Sociologically, it was based on the strong development of a flourishing middle class that was more open to the world, and it partially replaced the Napoleonic model, which aimed to train the elites who would run the administration of a powerful and omnipresent centralized state. The variety of university systems in Europe is extraordinary, since not only do we have about 50 different countries, with different state organizations, but also some of them, those that are federal, confederal or autonomous, have different university systems within the country itself, even having, as in the case of Belgium, two different Rectors' Conferences, namely the Flemish and the Walloon. We will now explore certain characteristics of the university systems of some of the more advanced countries.

Switzerland has a system made up of cantonal universities, some of which are excellent, and two (con)federal polytechnics, ETH Zurich and EPF Lausanne, both of which are world-renowned. One wonders why such a successful system has not been copied in other countries. The case of Germany is paradigmatic: the constitution does not allow the federal government to finance education, which is an exclusive competence of the *Länder*. Ergo, there can be no federal universities. It is a clear example of how the passion

[9] That land was often taken from indigenous people, which would not have been possible in Europe.

[10] His brother, Alexander, is considered one of the last global scientists and has given his name to one of the most important foundations in Europe dedicated to the promotion of research. Ortega y Gasset reminds us in "The Revolt of the Masses" of the dangers of the barbarism of "specialization", the substitution of encyclopedic knowledge, like Alexander's, for specialized knowledge, that of the scientist who knew Kant, like Einstein, for the mediocre specialist, the Fachidiot. Perhaps that is why there are no more Einsteins.

for over-legislation prevents us from doing what would benefit the country.[11] Switzerland has also benefited from its multilingualism and respect for universities, combined with its ability to welcome[12] students from all over the world, including many highly competent Spanish researchers.

German universities, like almost everything else in Germany, are still suffering from the psychological consequences of the last world war and the incredible brain drain it caused. Because of the aforementioned difficulty of the federal government, which has more resources for financing the universities, they have to make do with what their states decide to allocate to them, a situation similar to what happens in Spain and the Autonomous Communities. But since the federal government was aware that the economic development and well-being of the country depended to a large extent on the quality of the university system, it designed the *Exzellenzinitiativen* or Excellence Initiative, which made it possible to provide exceptional funding to a few universities based on criteria of research quality and international appeal in the initial phases, and later on broader criteria. To a certain extent, the strict selection has given way to "coffee for all", due to political pressure from the *Länder*, as well as due to the idea of equality that characterizes a public system like the German one, so that selective federal funding has gradually become more global, changing the criteria to benefit more and more universities. In any case, when applying the right criteria, a few universities have stood out and are now better placed in international rankings.[13] Incidentally, the fact that no Berlin university was successful in the first round did not cause any problems; on the contrary, it was an incentive for the three large universities in the capital.

The French case is not very different from the German one, except that it also has the *Grandes Écoles* and certain engineering schools, which depend on other ministries and have a more top-down governance. It also introduced the *Initiatives d'Excellence* and had no problem accepting that no Parisian university was in the first round.[14] These initiatives almost coincided with a policy of university mergers which, with a few exceptions, reversed the notoriously inadequate disciplinary division of the universities in the large French cities,

[11] I am informed that the current legislation would allow it in Spain.

[12] Selective welcome, as the solidarity reasons apply only partially.

[13] In particular the two large Munich universities. From a university point of view, Bavaria in Germany can be compared to Catalonia in Spain. I participated in the creation of a new Bavarian polytechnic university in Nuremberg, which was supposed to be a revulsive against university stagnation, but it was not; a piece of ice in a bathtub does not change the temperature much. It reminded me of the creation of the Autonomous Universities in Spain, and later of *Pompeu Fabra* and *Carlos III*, but they have meant some progress.

[14] As a member of the international committee that made the evaluations and classifications, I asked if our recommendations could be changed by the government. The answer was: only the President of the Republic could do it. He did not do it.

Strasbourg I, II and III, Bordeaux I, II and III, Lyon I, II and III, etc. As in Germany, and even more so given the higher level of unionization, the money ended up reaching almost all the universities, albeit with quantitative differences. All this has contributed to making the French system extraordinarily complicated, even for the French,[15] given the Gaulish tendency to somehow maintain previous structures with their multiple councils.[16]

Spain also tried to introduce a system of university excellence, but encountered some problems,[17] and rightly replaced it with measures to support institutions and outstanding researchers,[18] which seem to be well managed and should be further strengthened. What we could learn from France and Germany, which, like Spain, have a system predominantly based on the civil service, is the flexibility that makes it possible to appoint the best university lecturers as professors, wherever they come from, with much greater ease than south of the Pyrenees. Let us not forget that the most effective instrument for achieving university excellence is the ability to attract the best talent, from anywhere in the world, to serve society through knowledge, and that the civil service system was created with very different objectives, namely, to serve the state so that it can function efficiently and competently. The civil service system is not suitable for achieving academic excellence, unless it is adapted to the quality requirements of research activities and university teaching.

