

COMPETITION IN THE PORTUGUESE ECONOMY: ESTIMATED PRICE-COST MARGINS UNDER IMPERFECT LABOUR MARKETS*

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ABSTRACT

This article estimates price-cost margins for the Portuguese markets in a context of imperfect competition in the labour market. The database used includes virtually the universe of Portuguese firms for the period 2005-2009. The results strongly reject the hypothesis of perfect competition in both labour and product markets. Estimated price-cost margins are very heterogeneous across markets and the average for the overall economy ranges between 25 and 28 per cent, depending on the variables used to weight each market. In addition, the tradable sector presents a lower price-cost margin than the non-tradable sector. According to the methodology used, workers' bargaining power in the Portuguese economy is approximately 13 per cent, without a clear distinction between tradable and non-tradable sectors. Finally, workers' bargaining power is positively correlated with price-cost margins.

1. Introduction

Competition in the product market is a key ingredient for an efficient allocation of resources in the economy, thereby promoting a higher aggregate welfare. Therefore, the identification of markets where there are large deviations from the perfect competition paradigm is an important policy concern. From a theoretical point of view, market power relates to firms' ability to increase profits by sustaining prices above marginal costs. However, establishing robust measures of competition is a strong challenge both from a theoretical and empirical point of view.

This article uses the methodology presented by Roeger (1995), which closely relates to the approach proposed by Hall (1988), to test whether there is a significant gap between prices and marginal costs in Portuguese markets, *i.e.*, how distant are markets from the perfect competition paradigm. The methodology proposed by Hall (1988) for the estimation of price-cost margins is based on the relation between the Solow residual and the growth rate of inputs. However, this relation cannot be estimated by standard econometric methods such as OLS, since input growth rates are likely to be correlated with technological progress, which is not observable. In this context, Hall (1988) suggests the use of instrumental variables. However, finding suitable instruments is, in general, a severe obstacle. More recently, other authors propose the use of the generalized method of moments, such as Dobbelaere (2004), or the use of a control function, as Olley and Pakes (1996) and Levinsohn (1993).

An alternative methodology was proposed by Roeger (1995). This methodology uses the difference

* The authors thank António Antunes, Nuno Alves, Mário Centeno, Jorge Correia da Cunha, Ana Cristina Leal, José António Machado and Pedro Portugal for their comments and Lucena Vieira for her support in questions related to the database. The opinions expressed in the article are those of the authors and do not necessarily coincide with those of Banco de Portugal or the Eurosystem. Any errors and omissions are the sole responsibility of the authors.

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between the Solow residuals obtained through profit maximization and cost minimization problems of the firm, as a way to overcome the main source of endogeneity in the formulation of Hall (1988). In the standard version of these methodologies, constant returns to scale and the existence of homogeneous inputs that adjust instantly in perfectly competitive markets are generally assumed. However, the literature has discussed the validity of these assumptions, particularly with respect to perfect competition in the labour market. In fact, recent empirical evidence suggests that the level of product market imperfection is significantly underestimated when the degree of imperfection in the labour market is ignored.

In this context, both methodologies were modified to estimate simultaneously product and labour market imperfections, measured by the price-cost margin and workers' bargaining power, respectively. Beyond the explicit test of perfect competition, one of the advantages of both Hall (1988) and Roeger (1995) methodologies is that differences between technologies across sectors are partially taken into account by the use of production functions.

This article contributes to the assessment of competition in the Portuguese economy, complementing the alternative approaches presented in Amador and Soares (2012a,b). A distinctive feature of the article is the coverage of a large number of markets in the economy (including services) and the distinction between tradable and non-tradable sectors. This distinction is relevant given the potential disciplinary effect of international competition and the nature of the sectoral adjustment process currently underway in the Portuguese economy. Other distinctive features are the use of firm-specific measures of the user cost of capital and depreciation rates, the inclusion of tangible and intangible assets, and the test for sample selection bias.¹ The data used in this article is based on information on the annual accounts of Portuguese firms reported under *Informação Empresarial Simplificada (IES)* for 2005-2009.

The article concludes that the assumption of perfect competition in Portuguese product markets is widely rejected, though there is substantial heterogeneity in price-cost margin estimates. Allowing for imperfect competition in the labour market, the estimated price-cost margin for the overall economy ranges between 25 and 28 per cent, depending on the variables used to weight each market. Additionally, the price-cost margin in the tradable sector is lower than in the non-tradable sector. Similarly, perfect competition in the labour market is rejected in around 75 per cent of the markets. The workers' average bargaining power in the Portuguese economy lies between 12 and 14 per cent, according to weights considered for each market, without a clear distinction between tradable and non-tradable sectors. Nevertheless, there is a significant dispersion across markets. Consistent with the results presented in the empirical literature, estimates for workers' bargaining power are positive and strongly correlated with price-cost margins across markets in the Portuguese economy.

