ASSESSING THE REGIONAL DIGITAL DIVIDE ACROSS THE EUROPEAN UNION-27

MARÍA ROSALÍA VICENTE
ANA JESÚS LÓPEZ

FUNDACIÓN DE LAS CAJAS DE AHORROS
DOCUMENTO DE TRABAJO
Nº 483/2009

De conformidad con la base quinta de la convocatoria del Programa de Estímulo a la Investigación, este trabajo ha sido sometido a evaluación externa anónima de especialistas cualificados a fin de contrastar su nivel técnico.

ISSN: 1988-8767

La serie **DOCUMENTOS DE TRABAJO** incluye avances y resultados de investigaciones dentro de los programas de la Fundación de las Cajas de Ahorros.
Las opiniones son responsabilidad de los autores.

ASSESSING THE REGIONAL DIGITAL DIVIDE ACROSS THE EUROPEAN UNION-27

María Rosalía Vicente*
Ana Jesús López*

Abstract

Over the last years great efforts have been devoted to the analysis of the digital divide at the international level. In contrast, the evidence about the regional digital divide is still scarce, especially in the case of the European Union. Within this context, the aim of this paper is to remedy this deficiency, trying to throw some light on the state of ICT adoption across European regions. On the basis of a set of ICT-related indicators, we perform a factor analysis that leads us to the development of a ranking, identifying best-and-worst performing regions. The Top-10 mainly corresponds to Dutch regions, while Greece and Bulgaria occupy the Bottom-10. Hence, results show that the regional digital divide reflects to some extent the income gap. However, regional policy towards ICT seems to be having some positive implications for technology adoption. Finally, we assess the regional divides within each Member State.

*Keywords***:** Information and communication technologies (ICT), regions, digital divide, European Union, factor analysis.

*JEL classification***:** L86, O33, O52, R12.

Corresponding author: María Rosalía Vicente, Dept. of Applied Economics, Faculty of Economics and Business, University of Oviedo, Asturias (33006), Spain. E-mail: mrosalia@uniovi.es

*Dept. of Applied Economics-Faculty of Economics and Business--University of Oviedo

INTRODUCTION

The last two decades have seen the revolutionary spread of Information and Communication Technologies (ICT). The developments in hardware, software, and computing fields have resulted in affordable general purpose technologies (Bresnahan and Trajtenberg, 1995) that can be used in most sectors and whose benefits may extend everywhere. Thus, activities such as e-government, e-learning, e-commerce, e-banking, and e-tax have become part of daily life. Likewise, e-mail, web-surfing, social networks, internet news, and online dictionaries are more and more a major component of life for many citizens.

Hence, ICT have been recognised as a major contributor in social and economic development (OECD, 2004, 2007b; Greenstein and McDevitt, 2009). Furthermore, several authors have stressed the importance of these technologies as a catalyst for growth in the economic current crisis (World Economic Forum, 2009). In fact, both American and European recovery plans from the crisis have considered ICT as part of their strategic actions: for instance, the European Commission has earmarked EUR 1 billion of extra spending for investment in broadband, with special attention to the improvement of high-speed connections in rural regions (European Commission, 2009).

ICT are increasingly determining the ability of individuals, firms, and territories to remain competitive and to do things in a more effectively and efficient way, which, in the end, turns into the creation of wealth. Therefore, their path of diffusion suggests how the future distribution of wealth may take shape (International Telecommunications Union, 2006).

In this context, a proper assessment of the state of ICT in a territory has become crucial. Comparing the ICT achievements of individual territories with those of others stands as an important benchmark to gauge regional and global competitiveness. Consequently, call for monitoring and benchmarking have become more and more frequent at international, national, and regional levels. Special attention has been paid to the measurement and track of the digital divide, that is, the gap between individuals, households, businesses, and geographic areas at different socio-economic levels with regard both to their opportunities to access and use ICT for a wide variety of activities (OECD, 2001). In this sense, the outcome plans of the World Summit on the Information Society requested the international performance evaluation and benchmarking of the information society developments (and the resulting divides) through

comparable statistical indicators[1]. Such demand led to set a list core of ICT indicators (Partnership on measuring ICT for development, 2005), and to the development of several composite indices in order to summarise the multidimensionality of a phenomena such as the information society. Examples of such indices are the Information Society Index (IDC/World Times, 2005), the Technology Achievement Index (United Nations, 2001), the Infostate Index (Orbicom, 2002, 2003), the Networked Readiness Index (World Economic Forum, 2008), and the Digital Opportunity Index (International Telecommunications Union, 2008)[2], among others.

Likewise, the European action plans for the information society (eEurope and i2010) have highlighted the importance of measuring and comparing the diffusion of these technologies across the Member States: only once the situation of ICT is properly assessed and measured, policies can be designed and implemented effectively in order to foster the progress of those territories lagging behind. Hence, the current i2010 plan has considered a set of indicators to track ICT diffusion, and has commissioned the development of an "e-business readiness index" in order to give a broad picture of the level of ICT adoption and e-business development at country level (Pennoni et al., 2005).

However, very little has come of these actions in terms of the regional benchmarking of ICT penetration. Most evidence refers to the US (Progressive Policy Institute, 2002; Atkinson and Andes, 2008), while the references to the European Union are few. This is due both to the limited availability of comparable statistical data across European regions and to the lack of instruments for systematically quantifying ICT diffusion, even though considerable efforts were devoted to that end by some European projects (BISER, 2004; UNDERSTAND, 2006). As a consequence, most research has focused on the analysis of regional ICT disparities within a particular Member State (Vicente and López, 2007) or has just considered one indicator to assess the development of the information society (Billón et al., 2009), neglecting its multidimensional nature.

In this context, the aim of this paper is to contribute to the literature on the digital divide by analysing the state of these technologies across the regions of the 27 Member States of the

[1] The World Summit on the Information Society took place in two phases: Geneva 2003 and Tunisia 2005.
[2] See Vicente and López (2008) for complete survey on the development of ICT indices, and Archibugi et al. (2009) for a state-of-art on composite indicators of the technological capabilities of nations in general.

European Union (EU). Hence, we try to assess the level of ICT penetration in each region, and identify best-and-worst positioned regions. Moreover, we use a set of ICT-related indicators in order to capture the multidimensionality of the information society. Therefore, we first present the conceptual framework to measure ICT (section 2) and details of the data (section 3). From this, we perform a factor analysis (section 4) in order to deal with our multivariate data, and we finally summarize our principal findings (section 5).

FRAMEWORK

Over the last decade, the rapid diffusion of ICT has gone alongside with the need for indicators, measures and analysis of such phenomena in order to support and inform policy making (Partnership on measuring ICT for development, 2008). According to the OECD (2005) the well-know S curve of technological diffusion provides a useful conceptual framework to analyze the changes driven by ICT. It considers the following three stages:

- ICT readiness, reflecting the level of networked infrastructure and access to ICT.
- ICT intensity, reflecting the level of ICT use in the society, and the extent to which ICT-related activities are carried out.
- And finally, ICT impact, reflecting the result of efficient and effective ICT use, and therefore indicating whether ICT make a difference in terms of efficiency and/or the creation of new sources of wealth.

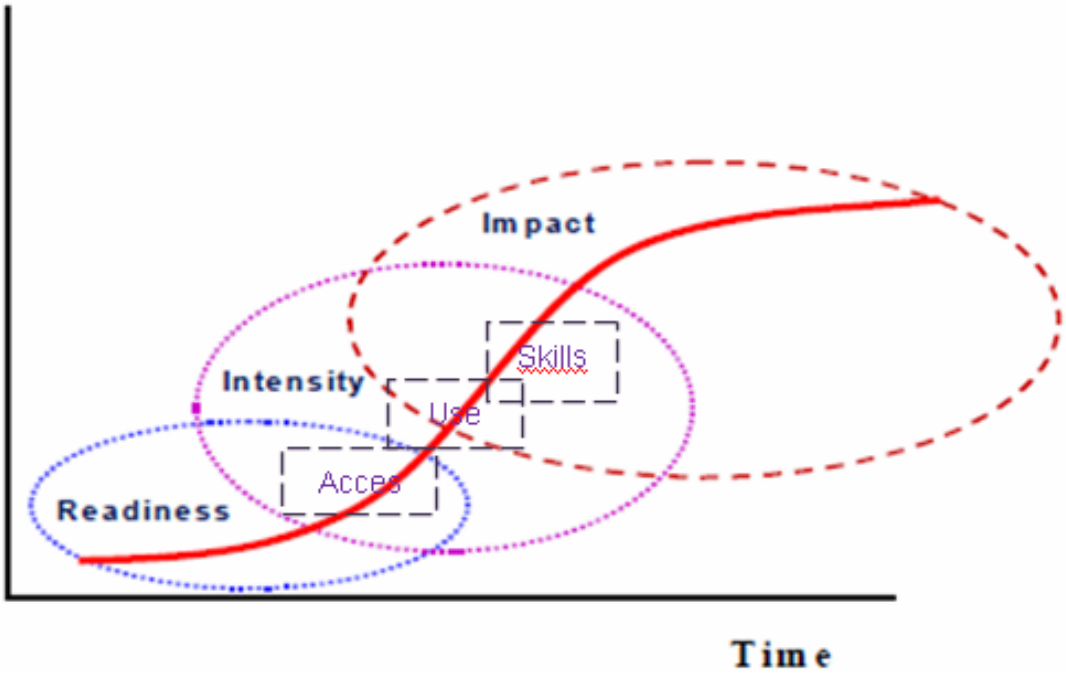
These elements reflect a time sequence in which they are closely linked: without infrastructure, there is no access; without access there is no use; and use will in the end determine impact. In particular, use indicates the level of absorption of the technologies, which at the same time involves increases in terms of the following three elements: numbers (i.e. more ICT users), level of intensity (for example, more SMS being sent), and sophistication of use (for example, online banking or purchasing) (International Telecommunications Union, 2009).

It is important to bear in mind that in addition to access and use, reaching the final state (ICT impact) depends on a third component: ICT capability or skills. ICT skills are needed to make the best use of ICT. They are critical to the potential impact that ICT can have on development: if the individuals in a territory are not capable to exploit the new technologies and realize their potential benefits, development and progress will be hampered in that area. ICT

impact therefore largely depends on the availability of skills and knowledge and the capability to use ICT efficiently and effectively. In fact several authors have pointed out that the gaps in individuals' abilities to find information online are opening a second-level digital divide in addition to the one in access (Hargittai, 2002; OECD 2007a).

Then, our framework of analysis considers three key elements to track the evolution of a territory towards the information society and the successful reaching of the final stage (impact). As shown in Figure 1, these three components are ICT access, use, and skills. Indicators on these three dimensions will be therefore indispensable input measurement to properly assess the state of ICT across European regions.

Figure 1. Framework of analysis: Stages of diffusion and related indicators



Source: Own based on OECD (2005).

DATA

One of the main constraints to the analysis of the digital divide is associated with the availability of data on a regional basis. In spite of the international efforts to develop statistical information about the information society, there is still a lack of comparable data on ICT adoption at the regional level in the EU. In fact, while at the national level there is much data, the regional authorities lack some of the basic information to understand the level of ICT adoption and to evaluate the impact and the effectiveness of ICT policies (Billón et al., 2008).

As a consequence, there is usually a "trade-off" between breadth and depth in the selection of indicators. That is, the more indicators we try to use, the less the number of territories we can include in our investigation.

Our analysis of the digital divide focuses on the EU-27 and uses data provided by Eurostat. We consider 164 regions at the NUTS-2 level (whenever possible) with the exceptions of Hungary, Romania, and Sweden, for which Eurostat provides no regional ICT disaggregated data. We have decided to include these three countries in the analysis in order to get a full picture of the EU. However, it is important to bear in mind such limitation when interpreting the results for those countries.

Data reports to the year 2008. Although information is also available for the period 2006-2007, the high number of missing values for those years prevents us from analysing the evolution of the regional digital divide.

As already mentioned, the availability of data was the main restrictive factor in the selection of variables[3]. Eurostat provides data on only five regional ICT indicators related to Internet access, use, and e-skills (Table 1). These indicators are based on the information coming from the annual survey on ICT usage in households and by individuals, collected by the National Statistical Institute or Ministry of each Member State. Part of the data collected is used in the context of the aforementioned i2010 initiative in order to track the progress of the EU in the ICT field. The survey is based on Eurostat's annual model questionnaire on ICT usage, and is the only homogenous source of such kind covering the whole EU and able to supply regionally disaggregated data on ICT adoption. Specifically, the survey covers the population of all individuals aged 16 to 74 years, and all households having at least one member in such age group.

[3] Such restriction is common to other regional analyses performed at the European level. For instance, the European Innovation Scoreboard includes seven variables at the regional level, while the national one is built upon twenty-five variables (MERIT/JRC, 2007; Zabala-Iturriagagoitia, 2007).

