Reallocation of resources: The driving force behind competitiveness

Aránzazu Crespo[1]

Aggregate unit labor costs are the most commonly used indicator to gauge the competitiveness of an economy. However, they often fail to provide sufficient information as they do not adequately capture the role of firms and their heterogeneity. Recent empirical data confirm that efficient reallocation of resources between firms and sectors is the key to the underlying evolution of aggregate unit labor costs and hence to understanding country competitiveness.

The latest global crisis, together with the increase in European debt levels, has reopened the debate over the competitiveness of an economy, which often tends to be forgotten under favorable economic conditions. Using firm level data, this article analyzes the factors that drive the evolution of aggregate unit labor costs – the most commonly used indicator of European competitiveness – in France, Germany, Italy and Spain. Recent empirical research concludes that the evolution of aggregate unit labor costs is not driven by the evolution of firm level unit labor costs, but rather by an important factor for the competitiveness of a country: the reallocation of resources among firms in the economy. As this article shows, an efficient resource allocation is key to achieving productivity gains. Moreover, the evidence presented suggests that for the case of Spain, the loss of competitiveness in recent years does not seem to have occurred among the largest firms, with the greatest presence in international trade, but that it may be mainly the result of a lack of flexibility, which prevents resources from being efficiently reallocated between sectors and firms. From this perspective, improving Spain's competitiveness would require significant reforms in competition policy and in the labor market, given the rigidities in these areas that delay or prevent the achievement of efficient resource allocation.

Introduction

The latest global crisis, together with the increase in European debt levels, has reopened the debate over the competitiveness of an economy, which often tends to be forgotten under favorable economic conditions. Currently, the most commonly used measure of competitiveness in the European Union is the evolution of unit labor costs. The unit labor cost is a macroeconomic aggregate that measures the labor cost per unit of product and is calculated as the ratio of total labor costs to real output. A rise in labor costs higher than the rise in labor productivity may be a threat to an economy's cost competitiveness if other costs are not adjusted in compensation.

[1] European University Institute (aranzazu.crespo@eui.eu).

However, the use of aggregate price-cost based indicators, like unit labor costs, may not provide sufficient information about the competitiveness of a country. For example, Spain's aggregate unit labor costs have grown faster than in other European countries in the last decade. Accordingly, there should have been a decrease in Spain's share of world exports, reflecting a decrease in the ability to sell its products. However, the country´s export share has decreased less than that of other European countries.

This phenomenon known as the "Spanish paradox," is explained by the different relative weight of firms in unit labor costs and the economy's total exports. Firms that export are usually the largest and most productive in the economy, and they account for the main share of exporters (see Clerides *et al.,* 1998) and Bernard and Jensen (1999)). However, for the aggregate unit labor cost, all firms in the economy are taken into account, not just the exporters.

The purpose of this article is twofold. First, it reviews the usual measures of competitiveness and their limitations, and analyzes their ability to capture adequately firm heterogeneity in a country. The results point to the reallocation of resources among firms of the economy as the main factor behind the evolution of unit labor costs. Current international trade theory models also emphasize this mechanism as the source of productivity gains at the country level. Thus, the second objective of the article is to analyze the importance of efficient resource allocation between firms and sectors of the economy to the competitiveness level of a country, using firm level data.

Limitations of traditional competitiveness indicators

Porter (1990) defines the competitiveness of a nation as the productivity with which a nation utilizes its human, capital and natural resources. The OECD considers the ability of a country to sell its products in the international markets, while Krugman (1994) refers to competitiveness as a poetic way of speaking about productivity, and warns about the danger of obsessing about the competitiveness of a country. Most of these definitions allude to the relative position of a country in international trade. This position, in principle, depends on price and cost factors because if they have a negative evolution in relation to those of other economies, the ability to sell products at home and abroad is damaged. This argument, combined with the easy availability of data, makes price-cost competitiveness indicators especially attractive for the analysis of a country's economic situation.