Among the other characteristics of Germany and France that deserve our attention, there is one that is essential but for which the universities are only partly responsible: the lack of interest that society and politics have in the university world, beyond paying lip service.[19] It is true that the French and German academic tradition is more solid, it is true that they are richer and more industrialized countries, but Spain today should not be satisfied with Unamuno's "let the others invent", but rather should follow Ramón y Cajal when he said: "The cart of Spanish culture lacks the wheel of science". But the universities also bear some responsibility for this lack of interest; in any case, they have an obligation, if only out of self-interest, to do what they can, and they can do a great deal, to bring the academic world closer to society and to the attention of Spanish politics. In this sense, the public sector can learn something from the private sector.

[15] The case of Paris is unbeatable, I think that not even the Parisians understand it.

[16] They call it *structure en oignon*, onion structure, an expression that I believe Hannah Arendt introduced in another context.

[17] Someone told me that the non-inclusion of Madrid universities in the first round caused a great stir, but it seems that there were other difficulties as well.

[18] The *Severo Ochoa-María de Maeztu* and the *Ramón y Cajal* excellence programs, respectively.

[19] In the countries north of the Pyrenees and Alps, the percentage of presidents and CEOs of large companies with second and third level academic degrees is considerably higher than in Spain.

The Netherlands and the Scandinavian countries have excellent university systems, but I think it is unrealistic to think that Spain can learn from them in general; they are too different from Spain demographically, culturally and economically. But some concrete measures could be of interest to us, such as giving new teachers a few years' moratorium before requiring them to be trained to teach courses in the national language. Other measures, such as the use of English on an equal footing with the national language,[20] do not seem to be transferable to Spain, at least at present.

Something similar happens with the excellent British university system: it is so far removed from ours, closer to the American,[21] that we would have to adapt much more than the university system in order to learn from them. Besides, they also have the undeniable advantage of being fluent in English, the lingua franca of research. It remains to be seen how the United Kingdom will manage its last imperial dreams in the coming decades and what consequences this will have for its universities, which are in no way responsible for the recent political delusions. But make no mistake: Europe would lose a great deal if British universities were to deteriorate; the *schadenfreude*, or the delight in the misfortunes of others, has no place here.

I would like to end this little journey through Western European universities with a few words about four singular countries: Belgium, Austria, Portugal, and Italy. Belgium, in its Flemish part, has excellent universities, but its state structure is incomprehensible to the rational mind, and the European institutions have a strong influence on the Belgium of today. Austria proved a decade ago that, if the political will is there, the university system can be revolutionized without the world sinking. Thus, universities can now choose between a civil-servant and a private employment system, and medical schools have become independent. We can also learn from Portugal, which at the same time also radically changed its system, and so universities can decide to become foundations.[22] It should be added that the credit for this belongs to Mariano Gago, when he was minister, as not being a politician but a physicist, he did not think about votes and did what he thought he had to do for the good of his country. Of course, the thermalization mentioned for Germany also worked in Portugal, but undoubtedly the system has improved. Unfortunately, we can learn almost nothing from the current Italian system, which is a shadow of its former self, abandoned by many of the best who have emigrated.

[20] Recently contested, as is to be expected in times of more nationalistic passions, but with a certain reason, for fear of the impoverishment of the national language.

[21] Their legal structures are hardly comparable, and the most prestigious have *endowments* of 10 digits, a few American ones of 11. Tuition fees in England are high, but Scottish universities are free; however, they are all in the same vice-chancellors' conference, which is *Great-British.*

[22] I believe that four, particularly in the north, chose this path.

We will now briefly discuss certain aspects of the private university system, which is developing strongly in Spain, especially in certain autonomous regions.[23] Something similar is happening in Germany and Italy, but not in the United Kingdom, where for legal reasons British universities already operate partly according to private criteria, nor in France, where for ideological reasons the private sector is frowned upon.[24] To simplify matters, private universities can be divided into those that are religious, those that are purely commercial, often owned by international funds, and those that are non-profit. Religious universities have a strong tradition of implantation and education, which explains their success in society, not only among believers, especially their business schools and certain disciplines such as medicine. As for the universities that are only a business, their social-educational value could be considered doubtful. The private non-profit ones deserve a closer look.