The article is organized as follows. The next section briefly describes the methodology used in the estimation of price-cost margins under competitive and imperfect labour markets. Next, section 3 describes the database and presents the definition of the variables. Section 4 presents the results, highlighting the difference between tradable and non-tradable sectors. Section 5 presents some concluding remarks.

2. Methodology

Technological progress and market power are strongly related from a theoretical and empirical point of view. The seminal contribution of Solow (1957) introduced growth accounting to identify the role of technological progress. Later, Hall (1988) and Roeger (1995) relaxed the assumption of perfect competition in the product market, allowing for the estimation of markups. The standard formulation relies on the assumptions of efficient and homogeneous input markets, instantaneous adjustment of all input factors and constant returns to scale. Subsequently, the assumption of perfect competition in the labour market was relaxed, allowing for the joint estimation of price-cost margins and workers' bargaining power.

¹ For more details on the methodology used in this article and additional results see Amador and Soares (2013).

2.1 Price-cost margin estimation under competitive labour markets

Considering a neoclassical production function, the assumption of efficient input markets drives the standard equality between the value of marginal productivity and the corresponding price of the input. Consequently, input elasticities correspond to their weight in output. Therefore, in the presence of market power and assuming constant returns to scale, the Solow residual (SR) can be rewritten as follows:

$$SR = \left(1 - \frac{1}{\mu}\right)(\Delta q - \Delta k) + \frac{1}{\mu}\theta \quad (1)$$

where μ is the markup, θ represents the growth rate of Hicks-neutral technological progress and q and k are the logarithms of output and capital, respectively. Therefore, the classical price-cost margin can be obtained from the estimate of the parameter $\left(1 - \frac{1}{\mu}\right)$ in equation 1. This parameter corresponds to the Lerner index, defined as $(P - MgC) / P$, where P and MgC represent the price and marginal cost, respectively. However, the last term in equation 1 is not observable, thus the OLS estimator is inconsistent. The solution proposed by Hall (1988) consists in using instrumental variables. However, it is usually difficult to obtain suitable instruments and results tend to be sensitive to this choice. In this context, Roeger (1995) proposed an alternative approach.

Considering the firm's dual problem, *i.e.*, cost minimization for a given level of output, along with the assumption of imperfect competition in the product market and constant returns to scale, the Solow residual of the dual problem (SR^d) is:

$$-SR^d = \left(1 - \frac{1}{\mu}\right)(\Delta p - \Delta r) - \frac{1}{\mu}\theta \quad (2)$$

where p is the logarithm of the price and r is the logarithm of the cost of capital. Finally, adding the primal and dual Solow residuals (equations 1 and 2), it is possible to write:

$$SR - SR^d = \left(1 - \frac{1}{\mu}\right) [(\Delta p + \Delta q) - (\Delta r + \Delta k)] \quad (3)$$

Consequently, the term related to technological progress in equation 3 is eliminated, solving the inconsistency problem mentioned above. This approach allows for the estimation of the price-cost margin consistently by OLS. Furthermore, this formulation avoids the use of deflators, which is a source of measurement error, particularly when firm level data is used. However, a measure of the cost of capital is required.

2.2 Price-cost margin estimation under imperfect labour markets

In the previous subsection market power was estimated assuming that workers receive perfectly competitive wages, *i.e.*, assuming that their bargaining power is null. However, this assumption is not supported by empirical evidence.

The approaches suggested by Hall (1988) and Roeger (1995) can be modified to account for imperfect competition in the labour market (see Crépon *et al.*, (2005), Dobbelaere (2004) and Abraham *et al.*, (2009)). Under imperfect labour markets, wages (W) and the number of workers (L) are simultaneously chosen according to a standard Nash bargaining problem, which involves sharing the surplus between firms that maximize profits and workers whose utility depends on employment and wages, that is:

$$\max_{L, W} \Omega = \left[(W - \bar{W})L \right]^\varphi (PQ - WL)^{(1-\varphi)} \quad (4)$$

where \bar{W} is the reservation wage (related to the best alternative wage in the labour market and unemployment benefits), P and Q represent the price and quantity sold, respectively. In addition, $1 \geq \varphi \geq 0$ represents the bargaining power of the workers, where $\varphi = 0$ corresponds to competitive labour markets and $\varphi = 1$ to a total appropriation of the firm's surplus by the workers.² In this context, assuming imperfect competition and an isoelastic demand function, the Solow residual can be written as:

$$SR = \left(1 - \frac{1}{\mu}\right)(\Delta q - \Delta k) + \left(\frac{\varphi}{1 - \varphi}\right)(\alpha^L - 1)[\Delta l - \Delta k] + \frac{1}{\mu}\theta \quad (5)$$