Currently, the price-cost indicator of reference to measure competitiveness in the European Union is the unit labor cost (ULC), which measures the labor cost by unit of product and is calculated as the ratio of total labor costs to real output. A rise in an economy's ULCs represents an increased reward for labor's contribution to output. However, a rise in labor costs higher than the rise in labor productivity may be a threat to an economy's cost competitiveness, if other costs are not adjusted in compensation.

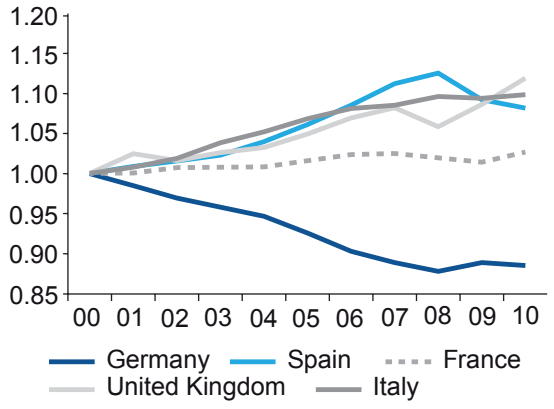
A drawback of these measures is that a simple comparison of the evolution of price and costs between two countries will not be indicative enough of their competitiveness differences if the countries produce different goods and sell them in different markets. Another example of the limited prediction power of the price-cost competitiveness

Spain´s ULCs have grown faster than in the main developed countries, but its share of world exports has decreased less than those of other countries, with the exception of Germany. The different relative weight of firms in aggregate ULCs and in the economy's total exports helps to explain this paradox.

Exhibit 1

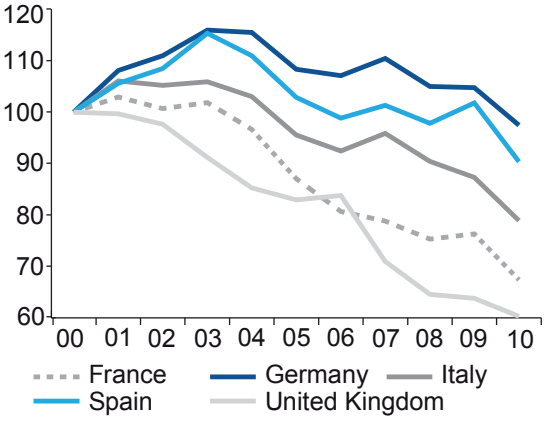
Competitiveness indicators vis-à-vis the Euro Area

(a) Unit Labor Cost



Source: ECB.

(b) Market Share Index



Fuente: WTO.

indicators can be seen in the so-called *Spanish competitiveness paradox,* which is illustrated in Exhibit 1. Panel (a) shows the evolution of ULCs for Spain and the main developed economies, while Panel (b) shows the evolution of these countries share of world exports during the 2000s. Spain´s ULCs have grown faster than in the main developed countries, but its share of world exports has decreased less than those of other countries with the exception of Germany.

Spanish firms experienced both lower ULC growth and higher export growth than other countries, yet this differential is not reflected in aggregate price indicators due to aggregation and dispersion bias (see Antràs *et al.,* 2010 and Almonte *et al.,* 2012). In the calculation of ULCs, all the firms are taken into account, while to calculate the economy's total exports, only the exporters are taken into account. Firms that export are usually the largest and most productive of the economy (see Clerides *et al.,* 1998 and Bernard y Jensen, 1999). The different relative weight of firms in aggregate ULCs and in the economy's total exports helps to explain the *Spanish paradox.* In a nutshell, an adequate competitiveness measure should be able to capture the role of firms and their heterogeneity.