The survey focuses on five regional indicators: percentage of personal computer (PC) non-users[4], percentage of Internet users, percentage of e-commerce users, percentage of households with Internet access, and percentage of households with broadband access.

We note that there is no information available regarding ICT adoption by businesses. Although this lack of data could pose some limitation in our analysis, it is important to take into account that most research on ICT progress have focused on the diffusion of these technologies across population. Furthermore, ICT use by businesses can be expected to be highly correlated with the spread of these technologies across individuals, suggesting that it is not essential to include them in the analysis.

Table 1. Description of variables and codes

CODE	Variable
COM	Percentage of individuals who ordered goods or services online for private use*
NOPC	Percentage of individuals who have never used a computer*
HOME	Percentage of households with access to the Internet at home
BROAD	Percentage of households with broadband access
USE	Percentage of individuals regularly using the Internet*

Note: (*) These percentages have been calculated over the population between 16-74 years old in each region.

The descriptive statistics shown in Table 2 reflect some important differences across regions. Thus, the percentage of households connected to the Internet goes from a minimum of 15% in the region of Severozapaden (Bulgaria) to a maximum of 90% in Noord-Holland (the Netherlands). Moreover the percentage of individuals using e-commerce goes from 1% in Yugoiztochen (Bulgaria) to 69% in the South East of the United Kingdom. The uneven distribution of ICT does not impose any limitation on our analysis, as the methods employed do not make any distributional assumptions.

[4] Eurostat considers the "percentage of individuals who have never used a computer" as an indicator of e-skills, and in particular, of the lack of digital skills across population. Nonetheless, it would be of more interest to have other indicators of digital skills, such as those available at country level at Eurostat, based on a self-assessment approach.

Table 2. Descriptive statistics

	COM	NOPC	HOME	BROAD	USE
Mean	29.84	27.68	58.39	47.27	56.13
Median	23.00	25.00	58.50	47.50	57.00
Std. Deviation	18.66	15.37	16.38	16.25	17.03
Skewness	0.31	0.49	-0.22	-0.08	-0.01
Kurtosis	-1.29	-0.84	-0.32	-0.72	-0.85
Minimum	1.00	5.00	15.00	12.00	22.00
Maximum	69.00	61.00	90.00	79.00	97.00
Percentile 25	14.00	14.00	47.00	35.00	44.00
Percentile 50	23.00	25.00	58.50	47.50	57.00
Percentile 75	48.75	39.00	71.00	58.75	70.00

Source: Eurostat (2009).

FACTOR ANALYSIS

As stated in previous sections, the analysis of ICT development in a territory requires the evaluation of three key facets: access, use, and skills. In this context, factor analysis has revealed as a useful tool to capture the overall dimension of the digital divide (Corrocher and Ordanini, 2002; Soupizet, 2004; Vicente and López, 2006a; Trkman et al., 2008; Al-Mutawkkil et al., 2009).

Factor analysis is a multivariate technique that addresses the problem of analyzing the structure of relationships among a number of variables by defining a set of common underlying dimensions, known as factors (Hair et al., 1995). With this technique, which requires the variables to be highly correlated with each other to be appropriate, the separate dimensions of the structure can be identified, and the extent to which each variable is explained by each dimension is determined. Once this has been done, the two main uses of factor analysis can be achieved: summarization and data reduction. In summarizing the data, factor analysis derives underlying dimensions that, when interpreted and understood, describe data in a much smaller number of items that the original variables. Data reduction can be achieved by calculating scores for each dimension and substituting them for the original variables.

So, first of all, it is necessary to assess whether the variables are sufficiently correlated with each other in order to evaluate the appropriateness of this technique. In our case, the correlation matrix (Table 3) shows that all variables are closely related to each other, with correlation coefficients (in absolute values) larger than 0.8. For instance, the percentage of individuals who have never used a computer is high and negatively correlated with using the

Internet and having access at home because most people are connected to the Internet through a computer. Furthermore, the high and positive correlations of broadband with home access and use show the increasingly importance of high-speed connections: many of the most effective applications and services that can foster development are only available through a high-speed Internet connection, for example those related to e-commerce, e-government, or e-banking.

Table 3. Correlation matrix

	COM	NOPC	HOME	BROAD	USE
COM	1.00	-0.90	0.89	0.82	0.87
NOPC	-0.90	1.00	-0.92	-0.87	-0.96
HOME	0.89	-0.92	1.00	0.92	0.94
BROAD	0.82	-0.87	0.92	1.00	0.93
USE	0.87	-0.96	0.94	0.93	1.00

Note: All the correlations are significant at the 1% level.

As the correlation matrix reveals the existence of strong and significant relationships between the variables, factor analysis seems suitable. Further insights can be gained by using the Bartlett test of sphericity and the Kaiser-Mayer–Olkin (KMO) measure of sampling adequacy (Table 4). Bartlett tests the null hypothesis that the correlation matrix is an identity matrix, which implies that there is no correlation between the variables. The KMO measure requires values greater than 0.5 for a satisfactory factor analysis to proceed. The Bartlett test, with a statistical value of 1,386 and an associated probability of less than 1 percent, and the KMO measure, with a value of 0.85, suggest that the data structure is adequate for factor analysis.

Table 4. Kaiser-Mayer–Olkin Measure and Bartlett's test

Measure		Results
Kaiser-Mayer–Olkin Measure of Sampling Adequacy		0.85
Bartlett's Test of Sphericity	Approx. Chi-Square	1,386.22
	df	10
	Sig.	0.00

Therefore, factor analysis is run. Results are shown in Table 5. For the initial solution there are as many factor as variables, that is, five; so the next step is to decide how many factors to extract. According to the the eigenvalue criterion, all factors having eigenvalues greater than 1 should be retained. This guarantees that any factor accounts for at least the

variance of a single variable. Meanwhile the percentage of variance criterion considers all factors accounting for at least 60 percent (typically, but sometimes 80 percent) of the variance of the original variables. In our case both criteria suggest retaining the first factor, which explains 92 percent of the total variance of the original variables.

Table 5. Results of factor analysis

Factor	Eingenvalue	Percent of variance	Cumulative percent of variance
1	4.60	92.04	92.04
2	0.20	3.91	95.95
3	0.11	2.22	98.17
4	0.06	1.27	99.44
5	0.03	0.56	100.00

Note: The extraction method is Principal Component Analysis.

Table 6 shows the factor loadings matrix, which includes the correlation coefficients between each factor and each variable, and the communalities. Factor 1 has significant positive loadings on all the variables except for the percentage of individuals who have never used a computer, which gets a negative sign. The variable with the highest loading is the percentage of individuals using the Internet, followed by home-Internet-access penetration. The communalities show that the retained factor explains between 87 and 96 percent of the variance of each individual variable. This highlights the quality of the results.

Table 6. Factor loadings matrix and communalities

	Factor loadings	Communalities
USE	0.98	0.96
HOME	0.97	0.95
NOPC	-0.97	0.93
BROAD	0.95	0.90
COM	0.93	0.87

Note: The extraction method is Principal Component Analysis.

By computing each region score on the retained factor, we can identify best- and-worst performing regions in ICT adoption, developing a ranking. The main advantage of building such a ranking is that it provides a clear picture of regional performance and facilitates the benchmarking exercise. Furthermore, it is easier to interpret the place of a region on it than the position derived from a battery of many separate indicators. However, such advantages can transform into disadvantages if simplistic conclusions are derived from it (OECD/JRC, 2008).

Table 7 shows that Europe's Nordic regions are the most advanced when it comes to ICT. In particular, Dutch regions stand out with seven places among the Top-10, including the first position of Noord-Holland. These regions show extraordinary high levels of Internet penetration with about 85 percent of individuals regularly using the Internet, and almost 90 percent of households connected to the Net, mainly by high-speed connections. These high levels of access imply both high levels of usage (more than half of individuals buying online) and digital skills (less than 7 percent of population has never used a computer). The rest of the Top-10 corresponds to two Danish regions (ranks 3rd and 9th) and the British South East (rank 8th).

On the opposite, the Greek region of Kentriki Ellada is in the last position of the ranking (rank 164th), preceded by five Bulgarian regions, two other Greek and one Italian regions. It is interesting to note that Bulgaria places all its regions among the Bottom-10 with the exception of the one which corresponds to the capital, ranking 20 places ahead (Yugozapaden in the 139th position).

Romania is also positioned in the Bottom-10, but is important to remember that there is no disaggregated information for this country: therefore, its 157th rank could be disguising serious regional digital disparities within it. The same could be happening with Sweden (rank 11th) and Hungary (rank 102nd) which, despite the lack of disaggregated data, were included in the analysis in order to have a full picture of the EU-27.

Figure 2 shows a diamond chart for the top and bottom regions, that is, Noord-Holland (1st) versus Kentriki-Ellada (164th). In order to give a clear picture of the magnitude of the regional gap across the EU-27, we have included the variable "percentage of individuals who have ever used a computer" instead of the "percentage of those who have never used it" (NOPC)[5]. The chart shows that the digital divides between the top and bottom regions are big indeed. In fact, the differences in all the five indicators exceed 50 percentage points. Moreover, the biggest gap is observed for home-Internet-connection with 71 percentage points of difference between Noord-Holland (90 percent) and Kentriki-Ellada (19 percent).

[5] The percentage of individuals who have ever used a computer has been reckoned as the following difference=100-NOPC (percentage of individuals who have never used a computer).

Table 7. Ranking of regions derived from the factor analysis

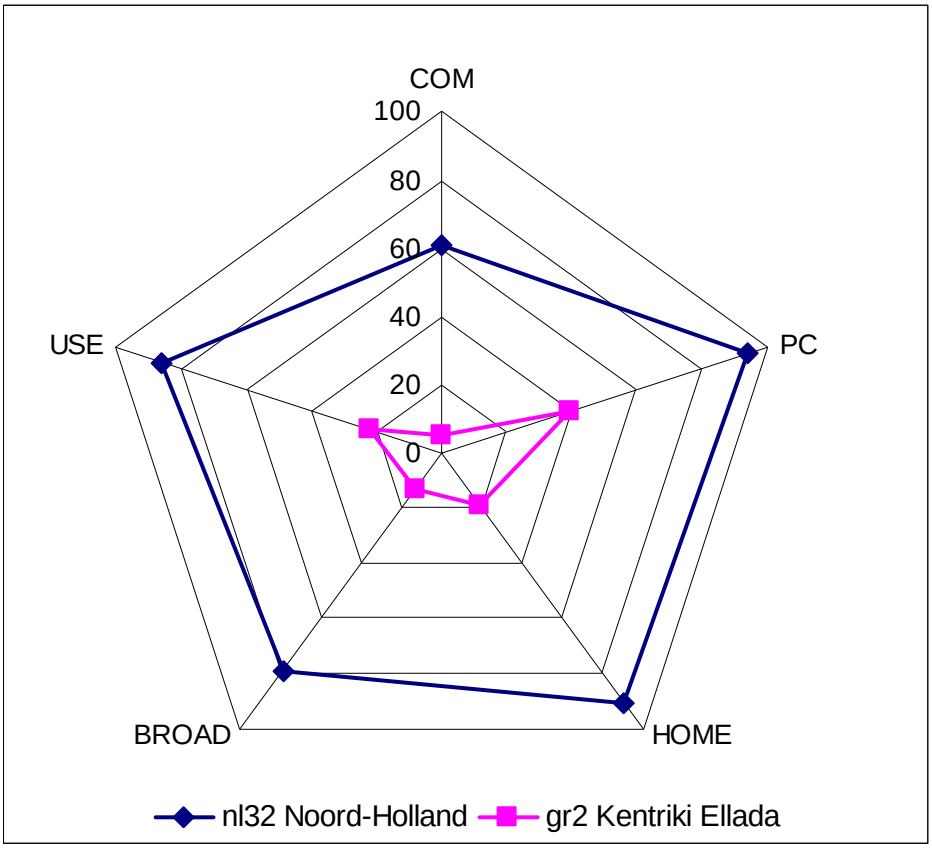
Rank	Region and code	Score	Rank	Region and code	Score	Rank	Region and code	Score
1	nl32 Noord-Holland	1.82	32	deb Rheinland-Pfalz	1.02	63	fr7 Centre-Est	0.38
2	nl31 Utrecht	1.80	33	ukm Scotland	0.98	64	at11 Burgenland	0.38
3	dk01 Hovedstaden	1.78	34	de6 Hamburg	0.95	65	fr5 Ouest	0.37
4	nl11 Groningen	1.78	35	dec Saarland	0.95	66	dee Sachsen-Anhalt	0.36
5	nl21 Overijssel	1.68	36	de1 Baden-Württemberg	0.95	67	ukc North East	0.28
6	nl33 Zuid-Holland	1.62	37	ukf East Midlands	0.95	68	be10 Région de Bruxelles-Capitale	0.28
7	nl23 Flevoland	1.61	38	at13 Wien	0.94	69	de8 Mecklenburg-Vorpommern	0.25
8	ukj South East	1.58	39	de9 Niedersachsen	0.93	70	fr4 Est	0.24
9	nl22 Gelderland	1.58	40	de5 Bremen	0.92	71	es30 Comunidad de Madrid	0.23
10	dk04 Midtjylland	1.54	41	def Schleswig-Holstein	0.90	72	fr2 Bassin Parisien	0.23
11	se Sweden	1.51	42	ukl Wales	0.89	73	at21 Kärnten	0.22
12	nl12 Friesland	1.41	43	fi13 Itä-Suomi	0.87	74	de4 Brandenburg	0.22
13	dk02 Sjælland	1.39	44	uke Yorkshire and The Humber	0.85	75	fr3 Nord-pas-de-Calais	0.21
14	nl41 Noord-Brabant	1.39	45	ukg West Midlands	0.82	76	ded Sachsen	0.20
15	fi20 Åland	1.33	46	be31 Prov. Brabant Wallon	0.77	77	be25 Prov. West-Vlaanderen	0.13
16	dk03 Syddanmark	1.32	47	be24 Prov. Vlaams Brabant	0.76	78	fr6 Sud-Ouest	0.12
17	uki London	1.29	48	fr1 Île de France	0.75	79	ie Ireland	0.12
18	nl42 Limburg	1.27	49	at32 Salzburg	0.61	80	sk01 Bratislavský kraj	0.08
19	fi18 Etelä-Suomi	1.27	50	be23 Prov. Oost-Vlaanderen	0.60	81	es51 Cataluña	0.07
20	fi19 Länsi-Suomi	1.24	51	be22 Prov. Limburg	0.60	82	be34 Prov. Luxembourg	0.06
21	nl34 Zeeland	1.24	52	be21 Prov. Antwerpen	0.59	83	be35 Prov. Namur	0.05
22	ukh Eastern	1.24	53	at34 Vorarlberg	0.58	84	sk02 Západné Slovensko	0.03
23	ukk South West	1.19	54	deg Thüringen	0.57	85	be33 Prov. Liège	-0.02
24	dk05 Nordjylland	1.15	55	ukd North West	0.54	86	sk03 Stredné Slovensko	-0.03
25	lu Luxembourg (Grand-Duché)	1.12	56	at33 Tirol	0.52	87	ee Estonia	-0.04
26	nl13 Drenthe	1.11	57	at31 Oberösterreich	0.50	88	sk04 Východné Slovensko	-0.09
27	de3 Berlin	1.11	58	cz01 Praha	0.49	89	es53 Illes Balears	-0.10
28	de2 Bayern	1.10	59	fr8 Méditerranée	0.48	90	si Slovenia	-0.18
29	dea Nordrhein-Westfalen	1.07	60	at22 Steiermark	0.42	91	es21 Pais Vasco	-0.19
30	de7 Hessen	1.05	61	at12 Niederösterreich	0.40	92	cz02 Strední Cechy	-0.21
31	fi1a Pohjois-Suomi	1.04	62	ukn Northern Ireland	0.40	93	es22 Comunidad Foral de Navarra	-0.24