where α^L represents the weight of labour costs in output. The dual counterpart of this problem is:

$$-SR^d = \left(1 - \frac{1}{\mu}\right)(\Delta p - \Delta r) + \left(\frac{\varphi}{1 - \varphi}\right)(\alpha^L - 1)[\Delta w - \Delta r] - \frac{1}{\mu}\theta \quad (6)$$

where w is the logarithm of wages. Thus, allowing for imperfect competition in the labour market and assuming constant returns to scale, the modified Roeger (1995) approach is:

$$SR - SR^d = \left(1 - \frac{1}{\mu}\right)[(\Delta p + \Delta q) - (\Delta r + \Delta k)] + \frac{\varphi}{(1 - \varphi)}(\alpha^L - 1)[(\Delta l + \Delta w) - (\Delta r + \Delta k)] \quad (7)$$

This equation allows for the joint estimation of price-cost margins and workers' bargaining power. The exclusion of the last term induces a bias in the price-cost margin estimate, which is higher the higher the bargaining power, the weight of labour costs in output and the larger the difference between the growth rate of nominal labour and capital costs.

3. Database and variable definitions

3.1. Database description

The data used in this article draws on the annual accounts of Portuguese firms reported under *Informação Empresarial Simplificada (IES)* for 2005-2009.³ This database provides very detailed information on items of the balance sheet and income statements for virtually the universe of non-financial firms. The initial raw dataset coincides with the one used in Amador and Soares (2012a,b). However, at odds with these articles, the information drawn from *Central de Balanços* for 2000-2004 was not considered. Since *Central de Balanços* contains information on a sample of Portuguese firms, comprising mainly large ones, the final set of information was insufficient to ensure the significance of the estimated parameters. On the contrary, in the case of *IES*, despite being available on a comparable basis for a limited number of years, its almost universal coverage provides a substantial set of observations.

² There are alternative models of negotiation between firms and workers where wages and number of workers are decided sequentially (see, e.g., Walque *et al.*, (2009)). In addition, there are methodological options in the Nash bargaining setup that may change results, namely the firm's threat point at the moment of negotiation. In this context, the definition of capital stock (gross or net), as well as the use of GVA alternatively to output can also change results.

³ Although *IES* formally began in 2006, it included a report for 2005. For this reason, for the purpose of this article, *IES* is considered from 2005 onwards.

Some observations were eliminated from the database to ensure robust estimations. Firstly, firms reporting less than two consecutive observations were eliminated. Additionally, only firms reporting strictly positive sales, labour costs, intermediate inputs and net capital stock (tangible and intangible) were considered. Secondly, observations associated to depreciation rates and share of labour costs and intermediate inputs in total sales outside the $[0,1]$ range were excluded. Moreover, observations below the 1st percentile and above the 99th percentile in the distribution of growth rates of sales, labour costs, intermediate inputs and tangible and intangible assets were excluded. Thirdly, consistent with profit maximization in the long run, firms exhibiting negative operational profits were withdrawn, representing approximately 22 per cent of the observations in the database. However, this option may increase the potential for the existence of a sample selection bias. Although this problem is typically disregarded in the literature, in this article the impact of selection bias is assessed through the two-step Heckman (1979) procedure. Finally, sectors as “Agriculture, Mining and Quarrying”, “Education” and “Health” were disregarded given their low share in total gross value added (GVA) or the significant relevance of the general government in the functioning of the market.

Given the reduced number of observations for each firm over the period considered, price-cost margins were estimated at market level, *i.e.*, we assume that price-cost margins and bargaining power are the same for all firms within each market. Nevertheless, it is necessary to establish a criterion to define markets. In order, to overcome the well known difficulties in establishing relevant markets, the standard approach in the literature is to use an economic activity classification. Similarly to Amador and Soares (2012a,b), markets are defined at 3-digit level in NACE Rev. 1. However, markets with less than 5 observations for a given year were eliminated. Overall, the article considers a total of 156 markets, 108 of which are considered tradable and 48 as non-tradable. As discussed in Amador and Soares (2012a), the set of tradable markets includes all manufacturing markets plus those where the exports to sales ratio exceeds 15 per cent.⁴ In this sample, the non-tradable sector represents 56 per cent of GVA, 61 per cent of sales and 54 per cent of total employment in the period 2006-2009.

3.2 Definition of variables and descriptive statistics

The set of variables required to estimate equation 7 is relatively large. Firstly, output corresponds to sales of goods and services, and its growth rate is $\Delta p_t + \Delta q_t$. Secondly, labour costs are given by nominal wages and other benefits including social security contributions, and its growth rate is represented by $\Delta l_t + \Delta w_t$. Thirdly, shares of labour costs and intermediate inputs (α^L and α^M) consist of the ratios of labour costs and costs of goods and services to sales, respectively. Chart 1 displays the distribution of these shares for Portuguese firms in 2008, distinguishing between those operating in tradable and non-tradable sectors. The average share of labour costs and intermediate inputs are 25 and 62 per cent, respectively. The distribution of labour cost shares is positively skewed, presenting greater dispersion in the tradable sector. In contrast, the distribution of intermediate inputs shares is negatively skewed in the non-tradable sector and closer to a Gaussian distribution in the tradable sector.