The importance of firm heterogeneity for the measurement of unit labor costs

In this section, we analyze how well the evolution of unit labor costs captures the firm heterogeneity present in a country. We examine the evolution of ULCs of four European countries given firm level information in EFIGE – AMADEUS.[2] The exercise analyzes if the aggregate evolution of ULCs between years 2002 and 2007 captures adequately the evolution of the same variable for the individual firms.[3]

[2] The design, construction and implementation of the database EFIGE has been led by the EFIGE Project, European Firms in a Global Economy: internal policies for external competitiveness. This is the first database to provide detailed and comparable information for seven European countries: Austria, France, Germany, Hungary, Italy, Spain and the United Kingdom, on the characteristics of their manufacturing firms, with an important emphasis on internationalization activities. To increase the utility of the survey, it has been merged with the Amadeus database from the Bureau van Dijk. For more details, see: www.efige.org

[3] Unfortunately, the coverage of Amadeus for Germany does not allow for the use of the whole sample from 2001 to 2009.

For that purpose, we calculate, at the firm level, a weighted change in ULCs as:

$$ULC_{t+1} - ULC_t = \sum_{i \in I_{t+1}} ms_{i,t+1} ulc_{i,t+1} - \sum_{i \in I_t} ms_{i,t} ulc_{i,t}, \quad (1)$$

where $ulc_{i,t}$ is the ULC of a given firm i at time t and $ms_{i,t}$ is its market share at that time. The components of the weighted average are decomposed as follows, according to the Laspeyres decomposition.

$$\begin{aligned} ULC_{t+1} - ULC_t &= \sum_{i \in I_{t+1}} ms_{i,t+1} ulc_{i,t+1} - \sum_{i \in I_t} ms_{i,t} ulc_{i,t} \quad (2) \\ &= \underbrace{\sum_{i \in I} ms_{i,t} \left(ulc_{i,t+1} - ulc_{i,t} \right)}_{\text{Within}} \\ &+ \underbrace{\sum_{i \in I_t} ulc_{i,t} \left(ms_{i,t+1} - ms_{i,t} \right)}_{\text{Reallocation}} \\ &+ \underbrace{\sum_{i \in I} \left(ms_{i,t+1} - ms_{i,t} \right) \left(ulc_{i,t+1} - ulc_{i,t} \right)}_{\text{Interaction}} \\ &+ \underbrace{\sum_{i \in I_{t+1}/I} ms_{i,t+1} ulc_{i,t+1} - \sum_{i \in I_t/I} ms_{i,t} ulc_{i,t}}_{\text{Entry-Exit}} \end{aligned}$$

The first element, the *within* component, is the change attributable to the evolution of the firms' ULCs given their market share. A positive sign would imply a relevant loss in competitiveness at the firm level. The second element, the *reallocation* component, accounts for the redistribution of market share among the firms, holding ULCs constant. A negative sign implies a reallocation of market share towards firms with initially lower ULCs. The third element, the *interaction* component, gives information about the underlying dynamics. A negative sign would show that ULCs and market share are moving in different directions, either because their activity is expanding thanks to a reduction in ULCs or because the importance of their sector is decreasing after an increase in ULCs. The fourth element, the *entry and exit* component is indicative of the market dynamics that follow the removal of barriers fostering entry, and the exogenous shocks that can oblige some firms to exit.[4]

Table 1 shows the result of the decomposition of the change in aggregate ULCs in manufacturing between years 2002 and 2007, on an annualized basis. First, on average, for the period considered, real ULCs have decreased in all countries indicating an improvement in the cost competitiveness of the countries – which is supported as well by results using the EU-KLEMS database. Second, the weight of the change in competitiveness within firms is small, particularly in Italy and Spain, where it is 0.17% and -0.21%, respectively. Third, the interaction effect has the desired sign, negative. Unfortunately we cannot infer if this is due to the activity of firms expanding thanks to a reduction in ULCs or because the importance of their sector is decreasing after an increase in ULCs. Fourth, reallocation of resources is the component that explains most

Table 1

Changes in the ULCs of each country, 2002-2007

(Annualized rate, percentage)

	Total	Within	Reallocation	Interaction	Entry - Exit
France	-2.62	-1.19	-1.87	-0.61	1.06
Germany	-3.25	-1.55	-2.69	-0.43	1.42
Italy	-1.38	0.17	-1.35	-1.42	1.22
Spain	-2.06	-0.21	-1.19	-1.27	0.61

Source: Author's calculations.