Table 7. Ranking of regions derived from the factor analysis

Rank	Region and code	Score	Rank	Region and code	Score	Rank	Region and code	Score
94	es13 Cantabria	-0.27	118	pl2 Poludniowy	-0.66	142	ite3 Marche	-1.08
95	be32 Prov. Hainaut	-0.29	119	itd5 Emilia-Romagna	-0.68	143	cy Cyprus	-1.12
96	es24 Aragón	-0.32	120	ite4 Lazio	-0.69	144	itc3 Liguria	-1.13
97	es23 La Rioja	-0.33	121	cz07 Střední Morava	-0.70	145	pt11 Norte	-1.20
98	mt Malta	-0.34	122	es41 Castilla y León	-0.73	146	itf1 Abruzzo	-1.22
99	lv Latvia	-0.35	123	itd2 Provincia Autonoma Trento	-0.75	147	pt20 Região Autónoma dos Açores	-1.25
100	pt17 Lisboa	-0.35	124	gr3 Attiki	-0.75	148	pt18 Alentejo	-1.29
101	es12 Principado de Asturias	-0.36	125	es61 Andalucia	-0.75	149	pt16 Centro	-1.30
102	hu Hungary	-0.42	126	cz04 Severozápad	-0.79	150	itf2 Molise	-1.31
103	es70 Canarias	-0.43	127	itd4 Friuli-Venezia Giulia	-0.81	151	itf5 Basilicata	-1.31
104	cz03 Jihozápad	-0.52	128	es42 Castilla-la Mancha	-0.82	152	itf3 Campania	-1.48
105	itd1 Provincia Autonoma Bolzano-Bozen	-0.53	129	pt15 Algarve	-0.84	153	itf6 Calabria	-1.55
106	cz06 Jihovýchod	-0.54	130	es62 Región de Murcia	-0.87	154	itf4 Puglia	-1.60
107	es52 Comunidad Valenciana	-0.54	131	es43 Extremadura	-0.91	155	itg1 Sicilia	-1.62
108	es64 Ciudad Autónoma de Melilla	-0.56	132	itd3 Veneto	-0.93	156	gr4 Nisia Aigaiou. Kriti	-1.87
109	pl1 Centralny	-0.58	133	itc2 Valle d'Aosta/Vallée d'Aoste	-0.94	157	ro Romania	-1.87
110	pl5 Poludniowo-Zachodni	-0.58	134	pl3 Wschodni	-0.94	158	gr1 Voreia Ellada	-1.88
111	pl4 Pólnocno-Zachodni	-0.58	135	ite2 Umbria	-0.97	159	bg13 Severoiztochen	-1.89
112	itc4 Lombardia	-0.64	136	es11 Galicia	-0.99	160	bg22 Yuzhen tsentralen	-1.94
113	es63 Ciudad Autónoma de Ceuta	-0.64	137	ite1 Toscana	-1.01	161	bg12 Severen tsentralen	-1.96
114	cz05 Severovýchod	-0.64	138	itc1 Piemonte	-1.03	162	bg23 Yugoiztochen	-1.99
115	lt Lithuania	-0.65	139	bg21 Yugozapaden	-1.04	163	bg11 Severozapaden	-2.09
116	pl6 Pólnocny	-0.66	140	itg2 Sardegna	-1.05	164	gr2 Kentriki Ellada	-2.09
117	cz08 Moravskoslezsko	-0.66	141	pt30 Região Autónoma da Madeira	-1.07			

Note: See Annex for country's abbreviations.

Figure 2. The Digital Divides between top and bottom regions

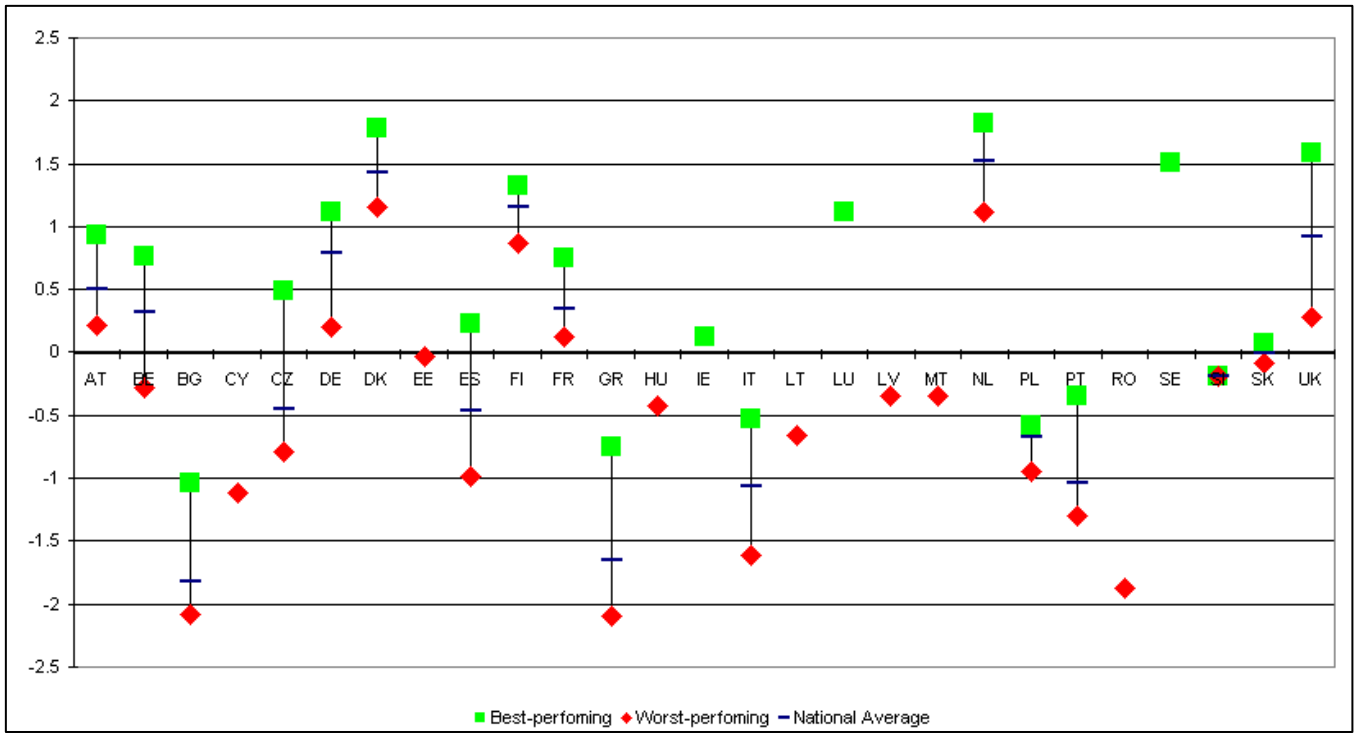


Looking further into the ranking we also observe that the first half of it mostly corresponds to regions from Northern and Central Europe countries. The only exceptions to this are Prague and Madrid ranking 58th and 71st respectively. From the place 86th on, all the regions belong to Southern countries and the New Members of the Union, with the only exception of the Belgian region of Hainaut which ranks 95th.

The fairly good place of Prague, ahead of some Northern regions, contrasts with the position of the rest of Czech territories which rank between 92nd and 126th places. The same happens with other countries such as Belgium, which regions rank between 46th and 95th positions. These results suggest the existence of important divides within countries. Further insights on such issue are presented on Figure 3 which shows for each country the best-and-worst performing regions, and the national average. The horizontal axis identifies countries by their abbreviations while the vertical axis displays factor scores with the value zero corresponding to the European average. Hence regions in the upper part of the diagram correspond to those over the average in what regards to ICT. If we measure the domestic digital

divide as the difference between the best and the worst performing regions in each country, Greece and the United Kingdom present the biggest divides. However, the regions of the former are all below the European average, while those of the latter are all above it. The Czech Republic and Spain also have big digital gaps with the peculiarity that the best performing regions are above the European average in contrast to the worst ones that are below it. The same happens in Belgium. Overall the chart points out the leading position of Northern regions in contrast to the Southern and Eastern ones.

Figure 3. The Digital Divides within countries



Note: See Annex for country's abbreviations.

In order to gain some more insights on this issue we have reckoned some correlations between the derived ICT scores from factor analysis and some socio-economic indicators. Tables 8 and 9 show the results.

Table 8. Correlation matrix (Pearson correlation coefficient)

	ICT factor scores	GDP per capita	GDP per capita (PPS)	Population density	RIS
ICT factor scores	1	0.67	0.59	0.17	0.73
GDP per capita	0.67	1	0.95	0.35	0.62
GDP per capita (PPS)	0.59	0.95	1	0.42	0.57
Population density	0.17	0.35	0.42	1	0.31
RIS	0.73	0.62	0.57	0.31	1

Notes: The number of regions considered is the 164 ones reported in Table 6, except for the correlations with the European Regional Innovation Scoreboard (RIS) which considers 151 regions. GDP and PPS stand for Gross Domestic Product and Purchasing Power Standard respectively. All the correlations are significant at the 1% level.

Sources: Eurostat (2009) and Hollanders (2007). Data reports to the last available year (2006), excluding ICT data which reports to 2008.

Table 9. Rank Correlation matrix (Spearman correlation coefficient)

	ICT factor scores	GDP per capita	GDP per capita (PPS)	RIS
ICT factor scores	1	0.71	0.62	0.73
GDP per capita	0.71	1	0.94	0.71
GDP per capita (PPS)	0.62	0.94	1	0.65
RIS	0.73	0.71	0.65	1

Notes and sources: As for Table 8.