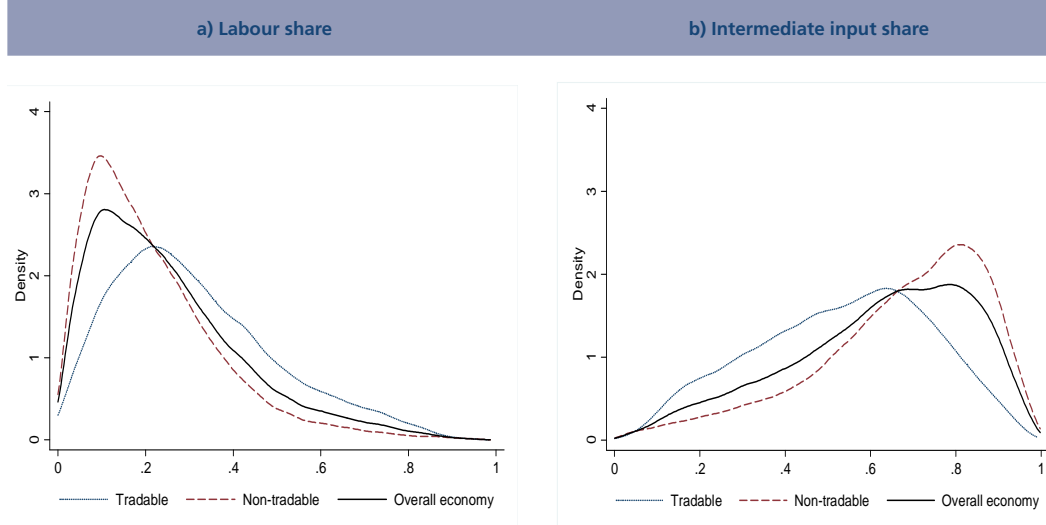
The estimation of equation 7 also requires information on the stock of capital and its user cost. Differently from most studies, the stock of capital considered in this article includes both tangibles and intangibles. If intangibles are dismissed, results can be substantially biased, particularly in services markets where these assets tend to have an extremely relevant role.

The user cost of capital is the price to pay for hiring or purchasing one unit of capital services and includes a measure of the financial cost of capital and the depreciation rate. Unlike most studies in the literature, this cost was calculated at firm level, which is likely to reduce measurement error. Following Hall and

⁴ Note that the set of markets considered in the article does not fully coincide with the one used in Amador and Soares (2012a,b) basically due to the exclusion of the information obtained under *Central de Balanços* (2000-2004).

Chart 1

DISTRIBUTION OF LABOUR AND INTERMEDIATE INPUT SHARES ON SALES AT FIRM-LEVEL IN 2008



Source: Author's calculations.

Jorgenson (1967), the user cost of capital of firm i in year t is defined as $r_{i,t} = (i_{i,t} - \hat{P}_{I,t} + \delta_{i,t})P_{I,t}$, where $i_{i,t}$ is the financial cost of capital, $\delta_{i,t}$ is the depreciation rate, $P_{I,t}$ and $\hat{P}_{I,t}$ represent the level and growth rate of investment goods prices, respectively. These elements derive from the standard equation that relates the value of an asset to the discounted real flows of rentals expected over its lifetime.⁵