[4] The EFIGE survey is not designed to keep track of entry and exit of firms, therefore this element is simply a residual of the calculation, and will be ignored in the discussion.

Table 2
Changes in the ULCs of each country relative to Germany, 2002-2007
(Percentage)

	Total	Within	Reallocation	Interaction
France	5.22	1.86	4.27	-0.91
Italy	10.37	8.75	6.39	-4.77
Spain	10.82	7.00	7.95	-4.14

Source: Author's calculations.

of the evolution of ULCs for all the countries in the sample. The relative intensity differs between countries - the largest reallocation of resources occurs in Germany, followed by France, then Italy and Spain. Not only is reallocation of resources in France and Germany larger, but it is also the most important factor in the explanation of the evolution of aggregate ULCs. In Italy and Spain, the interaction effect has a similar weight as the reallocation of resources effect in the explanation of the evolution of aggregate ULCs.

Finally, Table 2 shows the relative accumulated evolution of ULCs for each country with respect to the evolution of Germany for the period 2002 to 2007. A positive number indicates the possible gain associated with each effect if these countries had had the evolution of Germany. The change in competitiveness within firms was particularly small in Italy and Spain, which implies losses of competitiveness with respect to Germany of 8.75% in Italy and 7% in Spain. More importantly, the smaller reallocation of resources with respect to Germany between 2002 and 2007 implies losses of competitiveness of around 4.3% in France, 6.4% in Italy and 8% in Spain.

Even though the exercise has limitations since it only looks at manufacturing firms, recent empirical research with sectoral data shows that the reallocation of resources within the sector is key to understanding the evolution of aggregate ULCs (see Barba-Navaretti *et al.,* 2011). The next section focuses on understanding what the productivity gains would be in each of these countries if there were no misallocation, that is, if all the resources were allocated efficiently.

Resource misallocation: The source of cross-country productivity differences

The ability to reallocate resources within firms in the economy has a very significant role in the explanation of the evolution of aggregate ULCs. The next section applies the methodology of Hsieh and Klenow (2009) to explain the impact of an efficient allocation of resources in the productivity and output of France, Germany, Italy and Spain.

The ability to reallocate resources within firms in the economy has a very significant role in the explanation of the evolution of aggregate ULCs.

Foster, Haltiwanger and Syverson (2008) stress that, when industry deflators are used, differences in plant-specific prices show up in the customary measure of plant TFP. They distinguish between "physical productivity," which they denote as TFPQ, and "revenue productivity," which they call TFPR. The use of a plant-specific deflator yields TFPQ, whereas using an industry deflator gives TFPR.

The distinction between physical and revenue productivity is vital in this analysis too. In line with Hsieh y Klenow (2009), the assumption is that there are firm specific distortions affecting total production and capital. Distortions that increase the marginal products of capital and labor by

the same proportion are output distortions (τ_Y), while distortions that raise the marginal product of capital relative to labor are capital distortions (τ_K). As a result of these distortions, firms produce different amounts than what would be dictated by their productivity, and also may have different capital-labor ratios. Unlike TFPQ, TFPR does not vary across plants within an industry unless plants face capital, labor and/or output distortions.