Research on the digital divide, whether within or across economies, has demonstrated that quite a strong relationship exists between the rates of ICT adoption and the levels of income, whether personal or national. In particular, correlation coefficients of 0.9 between the Gross Domestic Product (GDP) and ICT penetration have been reported at country-level (Orbicom, 2005; Hanafizadeh et al., 2009). Our results show that such relationship is a bit less strong at regional-level: linear and rank correlation coefficients are between 0.6 and 0.7. Some regions such as Luxemburg and Bruxelles are not doing as well in ICT as they should be with respect to their level of income; while others such as Flevoland and Overijssel are doing much better in ICT than their incomes would suggest. Although these results must be taken with caution because of the time lag between the available data (the years 2006 and 2008 for GDP and ICT, respectively)[6], they could be interpreted as an indication that factors other than income come into play to explain ICT adoption. One of these factors could be regional policy. This might be the case of the aforementioned Dutch regions of Flevoland and Overijssel. Both of them,

[6] Such time lag has prevented us from further investigation of the role of ICT on regional economic growth in spite of the great interest of such issue. It makes little sense to regress 2006 GDP on 2008 ICT adoption.

being Objective 1 and 2 areas respectively with incomes below the European average[7], received special funding for enabling ICT use and ICT infrastructure from the 2000-2006 Cohesion Policy Programmes (Applica-Ismeri Europa-Wiiw Consortium, 2008). Such funding could be the reason why these regions are performing in ICT better than the expected from their income levels.

Since the EU has been paying special attention to bridging the rural-urban digital divide (Dabinett, 2001; Technopolis and IRISI (Europe), 2002; European Commission, 2006a, 2006b), we have also analysed the relationship between ICT factor scores and population density. In this case, the correlation coefficient gets a value of 0.17, indicating a very weak connection between these two variables, and therefore that the rural-urban digital gap is not that much. Although this result could be a sign of the success of the aforementioned institutional efforts towards bringing the rural gap, further exploration would be needed to draw robust conclusions about this fact.

Finally, we have examined the link between ICT and regional innovation performance. The economic literature on technological diffusion emphasizes the role of innovative activities in facilitating the successful use of external knowledge in general, and of new technologies in particular (Cohen and Levinthal, 1989; Karshenas and Stoneman, 1995; Lal, 1999). Hence, best-performing territories in innovation will be better positioned to adopt ICT and, therefore, to take advantage of the benefits that these technologies may provide (Maurseth and Frank, 2009). In these sense, Norris (2001) and Vicente and López (2006b) found, for a set of 179 countries and the European Union respectively, that those nations which spent more on research and development were more prone to adopt ICT. In order to take account of innovation performance across European regions, we have considered the Regional Innovation Score (RIS) developed at the initiative of the European Commission to evaluate and compare the innovation performance of the Member States under the Lisbon Strategy (Hollanders, 2007). The last year available for the RIS is 2006, when the Top-10 performing regions were Stockholm in Sweden, followed by Västsverige (SE), Oberbayern (DE), Etelä-Suomi (FI), Karlsruhe (DE), Stuttgart (DE), Braunschweig (DE), Sydsverige (SE), Île de France (FR), and Östra Mellansverige (SE).

[7] During the period 2000-2006 the province of Flevoland was a (phasing out) Objective 1 region.

In this case the correlation is also high with coefficients around 0.7 but, as happened with income, the innovation measure is not able to fully grasp the regional differences in ICT.

Overall, these results reveal that the development of an ICT ranking, like the one we have built, is useful if we are to properly assess the regional digital divide since such gap cannot be wholly captured by income and innovation differentials.

CONCLUDING REMARKS

Over the last years it has been recognised worldwide the key role that ICT can play in economic growth and development. Within this context, the European Union has paid special attention to building an "information society for all" individuals and territories, and therefore has implemented several plans to reach this aim. In particular, during the period 2000-2006 Structural Funds expenditure in the information society reached about EUR 5.5 billion[8]. Although such actions might have successful in increasing penetration levels across the Union, our results show that by the year 2008 the regional digital divide is still huge. For instance, the gap between the identified top and bottom regions (Noord-Holland and Kentriki-Ellada, respectively) exceeds 50 percentage points in all ICT indicators. Furthermore, such financial efforts have not been able to make the regional digital divide stop reflecting the regional wealth gap. Our ICT ranking clearly shows the leading position of Northern regions in contrast to Southern and Eastern territories. The correlation coefficients between ICT scores and income per capita are of 0.6-0.7. It is worth mentioning that these values are lower than the ones reported by previous papers at country-level. This fact suggests how cross-country comparisons of the digital divide (in spite of being indispensable in the definition of national strategies) tend to hide any other explanatory factors than the economic ones. In fact, in comparing small sets of countries or small units of analysis, slight variations in public policy and political environment seem to have significant casual implications for technology adoption (Guillen and Suarez, 2001; Oyelaran and Lal, 2005; Howard et al., 2009). In addition, we find little evidence that the regional digital divide is an urban-rural one. This result could be pointing at the success of recent European policies towards bridging such dimension of the digital gap.

[8] Authors' calculations based on data from Sweco (2008).

Nonetheless, some limitations must be considered in our analysis. They are mainly given by data constraints. First, we only consider five variables. Hence some aspects of the information society may not be covered. Second, we assess the regional digital divide at a given point of time. However, a proper appreciation of the gap requires an understanding of its evolution. Furthermore, the time lag between the available data for ICT and GDP has prevented us from analysing the role that ICT are playing in regional economic growth. In a recent paper Forman et al. (2009) found that the use of ICT was only associated with wage growth in those American counties that were already well off in terms of income, education, population, and industry.

As new waves of regional data become available, future research should focus in analyzing whether the identified digital gaps are narrowing or widening. Moreover, a critical point to address is the analysis of the wireless digital gap. Internet access is increasingly offered over wireless technologies and this type of connection is likely to become even more important than wired. Therefore, it is crucial for regions to assess how well they are performing in the diffusion of these technologies. Likewise, it is a key matter to initiate the measurement of the quality of regional connections since those territories with good broadband penetration but with poor quality are in danger of falling behind in the new wave of interactive and media-rich online services and networks.

REFERENCES

Al-Mutawkkil, A.; Heshmati, A. and Hwang, J. (2009): "Development of telecommunication and broadcasting infrastructure indices at the global level", Telecommunications Policy, 33, 176-199.

Applica-Ismeri Europa-Wiiw Consortium (2008): WP1-Coordination of evaluation of SF 2000-2006: Task 4. The Netherlands. ttp://ec.europa.eu/regional_policy/

Archibugi, D.; Denni, M. and Filippetti (2009): "The technological capabilities of nations: The state of the art of synthetic indicators", Technological Forecasting & Social Change, in press.

Atkinson, R. and Andes, S. (2008): The 2008 State New Economy Index: Benchmarking Economic Transformation in the States. Washington: Information Technology and Innovation Foundation.

Billón, M.; Ezcurra, R. and Lera-López, F. (2008): "The Spatial Distribution of the Internet in the European Union: Does Geographical Proximity Matter?", European Planning Studies, 16(1), 119-142.

Billón, M.; Ezcurra, R. and Lera-López, F. (2009): "Spatial effects in website adoption by firms in European regions", Growth and Change, 40(1), 54-84.

BISER (2004): BISER eEurope Region. Benchmarking Report. http://www.biser-eu.com/results

Bresnahan, T. and Trajtenberg, M. (1995): "General purpose technologies: Engines of growth?", Journal of Econometrics, 65, 83-108.

Cohen, W.M. and Levinthal, D.A. (1989): "Innovation and Learning: The two Faces of R and D", Economic Journal, 99(4), 569-596.

Corrocher, N. and Ordanini, A. (2002): "Measuring the digital divide: a framework for the analysis of cross-country differences", Journal of Information Technology, 17, 9-19.

Dabinett, G. (2001): "EU Mainstreaming of the Information Society in Regional Development Policy", Regional Studies, 35(2), 168-173.

European Commission (2006a): Bridging the broadband gap. Brussels: European Commission.

European Commission (2006b): Riga Declaration. Riga: European Commission.

European Commission (2009): Investing today for tomorrow's Europe. Brussels: European Commission.

Eurostat (2009): European statistics. http:// ec.europa.eu/eurostat

Forman, C.; Goldfarb, A. and Greenstein, S. (2009): "The Internet and local wages: Convergence or divergence?", NBER Working Papers, 14750.

Greenstein, S. and McDevitt, R.C. (2009): "The broadband bonus: Accounting for broadband Internet's impact on U.S. GDP", NBER Working Papers, 14758.

Guillén, M. and Suarez, S. (2001): "Developing the Internet: entrepreneurship and public policy in Ireland, Singapore, Argentina and Spain", Telecommunications Policy, 25, 349-371.

Hair J.F. Jr.; Anderson, R.E.; Tatham, R.L. and Black, W.C. (1995): Multivariate Data Analysis with Readings. London: Prentice Hall International.

Hanafizadeh, M.R.; Saghaei, A. and Hanafizadeh, P. (2009): “An index for cross-country analysis of ICT infrastructure and access”, Telecommunications Policy, 33(7), 385-405.

Hargittai, E. (2002): “Second-Level digital divide. Differences in people’s online skills”, First Monday. http://www.firstmonday.dk/issues/issue7_4/hargittai/

Hollanders, H. (2007): 2006 European Regional Innovation Scoreboard (2006 RIS). Maastricht: MERIT (Maastricht Economic and social Research and training centre on Innovation and Technology).

Howard, P.N.; Anderson, K.; Busch, L. and Nafus, D. (2009): “Sizing up information societies: Toward a better metric for the cultures of ICT adoption”, The Information Society, 25, 208-219.

IDC/World Times (2005): The Information Society Index. http://www.idc.com.

International Telecommunication Union (2006). World Telecommunication/ICT Development Report 2006: Measuring ICT for social and economic development. Geneva: International Telecommunication Union.

International Telecommunications Union (2008): The Digital Opportunity Index. Geneva: International Telecommunications Union.

International Telecommunications Union (2009): Measuring the information society. The ICT development index 2009. Geneva: International Telecommunications Union.

Karshenas, M. and Stoneman, P. (1995): “Technological diffusion”, in P. Stoneman (Ed.), Handbook of the Economics of Innovation and Technological Change (pp. 263-297). Oxford: Blackwell.

Lal, K. (1999): “Determinants of the adoption of information technology: a case study of electronic goods manufacturing firms in India”, Research Policy, 28, 667-680.

Maurseth, P.B. and Frank, B. (2009): “The German Information and Communication Technology (ICT) Industry: Spatial Growth and Innovation Patterns”, Regional Studies, 43(4), 605-624.

MERIT/JRC (2007): 2006 European Innovation Scoreboard. Maastricht: Maastricht Economic Research Institute on Innovation and Technology (MERIT) and the Joint Research Centre (Institute for the Protection and Security of the Citizen) of the European Commission

Norris, P. (2001): Digital Divide: Civic engagement, information poverty, and the Internet worldwide. New York: Cambridge University Press.

OECD (2001): Understanding the digital divide. Paris: OECD.

OECD (2004): The economic impact of ICT. Paris: OECD.

OECD (2005): Guide for measuring the information society. Paris: OECD.

OECD (2007a): Broadband and ICT access and use by households and individuals. Paris: OECD.

OECD (2007b): Measuring the impacts of ICT using official statistics. Paris: OECD.

OECD/JRC (2008): Handbook on composite indicators. Paris: OECD.

Orbicom (2002): Monitoring the Digital Divide. Montreal: Orbicom.

Orbicom (2003): Monitoring the Digital Divide…and beyond. Montreal: Orbicom.

Orbicom (2005): From the Digital Divide to Digital Opportunities: Measuring Infostates for Development. Montreal: Orbicom.

Oyelaran-Oyeyinka, B. and Lal, K. (2005): "Internet diffusion in Sub-Saharan Africa: A cross country analysis", Telecommunications Policy, 29(7), 507-527.

Partnership on measuring ICT for development (2005): Core ICT indicators. Santiago de Chile: United Nations.

Partnership on measuring ICT for development (2008): The global information society: a statistical view. Santiago de Chile: United Nations.

Pennoni, F.; Tarantola, S. and Latvala, A. (2005): The 2005 European e-business readiness index. Italy: European Commission/Joint Research Centre.

Progressive Policy Institute (2002): The 2002 State New Economy Index, Benchmarking Economic Transformation in the States. Washington: Progressive Policy Institute.

Soupizet, J.F. (2004): "The North-South digital divide", ICT and inequalities: the digital divides International Conference, Paris.

Sweco (2008): Final Report. European Regional Development Funds and Cohesion Funds Regional Expenditure. http://ec.europa.eu/regional_policy/

Technopolis and IRISI (Europe) (2002): Final Report for the Thematic Evaluation of the Information Society. http://ec.europa.eu/regional_policy/

Trkman, P.; Blazic, B.J. and Turk, T. (2008): "Factors of broadband development and the design of a strategic policy framework", Telecommunications Policy, 32,101–115.

UNDERSTAND (2006): Understand. Result Synopsis, UNDERSTAND Conference, Brussels.

United Nations (2001): Making New Technologies Work for Human Development, Human Development Report 2001. New York: United Nations.