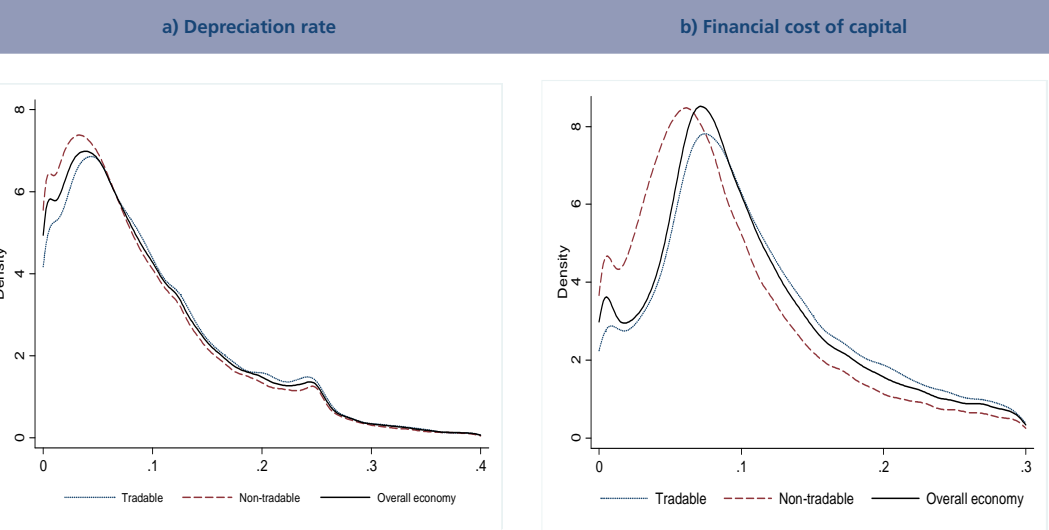
The depreciation rate at firm level is calculated as the ratio of total depreciations in year t to gross capital stock in year $t-1$, i.e., for firm i in year t , $\delta_{i,t} = \text{depreciation}_{i,t} / K_{i,t-1}$. The calculation of firm-level depreciation rates makes it possible to capture some of the heterogeneity in the stock of capital. Chart 2 a) presents the distribution of the depreciation rate for Portuguese firms in 2008. The distribution is positively skewed and the average for the overall economy lays around 10 per cent, with no significant differences between firms in tradable and non-tradable markets. These figures are in line with those used in similar articles. For example, Christopoulou and Vermeulen (2012) use a rate of 8 per cent with longitudinal data, Boulhol *et al.*, (2006) uses rates of 5 and 7 per cent, while Konings and Vandebussche (2005) assume a depreciation rate of 10 per cent.

While the calculation of the depreciation rate is relatively straightforward, the calculation of financial cost of capital is more complex. This article assumes that the financial cost of capital is given by the ratio between interest and financial debt for each firm and year. Thus, it is assumed that funding through equity is equivalent to funding through debt. Chart 2 b) shows the distribution of the financial cost of capital of Portuguese firms in 2008. The distribution is positively skewed, with an average of approximately 15 per cent and a median of 10 per cent. Additionally, the density in the tail that corresponds to lower costs of capital is higher in the non-tradable sector than in the tradable sector. Finally, regarding the deflator of investment goods ($P_{I,t}$), it was obtained directly through national accounts.

⁵ For more details on the methodologies used to measure the capital stock and its user cost see OECD (2001).

Chart 2

DISTRIBUTION OF DEPRECIATION RATE AND FINANCIAL COST OF CAPITAL AT FIRM-LEVEL IN 2008

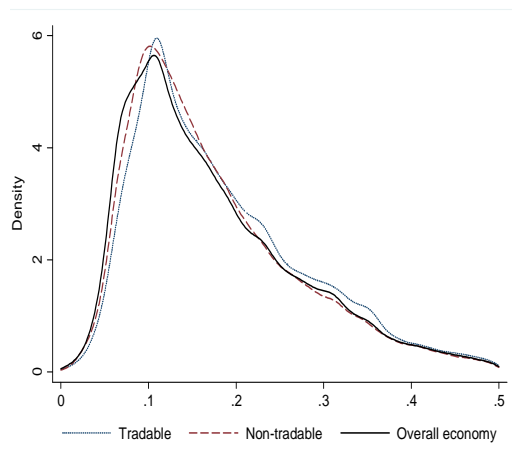


Source: Author's calculations.

In order to avoid a substantial loss of observations, the financial cost of capital of the firms that report no debt, interest payments or ratios outside the [0,1] range was considered equal to the average of the respective market in each year. Chart 3 displays the distribution of the user cost of capital of Portuguese firms, using the imputation referred above. This distribution is positively skewed with an average of about 20 per cent.

Chart 3

DISTRIBUTION OF THE USER COST OF CAPITAL AT FIRM-LEVEL IN 2008



Source: Author's calculations.

Note: The distribution displayed in the chart corresponds to the real financial cost of capital added to the depreciation rate.