In the absence of distortions, more labor and capital should be allocated to plants with higher TFPQ to the point where their higher output results in a lower price and the exact same TFPR as smaller plants. TFPR is proportional to a geometric average of the plant's marginal revenue products of labor and capital:

$$\mathrm{TFPR}_{si} \alpha \frac{\left(1+\tau_{K_{si}}\right)^{\alpha_s}}{1-\tau_{Y_{si}}}, \qquad (3)$$

where *s* denotes sector, *i* the given firm and α_s is the elasticity of capital. Hence, high plant TFPR is a sign that the plant faces barriers that raise the plant's marginal products of labor and capital, rendering the plant smaller than optimal. In general, variation of TFPR within a sector will be a measure of misallocation.

In order to determine the gains from an efficient allocation of resources, "efficient" output is calculated in each country in order to compare it with actual output levels. If there are no firm specific distortions, TFPR will be equalized across firms within a sector. For each industry, the ratio of actual TFP to this efficient level of TFP is calculated, and then aggregated across sectors using a Cobb-Douglas aggregator:

$$\frac{Y}{Y_{\text{efficient}}} = \prod_{s=1}^{S} \left[\sum_{i=1}^{M_s} \left(\frac{A_{si}}{\overline{A_s}} \frac{\overline{\mathrm{TFPR}_s}}{\mathrm{TFPR}_{si}} \right)^{\sigma-1} \right]^{\frac{\theta_s}{\sigma-1}}. \qquad (4)$$

To calculate the effects of resource misallocation, key parameters are estimated: industry output shares, industry capital shares, and firm-specific distortions. Firm level data information is used from France, Germany, Italy and Spain, which are drawn from the EFIGE-Amadeus dataset.

In particular, the data used are: plant's industry (four-digit level), age (based on reported birth year), wage payments, value-added, export revenues, and capital stock. For labor input, the plant's wage bill is also included. Capital stock is defined as the book value of fixed capital net of depreciation. The rental price of capital (excluding distortions) is set at *R*=0.10, contemplating a 5% real interest rate and a 5% depreciation rate. The elasticity of substitution between plant value-added is set at σ=3, which ranges within the estimates in trade and industrial organization literature (Broda and Weinstein, 2004). The elasticity of output with respect to capital in each industry is set to be 1 minus the labor share in the corresponding industry in 2008. The 2008 ratios are adopted as the benchmark.

On the basis of the other parameters and the plant data, the distortions and productivity can be inferred for each plant in each country per year as follows:[5]

$$\begin{aligned} 1+\tau_{K_{si}} &= \frac{\alpha_s}{1-\alpha_s}\frac{wL_{si}}{RK_{si}} \\ 1-\tau_{Y_{si}} &= \frac{\sigma}{\sigma-1}\frac{wL_{si}}{(1-\alpha_s)P_{si}Y_{si}} \\ A_{si} &= \frac{(P_{si}Y_{si})^{\frac{\sigma}{\sigma-1}}}{K_{si}^{\alpha_s}L_{si}^{1-\alpha_s}} \end{aligned} \qquad (5)$$

Table 3 provides percent TFP gains in each country from fully equalizing TFPR across plants in each industry for the years 2002 to 2008 (see Equation 4), where the entries are $100\left(Y_{\text{efficient}}/Y-1\right)$.[6]

[5] Before calculating the gains from a hypothetical liberalization, the 1% tails of $\log\left(\mathrm{TFPR}_{si}/\overline{\mathrm{TFPR}_s}\right)$ and $\log\left(\mathrm{TFPQ}_{si}/\overline{\mathrm{TFPQ}_s}\right)$ were trimmed across industries to make the results robust to outliers. All the measures were then recalculated.

[6] In Table 3, for Germany, hypothetical gains from a efficient resource allocation are only reported for the years 2004-2008 instead of 2002-2008, due to the bad data coverage mentioned earlier.

Removing all barriers, according to this calculation, would boost aggregate manufacturing TFP in 2008 by 22.7% in France, 27.9% in Germany, 43.3% in Italy and 28.2% in Spain. More interestingly, between the years 2002 to 2008, gains from efficient allocation decrease in Germany (-8.50%), increase in Italy and Spain (6.93% and 6.97%), and are constant in France (-0.82%). This reveals that within this period, in Italy and Spain the "misallocation" of resources within the sector has increased while in France it remains constant and in Germany it decreases.