Vicente, M.R. and López, A.J. (2006a): "A multivariate framework for the analysis of the digital divide: Evidence for the European Union-15", Information & Management, 43, 756-766.

Vicente, M.R. and López, A.J. (2006b): "Patterns of ICT diffusion across the European Union", Economic Letters, 93, 45-51.

Vicente, M.R. and López, A.J. (2007): "Measuring the digital divide at the regional level: Evidence for Spain", Regional Studies Association Annual International Conference, Lisbon.

Vicente, M.R. and López, A.J. (2008): "Metrics and Indicators of the Information Society: A survey of the state-of-art", Estadística Española, 50 (168), 273-321.

World Economic Forum (2008): The Global Information Technology Report 2008-2009. http://www.wef.com.

World Economic Forum (2009): The Global Information Technology Report 2008-2009. http://www.wef.com.

Zabala-Iturriagagoitia, J.M; Voigt, P.; Gutiérrez-Gracia, A. and Jiménez-Sáez, F. (2007): "Regional Innovation Systems: How to Assess Performance", Regional Studies, 41(5), 661-672.

ANNEX

Table 10. List of abbreviations

Abbreviations	Country	Abbreviations	Country
AT	Austria	LV	Latvia
BE	Belgium	LT	Lithuania
BG	Bulgaria	LU	Luxembourg
CZ	The Czech Republic	MT	Malta
CY	Cyprus	NL	The Netherlands
DK	Denmark	PL	Poland
EE	Estonia	PT	Portugal
FI	Finland	RO	Romania
FR	France	SI	Slovenia
DE	Germany	ES	Spain
GR	Greece	SE	Sweden
HU	Hungary	SK	The Slovak Republic
IE	Ireland	UK	The United Kingdom
IT	Italy		

FUNDACIÓN DE LAS CAJAS DE AHORROS

DOCUMENTOS DE TRABAJO

Últimos números publicados

159/2000 Participación privada en la construcción y explotación de carreteras de peaje
Ginés de Rus, Manuel Romero y Lourdes Trujillo

160/2000 Errores y posibles soluciones en la aplicación del *Value at Risk*
Mariano González Sánchez

161/2000 Tax neutrality on saving assets. The spahish case before and after the tax reform
Cristina Ruza y de Paz-Curbera

162/2000 Private rates of return to human capital in Spain: new evidence
F. Barceinas, J. Oliver-Alonso, J.L. Raymond y J.L. Roig-Sabaté

163/2000 El control interno del riesgo. Una propuesta de sistema de límites
riesgo neutral
Mariano González Sánchez

164/2001 La evolución de las políticas de gasto de las Administraciones Públicas en los años 90
Alfonso Utrilla de la Hoz y Carmen Pérez Esparrells

165/2001 Bank cost efficiency and output specification
Emili Tortosa-Ausina

166/2001 Recent trends in Spanish income distribution: A robust picture of falling income inequality
Josep Oliver-Alonso, Xavier Ramos y José Luis Raymond-Bara

167/2001 Efectos redistributivos y sobre el bienestar social del tratamiento de las cargas familiares en el nuevo IRPF
Nuria Badenes Plá, Julio López Laborda, Jorge Onrubia Fernández

168/2001 The Effects of Bank Debt on Financial Structure of Small and Medium Firms in some European Countries
Mónica Melle-Hernández

169/2001 La política de cohesión de la UE ampliada: la perspectiva de España
Ismael Sanz Labrador

170/2002 Riesgo de liquidez de Mercado
Mariano González Sánchez

171/2002 Los costes de administración para el afiliado en los sistemas de pensiones basados en cuentas de capitalización individual: medida y comparación internacional.
José Enrique Devesa Carpio, Rosa Rodríguez Barrera, Carlos Vidal Meliá

172/2002 La encuesta continua de presupuestos familiares (1985-1996): descripción, representatividad y propuestas de metodología para la explotación de la información de los ingresos y el gasto.
Llorenc Pou, Joaquín Alegre

173/2002 Modelos paramétricos y no paramétricos en problemas de concesión de tarjetas de credito.
Rosa Puertas, María Bonilla, Ignacio Olmeda

174/2002 Mercado único, comercio intra-industrial y costes de ajuste en las manufacturas españolas.
José Vicente Blanes Cristóbal

175/2003 La Administración tributaria en España. Un análisis de la gestión a través de los ingresos y de los gastos.
Juan de Dios Jiménez Aguilera, Pedro Enrique Barrilao González

176/2003 The Falling Share of Cash Payments in Spain.
Santiago Carbó Valverde, Rafael López del Paso, David B. Humphrey
Publicado en "Moneda y Crédito" nº 217, pags. 167-189.

177/2003 Effects of ATMs and Electronic Payments on Banking Costs: The Spanish Case.
Santiago Carbó Valverde, Rafael López del Paso, David B. Humphrey

178/2003 Factors explaining the interest margin in the banking sectors of the European Union.
Joaquín Maudos y Juan Fernández Guevara

179/2003 Los planes de stock options para directivos y consejeros y su valoración por el mercado de valores en España.
Mónica Melle Hernández

180/2003 Ownership and Performance in Europe and US Banking – A comparison of Commercial, Co-operative & Savings Banks.
Yener Altunbas, Santiago Carbó y Phil Molyneux

181/2003 The Euro effect on the integration of the European stock markets.
Mónica Melle Hernández

182/2004 In search of complementarity in the innovation strategy: international R&D and external knowledge acquisition.
Bruno Cassiman, Reinhilde Veugelers

183/2004 Fijación de precios en el sector público: una aplicación para el servicio municipal de suministro de agua.
Mª Ángeles García Valiñas

184/2004 Estimación de la economía sumergida es España: un modelo estructural de variables latentes.
Ángel Alañón Pardo, Miguel Gómez de Antonio

185/2004 Causas políticas y consecuencias sociales de la corrupción.
Joan Oriol Prats Cabrera

186/2004 Loan bankers' decisions and sensitivity to the audit report using the belief revision model.
Andrés Guiral Contreras and José A. Gonzalo Angulo

187/2004 El modelo de Black, Derman y Toy en la práctica. Aplicación al mercado español.
Marta Tolentino García-Abadillo y Antonio Díaz Pérez

188/2004 Does market competition make banks perform well?.
Mónica Melle

189/2004 Efficiency differences among banks: external, technical, internal, and managerial
Santiago Carbó Valverde, David B. Humphrey y Rafael López del Paso

190/2004 Una aproximación al análisis de los costes de la esquizofrenia en españa: los modelos jerárquicos bayesianos
F. J. Vázquez-Polo, M. A. Negrín, J. M. Cavasés, E. Sánchez y grupo RIRAG

191/2004 Environmental proactivity and business performance: an empirical analysis
Javier González-Benito y Óscar González-Benito

192/2004 Economic risk to beneficiaries in notional defined contribution accounts (NDCs)
Carlos Vidal-Meliá, Inmaculada Domínguez-Fabian y José Enrique Devesa-Carpio

193/2004 Sources of efficiency gains in port reform: non parametric malmquist decomposition tfp index for Mexico
Antonio Estache, Beatriz Tovar de la Fé y Lourdes Trujillo

194/2004 Persistencia de resultados en los fondos de inversión españoles
Alfredo Ciriaco Fernández y Rafael Santamaría Aquilué

195/2005 El modelo de revisión de creencias como aproximación psicológica a la formación del juicio del auditor sobre la gestión continuada
Andrés Guiral Contreras y Francisco Esteso Sánchez

196/2005 La nueva financiación sanitaria en España: descentralización y prospectiva
David Cantarero Prieto

197/2005 A cointegration analysis of the Long-Run supply response of Spanish agriculture to the common agricultural policy
José A. Mendez, Ricardo Mora y Carlos San Juan

198/2005 ¿Refleja la estructura temporal de los tipos de interés del mercado español preferencia por la liquidez?
Magdalena Massot Perelló y Juan M. Nave

199/2005 Análisis de impacto de los Fondos Estructurales Europeos recibidos por una economía regional: Un enfoque a través de Matrices de Contabilidad Social
M. Carmen Lima y M. Alejandro Cardenete

200/2005 Does the development of non-cash payments affect monetary policy transmission?
Santiago Carbó Valverde y Rafael López del Paso

201/2005 Firm and time varying technical and allocative efficiency: an application for port cargo handling firms
Ana Rodríguez-Álvarez, Beatriz Tovar de la Fe y Lourdes Trujillo

202/2005 Contractual complexity in strategic alliances
Jeffrey J. Reuer y Africa Ariño

203/2005 Factores determinantes de la evolución del empleo en las empresas adquiridas por opa
Nuria Alcalde Fradejas y Inés Pérez-Soba Aguilar

204/2005 Nonlinear Forecasting in Economics: a comparison between Comprehension Approach versus Learning Approach. An Application to Spanish Time Series
Elena Olmedo, Juan M. Valderas, Ricardo Gimeno and Lorenzo Escot

205/2005 Precio de la tierra con presión urbana: un modelo para España
Esther Decimavilla, Carlos San Juan y Stefan Sperlich

206/2005 Interregional migration in Spain: a semiparametric analysis
Adolfo Maza y José Villaverde

207/2005 Productivity growth in European banking
Carmen Murillo-Melchor, José Manuel Pastor y Emili Tortosa-Ausina

208/2005 Explaining Bank Cost Efficiency in Europe: Environmental and Productivity Influences.
Santiago Carbó Valverde, David B. Humphrey y Rafael López del Paso

209/2005 La elasticidad de sustitución intertemporal con preferencias no separables intratemporalmente: los casos de Alemania, España y Francia.
Elena Márquez de la Cruz, Ana R. Martínez Cañete y Inés Pérez-Soba Aguilar

210/2005 Contribución de los efectos tamaño, book-to-market y momentum a la valoración de activos: el caso español.
Begoña Font-Belaire y Alfredo Juan Grau-Grau

211/2005 Permanent income, convergence and inequality among countries
José M. Pastor and Lorenzo Serrano

212/2005 The Latin Model of Welfare: Do 'Insertion Contracts' Reduce Long-Term Dependence?
Luis Ayala and Magdalena Rodríguez

213/2005 The effect of geographic expansion on the productivity of Spanish savings banks
Manuel Illueca, José M. Pastor and Emili Tortosa-Ausina

214/2005 Dynamic network interconnection under consumer switching costs
Ángel Luis López Rodríguez

215/2005 La influencia del entorno socioeconómico en la realización de estudios universitarios: una aproximación al caso español en la década de los noventa
Marta Rahona López

216/2005 The valuation of spanish ipos: efficiency analysis
Susana Álvarez Otero

217/2005 On the generation of a regular multi-input multi-output technology using parametric output distance functions
Sergio Perelman and Daniel Santin

218/2005 La gobernanza de los procesos parlamentarios: la organización industrial del congreso de los diputados en España
Gonzalo Caballero Miguez

219/2005 Determinants of bank market structure: Efficiency and political economy variables
Francisco González

220/2005 Agresividad de las órdenes introducidas en el mercado español: estrategias, determinantes y medidas de performance
David Abad Díaz

221/2005 Tendencia post-anuncio de resultados contables: evidencia para el mercado español
Carlos Forner Rodríguez, Joaquín Marhuenda Fructuoso y Sonia Sanabria García

222/2005 Human capital accumulation and geography: empirical evidence in the European Union
Jesús López-Rodríguez, J. Andrés Faíña y Jose Lopez Rodríguez

223/2005 Auditors' Forecasting in Going Concern Decisions: Framing, Confidence and Information Processing
Waymond Rodgers and Andrés Guiral

224/2005 The effect of Structural Fund spending on the Galician region: an assessment of the 1994-1999 and 2000-2006 Galician CSFs
José Ramón Cancelo de la Torre, J. Andrés Faíña and Jesús López-Rodríguez

225/2005 The effects of ownership structure and board composition on the audit committee activity: Spanish evidence
Carlos Fernández Méndez and Rubén Arrondo García

226/2005 Cross-country determinants of bank income smoothing by managing loan loss provisions
Ana Rosa Fonseca and Francisco González

227/2005 Incumplimiento fiscal en el irpf (1993-2000): un análisis de sus factores determinantes
Alejandro Estellér Moré

228/2005 Region versus Industry effects: volatility transmission
Pilar Soriano Felipe and Francisco J. Climent Diranzo

229/2005 Concurrent Engineering: The Moderating Effect Of Uncertainty On New Product Development Success
Daniel Vázquez-Bustelo and Sandra Valle

230/2005 On zero lower bound traps: a framework for the analysis of monetary policy in the 'age' of central banks
Alfonso Palacio-Vera

231/2005 Reconciling Sustainability and Discounting in Cost Benefit Analysis: a methodological proposal
M. Carmen Almansa Sáez and Javier Calatrava Requena

232/2005 Can The Excess Of Liquidity Affect The Effectiveness Of The European Monetary Policy?
Santiago Carbó Valverde and Rafael López del Paso

233/2005 Inheritance Taxes In The Eu Fiscal Systems: The Present Situation And Future Perspectives.
Miguel Angel Barberán Lahuerta

234/2006 Bank Ownership And Informativeness Of Earnings.
Víctor M. González

235/2006 Developing A Predictive Method: A Comparative Study Of The Partial Least Squares Vs Maximum Likelihood Techniques.
Waymond Rodgers, Paul Pavlou and Andres Guiral.