We understand non-profit as the will to reinvest profits in its own growth and improvement. This private university generates an undeniable benefit to society at no public cost, and therefore has a moral and economic obligation to maximize that benefit for the good of society. The individuals or institutions that own them often show a genuine interest in education, training and their value to society, and consider employability at an appropriate level as one of their main objectives, to a greater extent than the public university, which tends to prioritize research and the generation of new knowledge. These priority profiles, which distinguish the private not-for-profit universities from the public ones, make them in fact quite complementary, to the extent that politicians should support both, *i.e.* they should provide adequate funding to the public universities and avoid placing administrative or fiscal obstacles in the way of the private not-for-profit ones. Unfortunately, and perhaps for ideological reasons, this happens only in exceptional cases, and it is society that suffers, as competition between the two models would improve the quality of both.

Certainly, in a system with a high degree of university autonomy, the way an academic institution is evaluated should take into account its profile and objectives. Classifications that rank both public and private institutions, using the same indicators for both, follow a methodology that is questionable at best. In fact, evaluating public and private institutions with identical criteria

[23] The number of students in private universities has increased dramatically in recent years, while public universities have seen a decline, only partly caused by demographics. The CyD Foundation has been providing increasingly relevant data on the Spanish university system for 20 years.

[24] When I was rector in Luxembourg, the president of a private international university based in France suggested that we merge our universities, which I found rather bizarre. When I asked him why, he told me that private universities were frowned upon and that it was very difficult to cooperate with public institutions. Since the region where his institution is located is one of the most advanced in France, the problem disappeared when it realized that its international prestige would suffer if the university moved to another country.

promotes the convergence of institutional profiles, so that complementarity and diversity tend to disappear. This policy is wrong. The data from the intensive indicators[25] show that, in general, public universities are stronger in research, while private universities are stronger in the employability of their graduates. Since both research and employability-oriented teaching are essential for the future of the country, its companies and its citizens, it is much better to have institutions that excel in one or the other priority than to push all of them to excel in both, possibly leading to a certain mediocrity in both priorities, which is of little value. Research in the private sector should primarily play the role of strengthening and updating teaching and teachers, while employability in the public sector should play the role of bringing research and researchers closer to industry and business.

We will briefly mention some threats and opportunities, starting with the growing politicization observed in some universities. What is academically correct is and should be different from what is politically correct, the rhythms of university activities should not be marked by elections and re-elections. The goal of the university coincides with the goal of politics only insofar as both serve society, but not in how to do so, which in the case of universities is the creation, transmission, analysis, verification, interpretation, explanation, development and use of knowledge.[26] This politicization is further encouraged by the electoral systems used in public universities, which are similar to those in politics and inappropriate for a modern, international university. The prevalence of egalitarianism, instead of a meritocratic, epistocratic and equitable policy, is partly due to the influence of political and social currents that are alien to the quest for university excellence and also to the fact that it defends the university staff more than the institution itself.

But there are also opportunities in Spain, a country that is going through turbulent times that often facilitate unexpected policies. Given the uncertainty of the unexpected, it is best to mention what we can be sure of: the demographic evolution of the university teaching staff, whose average age is now advanced, will lead to the renewal of about half of the teaching and research staff at the highest level in the next decade. This is an opportunity with capital letters, but without a clear will to improve, which is currently not perceived as such, it will be wasted with endogamic measures.

[25] I will never tire of reminding that extensive indicators measure size rather than quality. To say that the US has more Nobel Prizes than any other country does not mean much: it is mainly due to its 340 million inhabitants; to say that Switzerland, Austria, Ireland, the UK, Hungary, Israel and Germany have more Nobel Prizes per capita than the US means quite a lot. I have not included other countries in this "better than the US" list because of statistical fluctuations and proximity bias.

[26] And as far as possible, understanding. Knowing does not imply understanding.