4. Results

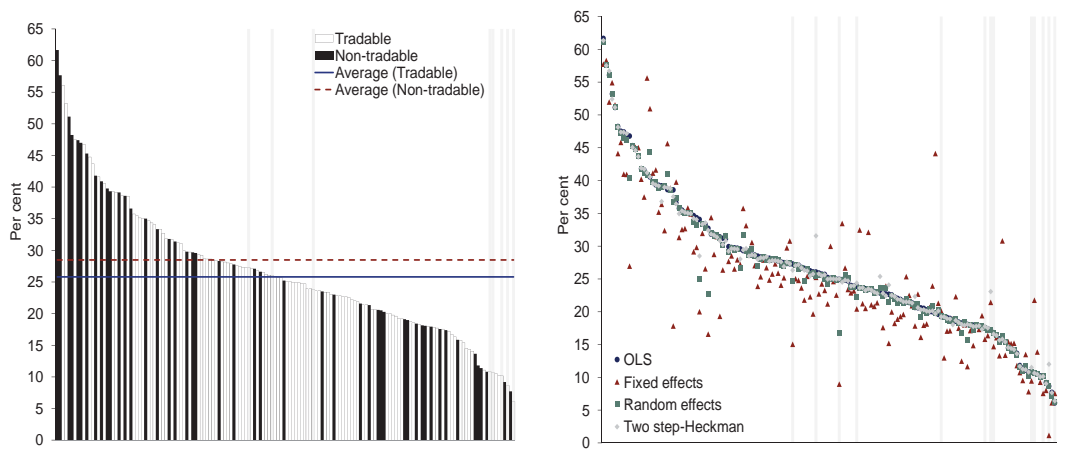
In this section we test the paradigm of perfect competition in Portuguese product markets in the period 2006-2009, allowing for imperfect labour markets, *i.e.*, estimating equation 7 for each market and distinguishing those with a tradable and non-tradable nature. The equation is estimated by OLS with clustered errors (benchmark specification). In addition, regressions with fixed effects, random effects and the two-step Heckman procedure are also estimated to ensure robust results. Furthermore, aggregations for some sectors are presented, as well as for the overall economy.

The perfect competition paradigm is widely rejected in Portuguese product markets. At a significance level of 5 per cent, estimated price-cost margins are statistically different from zero for virtually all markets considered (95 per cent of the markets). Chart 4 a) ranks estimated price-cost margins from the highest to the lowest, uncovering a substantial heterogeneity across markets. Price-cost margins range between a minimum of 6 per cent and a maximum of 62 per cent. The comparison between tradable and non-tradable sectors suggests lower competition intensity in the latter, with unweighted price-cost margins of 26 and 29 per cent, respectively. This difference is slightly higher when manufacturing and non-manufacturing sectors are compared. The price-cost margin for the overall Portuguese economy stands at 27 per cent.

Given the relevance of the results in terms of policy, the comparison of price-cost margins obtained through different econometric approaches is particularly important. Chart 4 b) reports price-cost margins estimated by fixed effects, random effects and two-step Heckman procedure for each market, sorted according to the benchmark specification.⁶ It should be noted that the rank of markets obtained through the different specifications is largely unchanged, implying that the identification of markets with a

Chart 4

PRICE-COST MARGIN FOR EACH MARKET IN THE PERIOD 2006-2009



Source: Author's calculations.

Note: Each market corresponds to a 3 digit level in NACE Rev. 1 classification. Black bars identify non-tradable markets as defined in Amador and Soares (2012a). Coefficients were obtained through OLS regressions with cluster errors, for each market (benchmark specification). Grey bars correspond to coefficients not significant at 5 per cent, in at least one specification.

6 The two-step Heckman procedure was used to test and correct the potential sample selection bias associated with the exclusion of a substantial number of firms with negative operational profits. The inverse Mills ratio is significant for around 30 percent of the markets, at a 5 per cent significance level. The explanatory variables in the participation equation are firm's age, sales and lagged total assets, in logarithm. Furthermore, the introduction of annual dummies in the remaining econometric approaches did not affect the results, thus they were not included. The Hausman test was also performed for each market and random effects were rejected in around 45 per cent the markets at a 5 per cent significance level.

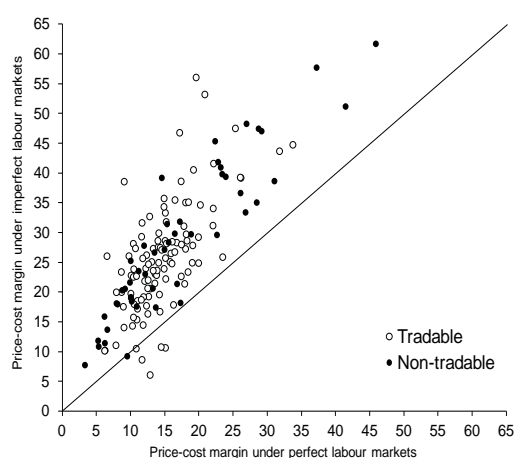
potentially less intense competitive environment does not change. The share of markets where there is statistical evidence to reject the perfect competition paradigm is below 8 per cent for all specifications, and these markets belong exclusively to the manufacturing sector.

One of the results in the literature is that estimates for the price-cost margin are higher if the methodology allows for the existence of imperfect competition in the labour market, *i.e.*, when workers hold some bargaining power. Under this assumption, the regression captures the overall surplus extracted by the firm to the consumer through its market power, including the part that is transferred to the workers through their bargaining power in the labour market. In fact, by assuming perfect competition in the labour market (null bargaining power for the workers), labour costs are incorrectly assumed to translate workers' productivity, thus underestimating firm's market power. Chart 5 illustrates this result by comparing price-cost margins presented above with those obtained assuming perfect competition in the labour market. The average underestimation is 11 p.p., though in some markets the bias reaches values above 35 p.p.. The results in the empirical literature have also pointed a substantial underestimation. Bassanetti et. al. (2012) refers an underestimation of 10 p.p.. Considering only the manufacturing sector, Dobbelaere (2004) reports a higher underestimation, around 20 p.p.. Still, there is a high correlation between estimated price-cost margins in both contexts (80 per cent), *i.e.*, markets associated to lowest competition intensity do not change substantially.