236/2006 Using Compromise Programming for Macroeconomic Policy Making in a General Equilibrium Framework: Theory and Application to the Spanish Economy.
Francisco J. André, M. Alejandro Cardenete y Carlos Romero.

237/2006 Bank Market Power And Sme Financing Constraints.
Santiago Carbó-Valverde, Francisco Rodríguez-Fernández y Gregory F. Udell.

238/2006 Trade Effects Of Monetary Agreements: Evidence For Oecd Countries.
Salvador Gil-Pareja, Rafael Llorca-Vivero y José Antonio Martínez-Serrano.

239/2006 The Quality Of Institutions: A Genetic Programming Approach.
Marcos Álvarez-Díaz y Gonzalo Caballero Miguez.

240/2006 La interacción entre el éxito competitivo y las condiciones del mercado doméstico como determinantes de la decisión de exportación en las Pymes.
Francisco García Pérez.

241/2006 Una estimación de la depreciación del capital humano por sectores, por ocupación y en el tiempo.
Inés P. Murillo.

242/2006 Consumption And Leisure Externalities, Economic Growth And Equilibrium Efficiency.
Manuel A. Gómez.

243/2006 Measuring efficiency in education: an analysis of different approaches for incorporating non-discretionary inputs.
Jose Manuel Cordero-Ferrera, Francisco Pedraja-Chaparro y Javier Salinas-Jiménez

244/2006 Did The European Exchange-Rate Mechanism Contribute To The Integration Of Peripheral Countries?.
Salvador Gil-Pareja, Rafael Llorca-Vivero y José Antonio Martínez-Serrano

245/2006 Intergenerational Health Mobility: An Empirical Approach Based On The Echp.
Marta Pascual and David Cantarero

246/2006 Measurement and analysis of the Spanish Stock Exchange using the Lyapunov exponent with digital technology.
Salvador Rojí Ferrari and Ana Gonzalez Marcos

247/2006 Testing For Structural Breaks In Variance Withadditive Outliers And Measurement Errors.
Paulo M.M. Rodrigues and Antonio Rubia

248/2006 The Cost Of Market Power In Banking: Social Welfare Loss Vs. Cost Inefficiency.
Joaquín Maudos and Juan Fernández de Guevara

249/2006 Elasticidades de largo plazo de la demanda de vivienda: evidencia para España (1885-2000).
Desiderio Romero Jordán, José Félix Sanz Sanz y César Pérez López

250/2006 Regional Income Disparities in Europe: What role for location?.
Jesús López-Rodríguez and J. Andrés Faíña

251/2006 Funciones abreviadas de bienestar social: Una forma sencilla de simultanear la medición de la eficiencia y la equidad de las políticas de gasto público.
Nuria Badenes Plá y Daniel Santín González

252/2006 "The momentum effect in the Spanish stock market: Omitted risk factors or investor behaviour?".
Luis Muga and Rafael Santamaría

253/2006 Dinámica de precios en el mercado español de gasolina: un equilibrio de colusión tácita.
Jordi Perdiguero García

254/2006 Desigualdad regional en España: renta permanente versus renta corriente.
José M.Pastor, Empar Pons y Lorenzo Serrano

255/2006 Environmental implications of organic food preferences: an application of the impure public goods model.
Ana Maria Aldanondo-Ochoa y Carmen Almansa-Sáez

256/2006 Family tax credits versus family allowances when labour supply matters: Evidence for Spain.
José Felix Sanz-Sanz, Desiderio Romero-Jordán y Santiago Álvarez-García

257/2006 La internacionalización de la empresa manufacturera española: efectos del capital humano genérico y específico.
José López Rodríguez

258/2006 Evaluación de las migraciones interregionales en España, 1996-2004.
María Martínez Torres

259/2006 Efficiency and market power in Spanish banking.
Rolf Färe, Shawna Grosskopf y Emili Tortosa-Ausina.

260/2006 Asimetrías en volatilidad, beta y contagios entre las empresas grandes y pequeñas cotizadas en la bolsa española.
Helena Chuliá y Hipòlit Torró.

261/2006 Birth Replacement Ratios: New Measures of Period Population Replacement.
José Antonio Ortega.

262/2006 Accidentes de tráfico, víctimas mortales y consumo de alcohol.
José Mª Arranz y Ana I. Gil.

263/2006 Análisis de la Presencia de la Mujer en los Consejos de Administración de las Mil Mayores Empresas Españolas.
Ruth Mateos de Cabo, Lorenzo Escot Mangas y Ricardo Gimeno Nogués.

264/2006 Crisis y Reforma del Pacto de Estabilidad y Crecimiento. Las Limitaciones de la Política Económica en Europa.
Ignacio Álvarez Peralta.

265/2006 Have Child Tax Allowances Affected Family Size? A Microdata Study For Spain (1996-2000).
Jaime Vallés-Giménez y Anabel Zárate-Marco.

266/2006 Health Human Capital And The Shift From Foraging To Farming.
Paolo Rungo.

267/2006 Financiación Autonómica y Política de la Competencia: El Mercado de Gasolina en Canarias.
Juan Luis Jiménez y Jordi Perdiguero.

268/2006 El cumplimiento del Protocolo de Kyoto para los hogares españoles: el papel de la imposición sobre la energía.
Desiderio Romero-Jordán y José Félix Sanz-Sanz.

269/2006 Banking competition, financial dependence and economic growth
Joaquín Maudos y Juan Fernández de Guevara

270/2006 Efficiency, subsidies and environmental adaptation of animal farming under CAP
Werner Kleinhanß, Carmen Murillo, Carlos San Juan y Stefan Sperlich

271/2006 Interest Groups, Incentives to Cooperation and Decision-Making Process in the European Union
A. Garcia-Lorenzo y Jesús López-Rodríguez

272/2006 Riesgo asimétrico y estrategias de momentum en el mercado de valores español
Luis Muga y Rafael Santamaría

273/2006 Valoración de capital-riesgo en proyectos de base tecnológica e innovadora a través de la teoría de opciones reales
Gracia Rubio Martín

274/2006 Capital stock and unemployment: searching for the missing link
Ana Rosa Martínez-Cañete, Elena Márquez de la Cruz, Alfonso Palacio-Vera and Inés Pérez-Soba Aguilar

275/2006 Study of the influence of the voters' political culture on vote decision through the simulation of a political competition problem in Spain
Sagrario Lantarón, Isabel Lillo, Mª Dolores López and Javier Rodrigo

276/2006 Investment and growth in Europe during the Golden Age
Antonio Cubel and Mª Teresa Sanchis

277/2006 Efectos de vincular la pensión pública a la inversión en cantidad y calidad de hijos en un modelo de equilibrio general
Robert Meneu Gaya

278/2006 El consumo y la valoración de activos
Elena Márquez y Belén Nieto

279/2006 Economic growth and currency crisis: A real exchange rate entropic approach
David Matesanz Gómez y Guillermo J. Ortega

280/2006 Three measures of returns to education: An illustration for the case of Spain
María Arrazola y José de Hevia

281/2006 Composition of Firms versus Composition of Jobs
Antoni Cunyat

282/2006 La vocación internacional de un holding tranviario belga: la Compagnie Mutuelle de Tram-ways, 1895-1918
Alberte Martínez López

283/2006 Una visión panorámica de las entidades de crédito en España en la última década.
Constantino García Ramos

284/2006 Foreign Capital and Business Strategies: a comparative analysis of urban transport in Madrid and Barcelona, 1871-1925
Alberte Martínez López

285/2006 Los intereses belgas en la red ferroviaria catalana, 1890-1936
Alberte Martínez López

286/2006 The Governance of Quality: The Case of the Agrifood Brand Names
Marta Fernández Barcala, Manuel González-Díaz y Emmanuel Raynaud

287/2006 Modelling the role of health status in the transition out of malthusian equilibrium
Paolo Rungo, Luis Currais and Berta Rivera

288/2006 Industrial Effects of Climate Change Policies through the EU Emissions Trading Scheme
Xavier Labandeira and Miguel Rodríguez

289/2006 Globalisation and the Composition of Government Spending: An analysis for OECD countries
Norman Gemmell, Richard Kneller and Ismael Sanz

290/2006 La producción de energía eléctrica en España: Análisis económico de la actividad tras la liberalización del Sector Eléctrico
Fernando Hernández Martínez

291/2006 Further considerations on the link between adjustment costs and the productivity of R&D investment: evidence for Spain
Desiderio Romero-Jordán, José Félix Sanz-Sanz and Inmaculada Álvarez-Ayuso

292/2006 Una teoría sobre la contribución de la función de compras al rendimiento empresarial
Javier González Benito

293/2006 Agility drivers, enablers and outcomes: empirical test of an integrated agile manufacturing model
Daniel Vázquez-Bustelo, Lucía Avella and Esteban Fernández

294/2006 Testing the parametric vs the semiparametric generalized mixed effects models
María José Lombardía and Stefan Sperlich

295/2006 Nonlinear dynamics in energy futures
Mariano Matilla-García

296/2006 Estimating Spatial Models By Generalized Maximum Entropy Or How To Get Rid Of W
Esteban Fernández Vázquez, Matías Mayor Fernández and Jorge Rodriguez-Valez

297/2006 Optimización fiscal en las transmisiones lucrativas: análisis metodológico
Félix Domínguez Barrero

298/2006 La situación actual de la banca online en España
Francisco José Climent Diranzo y Alexandre Momparler Pechuán

299/2006 Estrategia competitiva y rendimiento del negocio: el papel mediador de la estrategia y las capacidades productivas
Javier González Benito y Isabel Suárez González

300/2006 A Parametric Model to Estimate Risk in a Fixed Income Portfolio
Pilar Abad and Sonia Benito

301/2007 Análisis Empírico de las Preferencias Sociales Respecto del Gasto en Obra Social de las Cajas de Ahorros
Alejandro Esteller-Moré, Jonathan Jorba Jiménez y Albert Solé-Ollé

302/2007 Assessing the enlargement and deepening of regional trading blocs: The European Union case
Salvador Gil-Pareja, Rafael Llorca-Vivero y José Antonio Martínez-Serrano

303/2007 ¿Es la Franquicia un Medio de Financiación?: Evidencia para el Caso Español
Vanesa Solís Rodríguez y Manuel González Díaz

304/2007 On the Finite-Sample Biases in Nonparametric Testing for Variance Constancy
Paulo M.M. Rodrigues and Antonio Rubia

305/2007 Spain is Different: Relative Wages 1989-98
José Antonio Carrasco Gallego

306/2007 Poverty reduction and SAM multipliers: An evaluation of public policies in a regional framework
Francisco Javier De Miguel-Vélez y Jesús Pérez-Mayo

307/2007 La Eficiencia en la Gestión del Riesgo de Crédito en las Cajas de Ahorro
Marcelino Martínez Cabrera

308/2007 Optimal environmental policy in transport: unintended effects on consumers' generalized price
M. Pilar Socorro and Ofelia Betancor

309/2007 Agricultural Productivity in the European Regions: Trends and Explanatory Factors
Roberto Ezcurra, Belen Iráizoz, Pedro Pascual and Manuel Rapún

310/2007 Long-run Regional Population Divergence and Modern Economic Growth in Europe: a Case Study of Spain
María Isabel Ayuda, Fernando Collantes and Vicente Pinilla

311/2007 Financial Information effects on the measurement of Commercial Banks' Efficiency
Borja Amor, María T. Tascón and José L. Fanjul

312/2007 Neutralidad e incentivos de las inversiones financieras en el nuevo IRPF
Félix Domínguez Barrero

313/2007 The Effects of Corporate Social Responsibility Perceptions on The Valuation of Common Stock
Waymond Rodgers , Helen Choy and Andres Guiral-Contreras

314/2007 Country Creditor Rights, Information Sharing and Commercial Banks' Profitability Persistence across the world
Borja Amor, María T. Tascón and José L. Fanjul

315/2007 ¿Es Relevante el Déficit Corriente en una Unión Monetaria? El Caso Español
Javier Blanco González y Ignacio del Rosal Fernández

316/2007 The Impact of Credit Rating Announcements on Spanish Corporate Fixed Income Performance: Returns, Yields and Liquidity
Pilar Abad, Antonio Díaz and M. Dolores Robles

317/2007 Indicadores de Lealtad al Establecimiento y Formato Comercial Basados en la Distribución del Presupuesto
Cesar Augusto Bustos Reyes y Óscar González Benito

318/2007 Migrants and Market Potential in Spain over The XXth Century: A Test Of The New Economic Geography
Daniel A. Tirado, Jordi Pons, Elisenda Paluzie and Javier Silvestre