Spain, like France, Germany and Italy, has a research system carried out in public organizations which runs in parallel to university research. In these public research organizations (OPIs, in Spanish), governments have a greater influence in setting priorities than for universities, which cannot that easily be influenced by governments because they have autonomy, academic freedom and their own corporate governance. The OPIs, however, have a more hierarchical governance, the president is normally appointed by the government of the nation, and can also be easily dismissed. The largest Spanish OPI is the CSIC (Spanish National Research Council), the equivalent bodies are the CNRS in France, the MPG and the Leibniz in Germany and the CNR in Italy. All of them, in different ways, collaborate with universities, as is to be expected, being an example of *win-win*; in Spain this collaboration should be strengthened, since it gives excellent results. Other countries, such as the United Kingdom, Switzerland, Scandinavian countries and the Netherlands do not have a system of OPIs, so their universities excel more in research,[27] and governments influence their priorities through complementary funding, through agreements to carry out the tasks and research that the national government deems important. This model requires a university governance that is more hierarchical, more entrepreneurial as well as less collective and unionized. It is interesting to observe this positive and very strong correlation between the existence of public research organizations and collective university governments, or, equivalently, between the absence these organizations and a university government with a greater concentration of executive power. This very interesting topic is beyond the scope of this essay, but it is worth remembering that the existence of OPIs has a consequence that is difficult to avoid, namely the more or less chronic lack of adequate funding for public universities. This is due to the fact that finance ministers tend to consider the budget of public research organizations and universities as a constant sum.[28] If it seems difficult to carry out a profound reform of the university system (to improve its financing), it would be even more difficult if it were accompanied by a reduction of the OPI system. Here we would be entering the realm of unrealistic speculation; it would be better to concentrate on what is feasible.

I would like to end this long section dedicated to general aspects by commenting on an unexpected and positive development that has occurred in Catalonia in the last decades regarding the creation of research structures that combine the private and the public sector. These research institutes, thanks to other complementary measures implemented by the Generalitat (its regional

[27] This should be taken into account in the rankings, although, due to its difficulty, it is not.

[28] The case of Germany is somewhat different because of its greater wealth, the strong participatory role of the states, and the interest of industry in research.

government),[29] have managed to develop research at an average high level by successfully attracting excellent researchers from all horizons,[30] raising private funds, and reducing bureaucracy to the minimum allowed. These original and creative developments may not be a panacea, and there may even be doubts about their impact on the university system, but they were the best that the legislation allowed. It is worth remembering that this process would not have been necessary if the universities had done, or could have done, something similar. This brings us directly to the following, more specific sections.

On autonomy and accountability

As far as we know, there are no universities, at least in the Western world, that are in the first percentile and do not enjoy a relatively high degree of autonomy. One justification for autonomy is that an institution dedicated at the highest level to the various aspects of knowledge is unlikely to find structures that are even more expert than itself. It is therefore best placed to manage and define in detail its own strategy, which must in any case be integrated into its overall objective of serving society. There is, however, a risk of bias due to self-evaluation and self-judgment, but this is controlled by accountability. The thesis that a ministry can best direct a university's strategy may be defensible where universities do not excel, but it is considered quite nonsensical for good universities. However, university autonomy is a multifaceted concept, as can easily be seen by reading the University Autonomy Scorecards (Pru, 2017) published by the EUA every 3 to 6 years, despite numerous difficulties and with a high level of professionalism. Spanish universities remain, in the 2017 edition, within the four categories of autonomy, in the medium/low group of the 29 countries that participated. We will now explore some of the less discussed difficulties.

A very pervasive but under-discussed problem is the reluctance of some, or perhaps quite a few, rectors to use the discretional power granted by autonomy. The legislation allows the rector to decide to offer a professor up to double his or her nominal salary in order to ensure quality, to retain or attract a distinguished researcher, to develop a discipline that enjoys high salaries in industry, and so on. Well, almost no one does. Why not? Well, because a rector who is elected on the basis of a program, by vote and by bodies, and who is offered only a modest salary increase, will have little motivation to take

[29] The credit goes to Andreu Mas-Colell (see, for example, Mas-Colell, 2001 and 2002). Like the Portuguese case of Mariano Gago, it is an example of how real improvements come about when knowledge, ideas, will, cold blood, international experience, excellence, a sense of opportunity, and political-scientific savoir faire converge in one individual.

[30] Many of them have received the prestigious ERC contracts.

measures that many will consider elitist,[31] and, therefore, thanks to a fallacious populist *non sequitur*, "antidemocratic", which implies that the statistical distributions applied to society are wrong when they show the *outliers*, the black swans, and that what is democratic is uniformity, the absence of individuals who stand out.