The estimate for the term $\varphi / (1 - \varphi)$ in equation 7 makes it possible to recover the parameter for the workers' bargaining power (φ) in each market. Chart 6 a) reports workers' bargaining power in each market sorted in descending order. As reported for the product market, the assumption of perfect competition in the labour market is widely rejected (in about 75 per cent of the markets, at a significance level of 5 per cent). This percentage is higher in the non-tradable (85 per cent) than in tradable sector (72 per cent).

Chart 5

PRICE-COST MARGIN UNDER COMPETITIVE AND IMPERFECT LABOUR MARKETS | PER CENT



Source: Author's calculations.

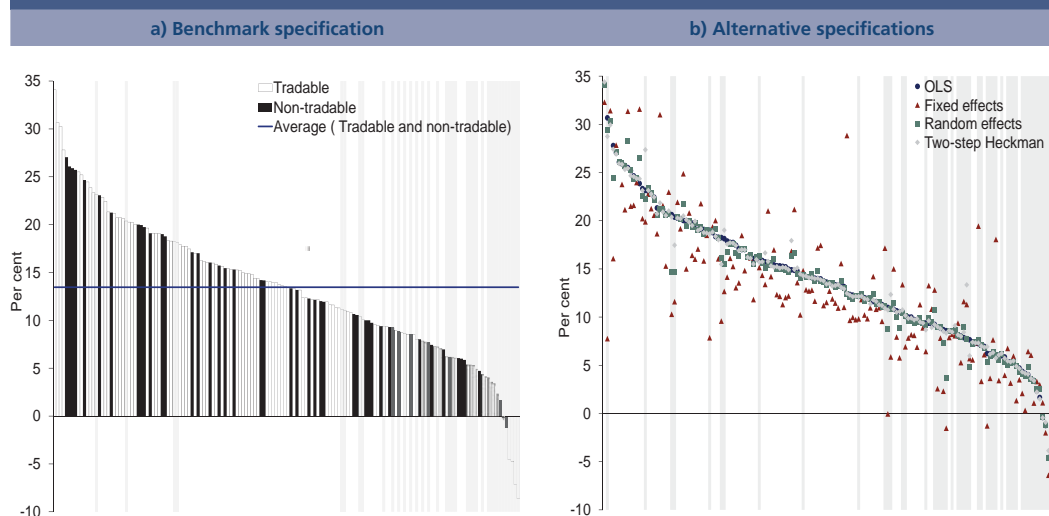
Notes: Each market corresponds to a 3 digit level in NACE Rev. 1 classification. Black dots identify non-tradable markets as defined in Amador and Soares (2012a). Coefficients were obtained through OLS regressions with cluster errors, for each market.

Workers' bargaining power is very heterogeneous, reaching values higher than 30 per cent in specific markets of "Transports" and "Real estate activities" but also very low figures in markets related to "Trade" and the manufacturing sector. Negative values are abnormal and are associated to non significant estimates, *i.e.*, markets where it is not possible to reject the existence of perfect competition in the labour market. Unweighted average bargaining power for the overall economy stands at 14 per cent, close to the figures found for tradable and non-tradable sectors. Regarding the results for different formulations, chart 6 b) overlaps estimates sorted according to the benchmark specification. The results are broadly consistent, though it can be seen that some estimates obtained using fixed effects differ from the benchmark specification but the overall rank is maintained.

As it is suggested in the empirical literature, results show that the degree of imperfection in the product market is closely related to the degree of imperfection in the labour market. The correlation between price-cost margins and workers' bargaining power across markets is around 81 per cent (Chart 7). For example, Estrada (2009) reports a correlation of 50 per cent for several EU countries for the period 1980-2004. Considering only the manufacturing sector, Boulhol *et al.*, (2006) studied 20 markets in the UK in the period 1988-2003 and reports correlations of 71 and 53 per cent in different specifications, while Dobbelaere (2004) reports a correlation of 87 per cent for a set of Belgian firms in the period 1988-1995. The latter article presents two alternative explanations for the positive correlation between price-cost margins and workers' bargaining power. One explanation is that a high bargaining power leads to increased wages and the reduction of the rents kept by the firm. Consequently, some firms exit the market, thus reducing the intensity of competition in the product market. On the contrary, it can be argued that workers tend to exert less bargaining pressure if there is no surplus to be extracted from the firm, which is the case when there is strong competition in the product market. In this context, Blanchard and Giavazzi (2003) suggest a model that relates labour and product market imperfections.