An increase in the "misallocation" of resources in Italy and Spain reveals an increase in the distortions or barriers to production present in these countries, which is consistent with their smaller ability to reallocate market share towards firms with initially smaller ULCs.

An increase in the "misallocation" of resources in Italy and Spain reveals an increase in the distortions or barriers to production present in these countries which is consistent with their smaller ability to reallocate market share towards firms with initially smaller ULCs as reported in Table 1. At the same time, the decrease in the "misallocation" of resources in Germany is also reflected by the greater ability of reallocating market share to firms with an initially lower ULC. The result of the decomposition is that evolution of ULCs and hypothetical efficient allocation of resources are complementary to each other.

What implications do these hypothetical gains in productivity have in the firm size distribution of these countries? Exhibit 2 plots the "efficient" versus actual size distribution of plants in year 2008, where size is measured as plant value-added. In all the countries, with the exception of Germany, the hypothetical efficient distribution is more dispersed than the actual one. In particular, in all countries, there should be fewer mid-sized plants and more small and large plants. It is well known that there are less large firms than there should be, and that this proportion is even smaller in economies where there are strong market distortions (see Rubini *et al.,* 2012). However, this exercise also implies that there are less small firms than there should be, as the flattening of these distributions is predicting. Hsieh and Klenow (2009) find similar predictions for their analysis of China, India and the United States, which suggest that the shape of the efficient plant size distribution is robust across countries.

In Germany, the efficient distribution is more dispersed as well – there is a shift to the right

Table 3

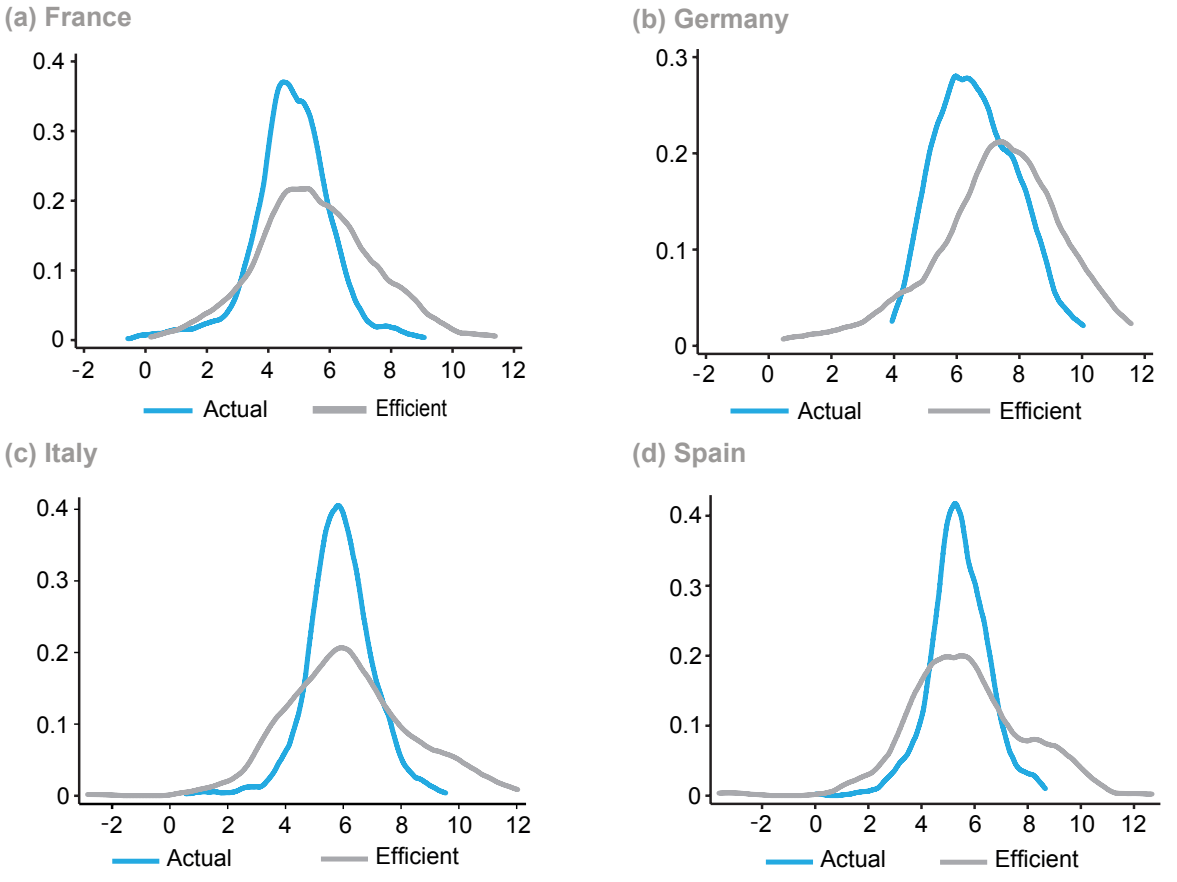
TFP gains from equalizing TFPR within industries