319/2007 El Impacto del Coste de Oportunidad de la Actividad Emprendedora en la Intención de los Ciudadanos Europeos de Crear Empresas
Luis Miguel Zapico Aldeano

320/2007 Los belgas y los ferrocarriles de vía estrecha en España, 1887-1936
Alberte Martínez López

321/2007 Competición política bipartidista. Estudio geométrico del equilibrio en un caso ponderado
Isabel Lillo, Mª Dolores López y Javier Rodrigo

322/2007 Human resource management and environment management systems: an empirical study
Mª Concepción López Fernández, Ana Mª Serrano Bedia and Gema García Piqueres

323/2007 Wood and industrialization. evidence and hypotheses from the case of Spain, 1860-1935.
Iñaki Iriarte-Goñi and María Isabel Ayuda Bosque

324/2007 New evidence on long-run monetary neutrality.
J. Cunado, L.A. Gil-Alana and F. Perez de Gracia

325/2007 Monetary policy and structural changes in the volatility of us interest rates.
Juncal Cuñado, Javier Gomez Biscarri and Fernando Perez de Gracia

326/2007 The productivity effects of intrafirm diffusion.
Lucio Fuentelsaz, Jaime Gómez and Sergio Palomas

327/2007 Unemployment duration, layoffs and competing risks.
J.M. Arranz, C. García-Serrano and L. Toharia

328/2007 El grado de cobertura del gasto público en España respecto a la UE-15
Nuria Rueda, Begoña Barruso, Carmen Calderón y Mª del Mar Herrador

329/2007 The Impact of Direct Subsidies in Spain before and after the CAP'92 Reform
Carmen Murillo, Carlos San Juan and Stefan Sperlich

330/2007 Determinants of post-privatisation performance of Spanish divested firms
Laura Cabeza García and Silvia Gómez Ansón

331/2007 ¿Por qué deciden diversificar las empresas españolas? Razones oportunistas versus razones económicas
Almudena Martínez Campillo

332/2007 Dynamical Hierarchical Tree in Currency Markets
Juan Gabriel Brida, David Matesanz Gómez and Wiston Adrián Risso

333/2007 Los determinantes sociodemográficos del gasto sanitario. Análisis con microdatos individuales
Ana María Angulo, Ramón Barberán, Pilar Egea y Jesús Mur

334/2007 Why do companies go private? The Spanish case
Inés Pérez-Soba Aguilar

335/2007 The use of gis to study transport for disabled people
Verónica Cañal Fernández

336/2007 The long run consequences of M&A: An empirical application
Cristina Bernad, Lucio Fuentelsaz and Jaime Gómez

337/2007 Las clasificaciones de materias en economía: principios para el desarrollo de una nueva clasificación
Valentín Edo Hernández

338/2007 Reforming Taxes and Improving Health: A Revenue-Neutral Tax Reform to Eliminate Medical and Pharmaceutical VAT
Santiago Álvarez-García, Carlos Pestana Barros y Juan Prieto-Rodriguez

339/2007 Impacts of an iron and steel plant on residential property values
Celia Bilbao-Terol

340/2007 Firm size and capital structure: Evidence using dynamic panel data
Víctor M. González and Francisco González

341/2007 ¿Cómo organizar una cadena hotelera? La elección de la forma de gobierno
Marta Fernández Barcala y Manuel González Díaz

342/2007 Análisis de los efectos de la decisión de diversificar: un contraste del marco teórico "Agencia-Stewardship"
Almudena Martínez Campillo y Roberto Fernández Gago

343/2007 Selecting portfolios given multiple eurostoxx-based uncertainty scenarios: a stochastic goal programming approach from fuzzy betas
Enrique Ballestero, Blanca Pérez-Gladish, Mar Arenas-Parra and Amelia Bilbao-Terol

344/2007 "El bienestar de los inmigrantes y los factores implicados en la decisión de emigrar"
Anastasia Hernández Alemán y Carmelo J. León

345/2007 Governance Decisions in the R&D Process: An Integrative Framework Based on TCT and Knowledge View of The Firm.
Andrea Martínez-Noya and Esteban García-Canal

346/2007 Diferencias salariales entre empresas públicas y privadas. El caso español
Begoña Cueto y Nuria Sánchez- Sánchez

347/2007 Effects of Fiscal Treatments of Second Home Ownership on Renting Supply
Celia Bilbao Terol and Juan Prieto Rodríguez

348/2007 Auditors' ethical dilemmas in the going concern evaluation
Andres Guiral, Waymond Rodgers, Emiliano Ruiz and Jose A. Gonzalo

349/2007 Convergencia en capital humano en España. Un análisis regional para el periodo 1970-2004
Susana Morales Sequera y Carmen Pérez Esparrells

350/2007 Socially responsible investment: mutual funds portfolio selection using fuzzy multiobjective programming
Blanca Mª Pérez-Gladish, Mar Arenas-Parra , Amelia Bilbao-Terol and Mª Victoria Rodríguez-Uría

351/2007 Persistencia del resultado contable y sus componentes: implicaciones de la medida de ajustes por devengo
Raúl Iñiguez Sánchez y Francisco Poveda Fuentes

352/2007 Wage Inequality and Globalisation: What can we Learn from the Past? A General Equilibrium Approach
Concha Betrán, Javier Ferri and Maria A. Pons

353/2007 Eficacia de los incentivos fiscales a la inversión en I+D en España en los años noventa
Desiderio Romero Jordán y José Félix Sanz Sanz

354/2007 Convergencia regional en renta y bienestar en España
Robert Meneu Gaya

355/2007 Tributación ambiental: Estado de la Cuestión y Experiencia en España
Ana Carrera Poncela

356/2007 Salient features of dependence in daily us stock market indices
Luis A. Gil-Alana, Juncal Cuñado and Fernando Pérez de Gracia

357/2007 La educación superior: ¿un gasto o una inversión rentable para el sector público?
Inés P. Murillo y Francisco Pedraja

358/2007 Effects of a reduction of working hours on a model with job creation and job destruction
Emilio Domínguez, Miren Ullibarri y Idoya Zabaleta

359/2007 Stock split size, signaling and earnings management: Evidence from the Spanish market
José Yagüe, J. Carlos Gómez-Sala and Francisco Poveda-Fuentes

360/2007 Modelización de las expectativas y estrategias de inversión en mercados de derivados
Begoña Font-Belaire

361/2008 Trade in capital goods during the golden age, 1953-1973
Mª Teresa Sanchis and Antonio Cubel

362/2008 El capital económico por riesgo operacional: una aplicación del modelo de distribución de pérdidas
Enrique José Jiménez Rodríguez y José Manuel Feria Domínguez

363/2008 The drivers of effectiveness in competition policy
Joan-Ramon Borrell and Juan-Luis Jiménez

364/2008 Corporate governance structure and board of directors remuneration policies: evidence from Spain
Carlos Fernández Méndez, Rubén Arrondo García and Enrique Fernández Rodríguez

365/2008 Beyond the disciplinary role of governance: how boards and donors add value to Spanish foundations
Pablo De Andrés Alonso, Valentín Azofra Palenzuela y M. Elena Romero Merino

366/2008 Complejidad y perfeccionamiento contractual para la contención del oportunismo en los acuerdos de franquicia
Vanesa Solís Rodríguez y Manuel González Díaz

367/2008 Inestabilidad y convergencia entre las regiones europeas
Jesús Mur, Fernando López y Ana Angulo

368/2008 Análisis espacial del cierre de explotaciones agrarias
Ana Aldanondo Ochoa, Carmen Almansa Sáez y Valero Casanovas Oliva

369/2008 Cross-Country Efficiency Comparison between Italian and Spanish Public Universities in the period 2000-2005
Tommaso Agasisti and Carmen Pérez Esparrells

370/2008 El desarrollo de la sociedad de la información en España: un análisis por comunidades autónomas
María Concepción García Jiménez y José Luis Gómez Barroso

371/2008 El medioambiente y los objetivos de fabricación: un análisis de los modelos estratégicos para su consecución
Lucía Avella Camarero, Esteban Fernández Sánchez y Daniel Vázquez-Bustelo

372/2008 Influence of bank concentration and institutions on capital structure: New international evidence
Víctor M. González and Francisco González

373/2008 Generalización del concepto de equilibrio en juegos de competición política
Mª Dolores López González y Javier Rodrigo Hitos

374/2008 Smooth Transition from Fixed Effects to Mixed Effects Models in Multi-level regression Models
María José Lombardía and Stefan Sperlich

375/2008 A Revenue-Neutral Tax Reform to Increase Demand for Public Transport Services
Carlos Pestana Barros and Juan Prieto-Rodriguez

376/2008 Measurement of intra-distribution dynamics: An application of different approaches to the European regions
Adolfo Maza, María Hierro and José Villaverde

377/2008 Migración interna de extranjeros y ¿nueva fase en la convergencia?
María Hierro y Adolfo Maza

378/2008 Efectos de la Reforma del Sector Eléctrico: Modelización Teórica y Experiencia Internacional
Ciro Eduardo Bazán Navarro

379/2008 A Non-Parametric Independence Test Using Permutation Entropy
Mariano Matilla-García and Manuel Ruiz Marín

380/2008 Testing for the General Fractional Unit Root Hypothesis in the Time Domain
Uwe Hassler, Paulo M.M. Rodrigues and Antonio Rubia

381/2008 Multivariate gram-charlier densities
Esther B. Del Brio, Trino-Manuel Ñíguez and Javier Perote

382/2008 Analyzing Semiparametrically the Trends in the Gender Pay Gap - The Example of Spain
Ignacio Moral-Arce, Stefan Sperlich, Ana I. Fernández-Saínz and Maria J. Roca

383/2008 A Cost-Benefit Analysis of a Two-Sided Card Market
Santiago Carbó Valverde, David B. Humphrey, José Manuel Liñares Zegarra and Francisco Rodriguez Fernandez

384/2008 A Fuzzy Bicriteria Approach for Journal Deselection in a Hospital Library
M. L. López-Avello, M. V. Rodríguez-Uría, B. Pérez-Gladish, A. Bilbao-Terol, M. Arenas-Parra

385/2008 Valoración de las grandes corporaciones farmaceúticas, a través del análisis de sus principales intangibles, con el método de opciones reales
Gracia Rubio Martín y Prosper Lamothe Fernández

386/2008 El marketing interno como impulsor de las habilidades comerciales de las pyme españolas: efectos en los resultados empresariales
Mª Leticia Santos Vijande, Mª José Sanzo Pérez, Nuria García Rodríguez y Juan A. Trespalacios Gutiérrez

387/2008 Understanding Warrants Pricing: A case study of the financial market in Spain
David Abad y Belén Nieto

388/2008 Aglomeración espacial, Potencial de Mercado y Geografía Económica: Una revisión de la literatura
Jesús López-Rodríguez y J. Andrés Faíña

389/2008 An empirical assessment of the impact of switching costs and first mover advantages on firm performance
Jaime Gómez, Juan Pablo Maícas

390/2008 Tender offers in Spain: testing the wave
Ana R. Martínez-Cañete y Inés Pérez-Soba Aguilar

391/2008 La integración del mercado español a finales del siglo XIX: los precios del trigo entre 1891 y 1905
Mariano Matilla García, Pedro Pérez Pascual y Basilio Sanz Carnero

392/2008 Cuando el tamaño importa: estudio sobre la influencia de los sujetos políticos en la balanza de bienes y servicios
Alfonso Echazarra de Gregorio

393/2008 Una visión cooperativa de las medidas ante el posible daño ambiental de la desalación
Borja Montaño Sanz

394/2008 Efectos externos del endeudamiento sobre la calificación crediticia de las Comunidades Autónomas
Andrés Leal Marcos y Julio López Laborda

395/2008 Technical efficiency and productivity changes in Spanish airports: A parametric distance functions approach
Beatriz Tovar & Roberto Rendeiro Martín-Cejas

396/2008 Network analysis of exchange data: Interdependence drives crisis contagion
David Matesanz Gómez & Guillermo J. Ortega

397/2008 Explaining the performance of Spanish privatised firms: a panel data approach
Laura Cabeza Garcia and Silvia Gomez Anson

398/2008 Technological capabilities and the decision to outsource R&D services
Andrea Martínez-Noya and Esteban García-Canal

399/2008 Hybrid Risk Adjustment for Pharmaceutical Benefits
Manuel García-Goñi, Pere Ibern & José María Inoriza

400/2008 The Team Consensus–Performance Relationship and the Moderating Role of Team Diversity
José Henrique Dieguez, Javier González-Benito and Jesús Galende

401/2008 The institutional determinants of CO_2 emissions: A computational modelling approach using Artificial Neural Networks and Genetic Programming
Marcos Álvarez-Díaz , Gonzalo Caballero Miguez and Mario Soliño