In countries where the university system is predominantly based on civil service, candidates are asked years after the doctorate to present a habilitation, if it is the responsibility of the university, or an accreditation, if it is the responsibility of the state[32] in order to be eligible for a permanent position as a professor or researcher. In the countries with the best university systems, this kind of quality filter after the doctoral degree does not usually exist. There is a fairly broad consensus among academics of a certain level in the countries that suffer or enjoy this control that it is an inevitably bureaucratized step that in the 21st century does not serve the purpose for which it was introduced and that it effectively implies a waste of time in what are usually the most creative years. Excessive *ex ante* control tends to replace creativity with boredom. Seizing the tools that allow the university to compete, to try to be the best, is a bad policy for improving the university system. Imposing controls to prevent it from making mistakes, *i.e.* tutelage, is also a policy that does not encourage the development of university excellence. Universities should be able to make mistakes, that is how they learn and improve, they should follow Schumpeter, even if this leads to better universities and others that are less good.

University autonomy must be accompanied by *ex post* accountability to society,[33] the university's main stakeholder. Society is represented by the government, which must then exercise this control and ultimately take whatever corrective action it deems appropriate.

On university governance[34]

For a university that has sufficient legal autonomy to be able to develop it effectively, it needs an adequate system of governance, which the Spanish university does not currently have. I have first-hand experience of the two extremes of university governance: as Vice-Rector of the University of Barcelona in the early 1990s and as Rector of the University of Luxembourg since 2005. In the former case, the governing board was made up of about a hundred people, all of

[31] And run the risk of having to end his term of office hastily.

[32] In Spain, ANECA is the agency in charge of evaluations and accreditations.

[33] Some would talk about tax payers (Krüger *et al.,* 2018) is a pertinent reading.

[34] (Krüger *et al.,* 2018) is a pertinent reading.

them from the university itself, representing various academic or administrative bodies or positions. With the exception, in principle, of the Rector's team, all of them defended the department or unit they represented or headed. Thus, the defense of the institution was supposed to be carried out, wishful thinking, from the confluence of this large number of supposedly concurrent forces. That such a body, of such size and composition and so subject to corporate interests, would hardly lead to excellence seems so obvious as to require no further discussion. This type of body encourages, even if unintentionally, inbreeding and is inadequate to create the conditions that make the institution attractive to international professors or researchers, or to those who contribute most to the university. It also suffers from another serious flaw: it has no representatives from society outside the university. The Social Council is supposed to make up for this last deficiency, but it is well known that it does not do so, that it cannot do so.[35]

At the University of Luxembourg, the Governing Council was made up of seven people, all from outside the university, three local executives and four academics from abroad, prestigious researchers or university leaders,[36] appointed by the government. A representative of the students, a representative of the faculties, a high official of the Ministry of Trusteeship and the Rector also attended the meetings. The representatives of the faculties and certain academic and administrative positions met in the University Council, whose recommendations were forwarded to the Governing Council, which was sovereign, although its autonomy was relative due to the appointment procedure. The Rector is sought internationally with the help of an academic[37] headhunter and a search committee, and is selected from a short list by the Governing Council and proposed to the Grand Ducal Government, which appoints him or her. The Governing Council can dismiss him or her, as it happened to my successor. The Governing Council also appoints all the lecturers, on the proposal of the Rector. Eighty percent of the academic and research staff under contract[38] are foreigners.[39]

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[35] I recommend the articles published in recent years by Antonio Abril.

[36] Not long ago, its composition was reformed to introduce four representatives in the Council, which now has 13 members.

[37] The same procedure is used by the *Universitat Oberta de Catalunya*, at least when I participated in it. The return on investment on a procedure of this type is very obvious: a mediocre rector has a much higher cost

[38] The University, being legally a public institution under private law, does not have civil servants, only employees. I do not understand why this legal framework has hardly been explored or proposed in Spain, when the PPP, the public-private partnership, has been praised so much, and rightly so. I guess it's for ideological reasons.

[39] I am aware that, in a country the size of Luxembourg, and with no academic tradition, this figure is not as significant as it may seem at first sight; but when I started in Luxembourg, the Prime Minister, Jean-Claude Juncker, who had strong doubts about the goodness of the decision to create a university, spoke to me among others about the danger of inbreeding, "of appointing the sons and daughters of my ministers as professors". This did not happen.

In Spain, there are private universities that have governing boards or rectorates that are not very different from those in Luxembourg. The issue of university governance has been dealt with extensively in the many reports that have been carried out in Spain since Bricall (2000), and in particular, Tarrach *et al.* (2011) and Miras *et al.* (2013). In an ideal world, it should be the university itself, by virtue of its autonomy, that decides, together with the regional government, the governance structure that best suits its vision and mission.