Year	France	Germany	Italy	Spain
2002	23.55		36.41	21.23
2003	19.29		30.46	21.68
2004	22.07	36.41	32.75	23.30
2005	22.43	31.90	30.46	24.66
2006	23.88	32.30	32.97	24.70
2007	20.95	33.25	34.54	28.71
2008	22.74	27.92	43.34	28.20
$\Delta_{2008\text{-}2002}$	-0.82	-8.50	6.93	6.97

Source: Author's calculations.

Exhibit 2

Distribution of plant size (2008)



Source: Author's calculations from the EFIGE database.

in the distribution rather than a flattening as it happens in the other countries. The reason behind the different behavior in Germany most likely lies in the bias in the size distribution of the German firms present in the AMADEUS dataset.[7] This explains why there is no flattening in the efficient distribution and the exercise predicts that a large group of the medium-sized firms in terms of output should increase their size.

Errors of measurement or modeling that could lead to an overestimation of the gains from efficient resource allocation have not been accounted for. A more exhaustive analysis, with other model specifications and robustness checks for the parameters, is conducted in Crespo and Segura-Cayuela (2014). The results are consistent – an increase of "misallocation" in Italy and Spain is reflected in the suboptimal evolution of ULCs.

Conclusions

Although competitiveness is relevant to various aspects of economic analysis, its empirical

[7] The small firms in terms of employment are highly underrepresented.

measurement runs up against a number of problems, arising from the vagueness of the concept that is used differently depending on the context. Moreover, there is a lack of disaggregated indicators that adequately capture the wide range of factors relevant to competitiveness.

This paper has analyzed the ability of the change in aggregate unit labor cost to capture the change in the competitiveness of a country. Empirical analysis of unit labor costs as a competitiveness measure reveals the need to open the "black boxes'' that macroeconomic indicators often are, by using firm level data to understand clearly what are the driving factors behind their evolution. The evidence presented suggests that the Spanish economy's loss of competitiveness in recent years does not seem to have occurred among the largest firms, with the greatest presence in international trade, but that it may be mainly the result of a lack of flexibility, which prevents resources from being efficiently reallocated between sectors and firms. In a preliminary attempt to make progress in this direction, estimations suggest that an efficient allocation of resources would boost aggregate manufacturing TFP in 2008 by 22.7% in France, 27.9% in Germany, 43.3% in Italy and 28.2% in Spain.

From this perspective, improving Spain's competitiveness would require significant reforms in competition policy and in the labor market, given the rigidities in these areas that delay or prevent the achievement of an efficient resource allocation.

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