402/2008 Alternative Approaches to Include Exogenous Variables in DEA Measures: A Comparison Using Monte Carlo
José Manuel Cordero-Ferrera, Francisco Pedraja-Chaparro and Daniel Santín-González

403/2008 Efecto diferencial del capital humano en el crecimiento económico andaluz entre 1985 y 2004: comparación con el resto de España
Mª del Pópulo Pablo-Romero Gil-Delgado y Mª de la Palma Gómez-Calero Valdés

404/2008 Análisis de fusiones, variaciones conjeturales y la falacia del estimador en diferencias
Juan Luis Jiménez y Jordi Perdiguero

405/2008 Política fiscal en la uem: ¿basta con los estabilizadores automáticos?
Jorge Uxó González y Mª Jesús Arroyo Fernández

406/2008 Papel de la orientación emprendedora y la orientación al mercado en el éxito de las empresas
Óscar González-Benito, Javier González-Benito y Pablo A. Muñoz-Gallego

407/2008 La presión fiscal por impuesto sobre sociedades en la unión europea
Elena Fernández Rodríguez, Antonio Martínez Arias y Santiago Álvarez García

408/2008 The environment as a determinant factor of the purchasing and supply strategy: an empirical analysis
Dr. Javier González-Benito y MS Duilio Reis da Rocha

409/2008 Cooperation for innovation: the impact on innovatory effort
Gloria Sánchez González and Liliana Herrera

410/2008 Spanish post-earnings announcement drift and behavioral finance models
Carlos Forner and Sonia Sanabria

411/2008 Decision taking with external pressure: evidence on football manager dismissals in argentina and their consequences
Ramón Flores, David Forrest and Juan de Dios Tena

412/2008 Comercio agrario latinoamericano, 1963-2000: aplicación de la ecuación gravitacional para flujos desagregados de comercio
Raúl Serrano y Vicente Pinilla

413/2008 Voter heuristics in Spain: a descriptive approach elector decision
José Luís Sáez Lozano and Antonio M. Jaime Castillo

414/2008 Análisis del efecto área de salud de residencia sobre la utilización y acceso a los servicios sanitarios en la Comunidad Autónoma Canaria
Ignacio Abásolo Alessón, Lidia García Pérez, Raquel Aguiar Ibáñez y Asier Amador Robayna

415/2008 Impact on competitive balance from allowing foreign players in a sports league: an analytical model and an empirical test
Ramón Flores, David Forrest & Juan de Dios Tena

416/2008 Organizational innovation and productivity growth: Assessing the impact of outsourcing on firm performance
Alberto López

417/2008 Value Efficiency Analysis of Health Systems
Eduardo González, Ana Cárcaba & Juan Ventura

418/2008 Equidad en la utilización de servicios sanitarios públicos por comunidades autónomas en España: un análisis multinivel
Ignacio Abásolo, Jaime Pinilla, Miguel Negrín, Raquel Aguiar y Lidia García

419/2008 Piedras en el camino hacia Bolonia: efectos de la implantación del EEES sobre los resultados académicos
Carmen Florido, Juan Luis Jiménez e Isabel Santana

420/2008 The welfare effects of the allocation of airlines to different terminals
M. Pilar Socorro and Ofelia Betancor

421/2008 How bank capital buffers vary across countries. The influence of cost of deposits, market power and bank regulation
Ana Rosa Fonseca and Francisco González

422/2008 Analysing health limitations in spain: an empirical approach based on the european community household panel
Marta Pascual and David Cantarero

423/2008 Regional productivity variation and the impact of public capital stock: an analysis with spatial interaction, with reference to Spain
Miguel Gómez-Antonio and Bernard Fingleton

424/2008 Average effect of training programs on the time needed to find a job. The case of the training schools program in the south of Spain (Seville, 1997-1999).
José Manuel Cansino Muñoz-Repiso and Antonio Sánchez Braza

425/2008 Medición de la eficiencia y cambio en la productividad de las empresas distribuidoras de electricidad en Perú después de las reformas
Raúl Pérez-Reyes y Beatriz Tovar

426/2008 Acercando posturas sobre el descuento ambiental: sondeo Delphi a expertos en el ámbito internacional
Carmen Almansa Sáez y José Miguel Martínez Paz

427/2008 Determinants of abnormal liquidity after rating actions in the Corporate Debt Market
Pilar Abad, Antonio Díaz and M. Dolores Robles

428/2008 Export led-growth and balance of payments constrained. New formalization applied to Cuban commercial regimes since 1960
David Matesanz Gómez, Guadalupe Fugarolas Álvarez-Ude and Isis Mañalich Gálvez

429/2008 La deuda implícita y el desequilibrio financiero-actuarial de un sistema de pensiones. El caso del régimen general de la seguridad social en España
José Enrique Devesa Carpio y Mar Devesa Carpio

430/2008 Efectos de la descentralización fiscal sobre el precio de los carburantes en España
Desiderio Romero Jordán, Marta Jorge García-Inés y Santiago Álvarez García

431/2008 Euro, firm size and export behavior
Silviano Esteve-Pérez, Salvador Gil-Pareja, Rafael Llorca-Vivero and José Antonio Martínez-Serrano

432/2008 Does social spending increase support for free trade in advanced democracies?
Ismael Sanz, Ferran Martínez i Coma and Federico Steinberg

433/2008 Potencial de Mercado y Estructura Espacial de Salarios: El Caso de Colombia
Jesús López-Rodríguez y Maria Cecilia Acevedo

434/2008 Persistence in Some Energy Futures Markets
Juncal Cunado, Luis A. Gil-Alana and Fernando Pérez de Gracia

435/2008 La inserción financiera externa de la economía francesa: inversores institucionales y nueva gestión empresarial
Ignacio Álvarez Peralta

436/2008 ¿Flexibilidad o rigidez salarial en España?: un análisis a escala regional
Ignacio Moral Arce y Adolfo Maza Fernández

437/2009 Intangible relationship-specific investments and the performance of r&d outsourcing agreements
Andrea Martínez-Noya, Esteban García-Canal & Mauro F. Guillén

438/2009 Friendly or Controlling Boards?
Pablo de Andrés Alonso & Juan Antonio Rodríguez Sanz

439/2009 La sociedad Trenor y Cía. (1838-1926): un modelo de negocio industrial en la España del siglo XIX
Amparo Ruiz Llopis

440/2009 Continental bias in trade
Salvador Gil-Pareja, Rafael Llorca-Vivero & José Antonio Martínez Serrano

441/2009 Determining operational capital at risk: an empirical application to the retail banking
Enrique José Jiménez-Rodríguez, José Manuel Feria-Domínguez & José Luis Martín-Marín

442/2009 Costes de mitigación y escenarios post-kyoto en España: un análisis de equilibro general para España
Mikel González Ruiz de Eguino

443/2009 Las revistas españolas de economía en las bibliotecas universitarias: ranking, valoración del indicador y del sistema
Valentín Edo Hernández

444/2009 Convergencia económica en España y coordinación de políticas económicas. un estudio basado en la estructura productiva de las CC.AA.
Ana Cristina Mingorance Arnáiz

445/2009 Instrumentos de mercado para reducir emisiones de co2: un análisis de equilibrio general para España
Mikel González Ruiz de Eguino

446/2009 El comercio intra e inter-regional del sector Turismo en España
Carlos Llano y Tamara de la Mata

447/2009 Efectos del incremento del precio del petróleo en la economía española: Análisis de cointegración y de la política monetaria mediante reglas de Taylor
Fernando Hernández Martínez

448/2009 Bologna Process and Expenditure on Higher Education: A Convergence Analysis of the EU-15
T. Agasisti, C. Pérez Esparrells, G. Catalano & S. Morales

449/2009 Global Economy Dynamics? Panel Data Approach to Spillover Effects
Gregory Daco, Fernando Hernández Martínez & Li-Wu Hsu

450/2009 Pricing levered warrants with dilution using observable variables
Isabel Abínzano & Javier F. Navas

451/2009 Information technologies and financial prformance: The effect of technology diffusion among competitors
Lucio Fuentelsaz, Jaime Gómez & Sergio Palomas

452/2009 A Detailed Comparison of Value at Risk in International Stock Exchanges
Pilar Abad & Sonia Benito

453/2009 Understanding offshoring: has Spain been an offshoring location in the nineties?
Belén González-Díaz & Rosario Gandoy

454/2009 Outsourcing decision, product innovation and the spatial dimension: Evidence from the Spanish footwear industry
José Antonio Belso-Martínez

455/2009 Does playing several competitions influence a team's league performance? Evidence from Spanish professional football
Andrés J. Picazo-Tadeo & Francisco González-Gómez

456/2009 Does accessibility affect retail prices and competition? An empirical application
Juan Luis Jiménez and Jordi Perdiguero

457/2009 Cash conversion cycle in smes
Sonia Baños-Caballero, Pedro J. García-Teruel and Pedro Martínez-Solano

458/2009 Un estudio sobre el perfil de hogares endeudados y sobreendeudados: el caso de los hogares vascos
Alazne Mujika Alberdi, Iñaki García Arrizabalaga y Juan José Gibaja Martíns

459/2009 Imposing monotonicity on outputs in parametric distance function estimations: with an application to the spanish educational production
Sergio Perelman and Daniel Santin

460/2009 Key issues when using tax data for concentration analysis: an application to the Spanish wealth tax
José Mª Durán-Cabré and Alejandro Esteller-Moré

461/2009 ¿Se está rompiendo el mercado español? Una aplicación del enfoque de feldstein –horioka
Saúl De Vicente Queijeiro, José Luis Pérez Rivero y María Rosalía Vicente Cuervo

462/2009 Financial condition, cost efficiency and the quality of local public services
Manuel A. Muñiz & José L. Zafra

463/2009 Including non-cognitive outputs in a multidimensional evaluation of education production: an international comparison
Marián García Valiñas & Manuel Antonio Muñiz Pérez

464/2009 A political look into budget deficits.The role of minority governments and oppositions
Albert Falcó-Gimeno & Ignacio Jurado

465/2009 La simulación del cuadro de mando integral. Una herramienta de aprendizaje en la materia de contabilidad de gestión
Elena Urquía Grande, Clara Isabel Muñoz Colomina y Elisa Isabel Cano Montero

466/2009 Análisis histórico de la importancia de la industria de la desalinización en España
Borja Montaño Sanz

467/2009 The dynamics of trade and innovation: a joint approach
Silviano Esteve-Pérez & Diego Rodríguez

468/2009 Measuring international reference-cycles
Sonia de Lucas Santos, Inmaculada Álvarez Ayuso & Mª Jesús Delgado Rodríguez

469/2009 Measuring quality of life in Spanish municipalities
Eduardo González Fidalgo, Ana Cárcaba García, Juan Ventura Victoria & Jesús García García

470/2009 ¿Cómo se valoran las acciones españolas: en el mercado de capitales doméstico o en el europeo?
Begoña Font Belaire y Alfredo Juan Grau Grau

471/2009 Patterns of e-commerce adoption and intensity. evidence for the european union-27
María Rosalía Vicente & Ana Jesús López

472/2009 On measuring the effect of demand uncertainty on costs: an application to port terminals
Ana Rodríguez-Álvarez, Beatriz Tovar & Alan Wall

473/2009 Order of market entry, market and technological evolution and firm competitive performance
Jaime Gomez, Gianvito Lanzolla & Juan Pablo Maicas

474/2009 La Unión Económica y Monetaria Europea en el proceso exportador de Castilla y León (1993-2007): un análisis de datos de panel
Almudena Martínez Campillo y Mª del Pilar Sierra Fernández

475/2009 Do process innovations boost SMEs productivity growth?
Juan A. Mañez, María E. Rochina Barrachina, Amparo Sanchis Llopis & Juan A. Sanchis Llopis

476/2009 Incertidumbre externa y elección del modo de entrada en el marco de la inversión directa en el exterior
Cristina López Duarte y Marta Mª Vidal Suárez

477/2009 Testing for structural breaks in factor loadings: an application to international business cycle
José Luis Cendejas Bueno, Sonia de Lucas Santos, Inmaculada Álvarez Ayuso & Mª Jesús Delgado Rodríguez

478/2009 ¿Esconde la rigidez de precios la existencia de colusión? El caso del mercado de carburantes en las Islas Canarias
Juan Luis Jiménez y Jordi Perdiguero

479/2009 The poni test with structural breaks
Antonio Aznar & María-Isabel Ayuda

480/2009 Accuracy and reliability of Spanish regional accounts (CRE-95)
Verónica Cañal Fernández

481/2009 Estimating regional variations of R&D effects on productivity growth by entropy econometrics
Esteban Fernández-Vázquez y Fernando Rubiera-Morollón

482/2009 Why do local governments privatize the provision of water services? Empirical evidence from Spain
Francisco González-Gómez, Andrés J. Picazo-Tadeo & Jorge Guardiola

483/2009 Assessing the regional digital divide across the European Union-27
María Rosalía Vicente & Ana Jesús López