About financing

Given the above comments on the simultaneous financing of the Public Research Organizations (OPIs), and the public university system, and considering the high cost of the Spanish State's debt, it is unlikely that the financing of the university system will increase significantly in the foreseeable future without a previous fundamental change.[40] What non-incremental, *i.e.* radical, changes can we imagine?

- A president with genuine interest in research and universities,[41] or at least a minister of universities and science with decision-making power and priority support from the president.

- The decision of the business sector, of the companies, of the industry and of the most important foundations associated with it, to strongly support the university sector with material, human and financial[42] resources, because they have come to the conclusion that a prestigious university will have a positive impact on the economic, industrial and business development of the country. From my point of view, this will not happen without first reforming the governance of the universities and making it more similar to the governance of companies, with decision-making procedures and responsibilities that are more understandable to the productive world.

- A European Commission that decides to impose on the Member States, perhaps indirectly, adequate funding for research and universities,

[40] There can always be surprises. Thus, the transfer of students from the public to the private sector could continue and the government could decide not to reduce the university budget, that is, to decouple it from the number of students, and instead make it depend on the other two academic activities: research and the third mission, transfer.

[41] That should have ordered, in the first month of his mandate, a report equivalent to (Bush, 1945) or that should have consulted those produced in Spain in recent years.

[42] Chairs financed by companies, foundations, municipalities or other institutions are an instrument of cooperation with the university that is convenient for both parties. Why don't we have many more?

although it is difficult to imagine that the European Council would allow this, since the Member States could consider it an encroachment on their competences.

- A Conference of Rectors of Spanish Universities (CRUE, in Spanish) that proposes to the government a radical reform of the university system in exchange for a substantial increase in funding. Having a body that wants to reform the system that has allowed it to become the highest university authority is neither obvious nor common, although individually many rectors, at least in the past, thought that a profound reform was necessary. But perhaps one day circumstances will allow the CRUE to overcome what psychologists call groupthink, which results from each member's attempt to approach what he or she believes to be the consensus of the collective, but with a final result with which no one is usually satisfied.

- An agreement among the governments of the Autonomous Communities, at least those that believe more in the role of the universities, to press the central government for a profound reform, accompanied by a substantial increase in funding, in exchange for greater coordination among them.

Looking ahead: Conclusions and final recommendations

Although concern for the *quality of teaching* is, to a greater or lesser degree, common to all of Europe, it seems to me that in Spain the imbalance in favor of research activity is even more marked than in other countries.[43] Quality is the *sine qua non* of university activity and university teaching is the most exclusive of the three university missions. It follows that a university cannot claim to be excellent unless the quality of its teaching is excellent. By extension, the procedure for electing or appointing the rector must be such as to maximize the likelihood of electing or appointing the most competent person for the position and who has shown a high level of quality in his or her academic activities.[44]

[43] As an anecdote, when I was dean, I questioned a professor whose teaching had received the worst evaluation in the school. He was a peculiar man, and with a certain sense of humor, he showed me a letter he had received from the vice rector in charge of teaching quality, saying that since he had passed the evaluation for the last five years, he was pleased to inform him that he had been granted a new teaching salary supplement. For various reasons, one of which was the system of electing the rector, the universities had decided to follow a procedure so that everyone would receive this salary increase. I threw in the towel. The evaluation of research, on which the granting of sexenios (6-year salary complements) was based, was, at least in those years, correctly done in a centralized way, for the entire Spanish university system, although perhaps with some discipline bias.

[44] It was said, years ago, that in too many universities, the ratio between granted and possible six-year periods awarded to the rector was lower than the average for his or her university.

There has been a lot of talk about *innovation* in the university context for a long time. Obviously, a university that wants to maintain its good level must innovate in all its activities. But when it is suggested that innovation should be as important as research, it is forgotten that a university is not a business. It is often said that research converts money into new knowledge,[45] while innovation transforms new knowledge into money, and this should be done by companies. Universities should ensure that an important part of the new knowledge they generate feeds into business innovation, perhaps through the creation of spin-offs and start-ups; that there is no contradiction between achieving a high level of quality in both basic research and applied research,[46] and in research closer to the economy is shown by the excellent polytechnic and technical universities that we have in Europe[47] and also in Spain.

One threat that hangs over the university world, indeed the world at large, is the growth of bureaucracy[48] due to the need for reports to be written, data to be provided, privacy to be respected, projects to be prepared, evaluations to be submitted, committees to be served on, departmental and faculty meetings to be attended, and so on. All of which has the consequence that the time left for the three university missions is substantially reduced.[49] Interestingly enough, few seem to be interested in quantifying this time[50] and evaluating the return on these hours, but if this were to happen, it would show a wasteful, irresponsible squandering of public resources. One of the causes of these obligations is the fact that the lack of trust, and therefore the passion for *ex ante* control, is an administrative principle that, in my opinion, is ineffective and unnecessary[51] and that feeds back in a loop. Controlling, with its evaluations, should be done *ex post*, which, of course, must have, in case of non-compliance, peremptory

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45 Thus, mathematicians say of themselves that they are machines for transforming coffee into theorems.

46 The effects on time of Einstein's special (1905) and general (1915) relativity theories, which were considered to be of no practical interest, took a century to make possible the current accuracy of GPS through the corrections in the four atomic clocks of the satellites necessary for localization. No one can foresee what a fundamental research result can be used for 50 years later (see Flexner [1939], which is still worth reading).

47 Such as the ETH in Zurich, the EPF in Lausanne, the KTH in Stockholm, the TUM in Munich, the TUDelft in the Netherlands or the Imperial College in London.

48 Which follows a Keeling-like curve for atmospheric CO_2.

49 I am told that these activities count towards being a professor, something like a professor "for points". It blows my mind; it is no longer necessary to read Kafka or Beckett.

50 Not long ago, while evaluating a French university, I asked for a quantification of this time devoted to administration. They could not give it to me, but I also understood that they were not interested in the subject.

51 When I was at a university in California, I needed a social security document. The clerk asked me for a lot of information without asking for a certificate. When I asked her if she trusted everything I told her, she replied: "We will do some checking, and if we find that you lied to us, we will deport you from the U.S.". This is the "trust but verify" philosophy that we could learn a lot from.

consequences. The time thus recovered for academic activities would allow a substantial improvement of our universities, at zero cost. There are other causes, such as fear of responsibility or control of and by colleagues.

The decentralized structure of the Spanish administration has advantages and disadvantages for the university system. The advantages would predominate if there were effective coordination within the State, based on mutual trust between the stakeholders. It is nonsense for all the Autonomous Communities of Spain to carry out research on the subjects that are currently in vogue and at a high level. It is a sign of narrow-mindedness to erect barriers to enrollment in universities located in another region. All the problems that arise are solvable if there is a willingness to coordinate and cooperate. And the system would be greatly improved, at no public cost.

I would like to end with a reflection, perhaps obsessive, on something that never ceases to surprise me: in the academia, scientific methodology is not used correctly when the object of study is the university system itself and when we try to understand the causes that have led to the situation under study[52]. Too often, analyses are based on inadequate and non-significant statistics; statistical and systematic errors are not taken into account; uncorrelated causes are assumed; single causes are sought when mono-causality almost never exists; errors of deduction such as non sequiturs are made; inference is applied with excessive generosity, using singular, anecdotal cases to make unwarranted generalizations; Occam's razor is misapplied; too much passion is given to irrelevant indicators and surveys; in the end, we work in a supposedly scientific but actually unscientific way. Therefore, the opinion, ideology, bias, *i.e.* the characteristics of the person conducting the study, determine the result of the study to an excessive extent. It is difficult to get it right,[53] but to get it wrong while pretending to get it right is detrimental to all of us: it is better to do the best we can while mentioning the limitations or honestly stating that it is just an opinion.

BIBLIOGRAPHY

Aghion, PH., Dewatripont, M., Hoxby, C., Mas-Colell, A., and Sapir, A. (2008). *Higher aspirations: An agenda for reforming European universities.* Brueghel.

Angrist, J. D., and Pischke, J-S. (2015). *Mastering ´Metrics. The path from cause to effect.* Princeton University Press.

[52] In the case of economics (Angrist and Pischke, 2015) explains how to study causality correctly.

[53] The fact that we do not know of studies that have been properly conducted with the full power of scientific methodology may indicate that the complexity of the object of study does not currently allow this to be done.

Boulton, G., and Lucas, C. (2008). *What are universities for?* League of European Research Universities.

Bricall, J. M. *et al.* (2000). Informe Universidad 2000.

Bush, V. (1945). Report to the President of the USA, "Science, The Endless Frontier". Washington: US Government Printing Office.

Elkana, Y., and Klöpper, H. (2012). *Die Universität im 21. Jahrhundert.* Edition Körber-Stiftung, Hamburg.

Flexner, A. (1939). The usefulness of useless knowledge. *Harper's magazine*, issue 179.

Krüger, K., Parellada, M., Samoilovich, D., and Sursock, A. (eds.). (2018). *Governance Reforms in European University Systems.* Springer.

Mas-Colell, A. (2001). *Els camins europeus de Catalunya: la Recerca.* Generalitat de Catalunya.

Mas-Colell, A. (2002). *Els camins europeus de Catalunya: la Universitat.* Generalitat de Catalunya.

Miras, M. T. *et al.* (2013). *Propuestas para la reforma y mejora de la calidad y eficiencia del sistema universitario español.*

Pearl, J., and Mackenzie, D. (2018). *The book of Why*. Basic books.

Pruvot, E. B., and Estermann, T. (2017). *University Autonomy III, The Scorecard 2017*. European University Association.

Salmi, J. (2009). *The Challenge of Establishing World-Class Universities.* The World Bank.

Tarrach, R. Egron-Polak, E., de Maret, P., Rapp, J.-M., and Salmi, J. (2011). Audacia para llegar lejos: universidades sólidas para la España del mañana, (original en inglés), entregado al ministro Gabilondo.

Tarrach, R. (2020). *What a wonderfull world.* Luxembourg: Maison Moderne.

Weber, L. (2015). *L'Université au XXIe Siècle.* Paris : Economica.

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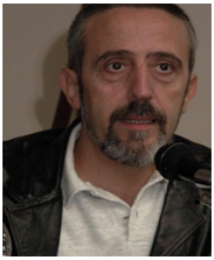

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His research deals with public management (new institutional designs, public management, organization theory, administrative reform, human resources, electronic government and public-private partnerships). He has published 16 books and 120 scientific articles on these subjects.

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Rolf Tarrach

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Former President of the Spanish Research Council (CSIC, Madrid, 2000-2003).

Rolf Tarrach studied physics at the University of Valencia, Spain, and got his PhD from the University of Barcelona. He has been postdoctoral researcher at CERN, Geneva. Dr. Tarrach has been professor of theoretical physics at the universities of Valencia and Barcelona.

He has published some 100 papers in theoretical high-energy physics, quantum field theory, quantum mechanics and in quantum information theory and has written five books. He did research for longer periods in Switzerland, Germany, France, UK, Denmark, Russia, US, Canada, and Argentina. He has supervised 12 PhD theses. He has given some 150 talks and seminars on physics and some 200 conferences on general science, research, scientific policy, energy policy, higher education policy, science and philosophy, science and religion, and innovation. Some 30 talks and essays on a diversity of subjects related, broadly, to gender, knowledge, trust, university and research policy, scientific methodology, Europe, energy, and climate change have been published. Some 100 interviews were published in journals in Spain, France, Germany, Switzerland, United Kingdom, Luxembourg, Belgium.

He has been Dean of the School of Physics and Vice-rector of the University of Barcelona. He is a former member of the European Union Research Advisory Board, of the European Heads of Research Councils group, which he also chaired, and of the 5-year assessment panel of experts of the European Commission. He has been co-organizer of the first three Euroscience Open Forum meetings in Stockholm (2004), Munich (2006) and Barcelona (2008).

He has been chairing the International Experts Board of Estrategia Universidad 2015 (Spain, 2010-2011) and member and vice-chair of the International Jury of Initiatives d'excellence (ANR, France, 2011-2012, 2015-2016). He has been on the European University Association Council for 10 years. He has been President of the Academic Cooperation Association (2008-2011). He has been Chair of the Board of Trustees of The Barcelona Institute of Science and Technology (2015-2016) and is still a member.

He has been awarded a honoris causa degree from the University of Saint Petersburg, Russia, and the University of Liège, Belgium, and is the recipient of some 15 prizes and decorations from Spain, Portugal, Belgium, and Luxembourg.

He is a former member of the Board of Telefonica of Catalonia. He advises a large company in Barcelona on innovation and is member of a few think tanks and several advisory boards and became member of the Governing Board of two private universities.

Beyond the tasks related to evaluation of research institutions mentioned above he has participated in the evaluation of universities and research systems in Spain, Kuwait, Austria, Germany, France, and Finland. In 2020 he was member of the Search Committee of the DG of ESA.

He was member of the commission which set up the frame for the creation of a new technical university in Nuremberg.

Since 2015 the Friends of the University of Luxembourg bestow each year the Rolf Tarrach Prize to the best PhD thesis.

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