Chart 6

BARGAINING POWER FOR EACH MARKET IN THE PERIOD 2006-2009

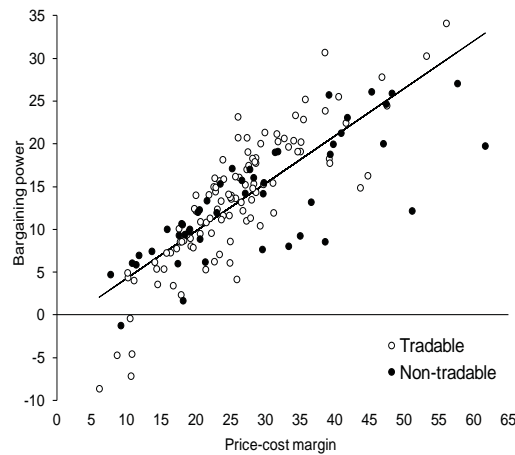


Source: Author's calculations.

Notes: Each market corresponds to a 3 digit level in NACE Rev. 1 classification. Black bars identify non-tradable markets as defined in Amador and Soares (2012a). Coefficients were obtained through OLS regressions with cluster errors, for each market (benchmark specification). Grey bars correspond to coefficients not significant at 5 per cent, in at least one specification.

Chart 7

PRODUCT AND LABOUR MARKET IMPERFECTION | PER CENT



Source: Author's calculations.

Notes: Each market corresponds to a 3 digit level in NACE Rev. 1 classification. Black dots identify non-tradable markets as defined in Amador and Soares (2012a). Coefficients were obtained through OLS regressions with cluster errors, for each market.

The top block of Table 1 reports estimated price-cost margins, aggregating markets into sectors and considering several weights (markets, sales, GVA and employment).⁷ Similarly, the bottom block of the table displays workers' bargaining power. "Electricity" and "Construction" exhibit the highest price-cost margins (above 35 per cent) and are associated to workers' bargaining power above that of other sectors of the economy (around 14 and 20 per cent, respectively). In contrast, the lowest price-cost margins are associated to "Trade" and, to a lesser extent, the manufacturing sector. In these cases, the bargaining power is also lower than that of other sectors of the Portuguese economy. Furthermore, results obtained with various weighing variables and alternative specifications are not substantially changed.

Studies for other countries report estimates for price-cost margins and bargaining power. However, the articles exhibit substantial differences in terms of sectors included, sample periods, characteristics of the databases and methodological details, which limits comparability. Estrada (2009) uses industry data and reports price-cost margins for Germany, Spain, Italy and France of 34.7, 25.3, 22.8 and 16.2 per cent, respectively, and workers' bargaining power of 20.2, 7.2, 12.6 and 14.2 per cent, respectively. Additionally, Moreno and Rodriguez (2010) uses a sample of 2000 Spanish manufacturing firms in the period 1990-2005 and reports a price-cost margin under imperfect labour markets of 17.6 per cent and a coefficient for workers' bargaining power that lies between 13 and 15 per cent. Similarly, Dobbelaere (2004) and Abraham *et al.* (2009) report an average price-cost margin of 33 to 26 per cent for the Belgian manufacturing sector, along with a bargaining power of 24 and 12 per cent, respectively. Considering a set of French firms in the manufacturing sector, Crépon *et al.* (2005) reports a price-cost margin of 30 per cent and a high parameter for workers' bargaining power (66 per cent).

⁷ The weights used are based on the average period of 2006-2009.

Table 1

PRICE-COST MARGIN AND BARGAINING POWER FOR SOME SECTORS									
	Nb. of markets (1)	Non-rejection of perfect competition (percentage of markets) (2)	Min.	Max.	Median	Unweighted average	Weighted average		
							Sales	GVA	Employment
Price-cost margin									
Overall economy	156	5	6.1	61.7	25.2	26.6 (5.4)	24.9 (3.1)	27.7 (4.2)	25.7 (1.9)
Manufacturing	93	9	6.1	46.8	24.8	24.7 (6.4)	24.2 (5.5)	25.3 (4.6)	24.7 (3.0)
Non-manufacturing	63	0	7.7	61.7	27.8	29.5 (5.4)	25.3 (2.8)	28.8 (4.1)	26.2 (1.6)
Tradable	108	7	6.1	56.1	25.0	25.8 (6.2)	24.7 (4.8)	25.7 (4.0)	25.4 (2.6)
Non-tradable	48	0	7.7	61.7	26.9	28.5 (3.7)	25.1 (2.8)	29.3 (4.2)	25.9 (1.7)
Electricity and water supply	3	0	29.6	39.2	38.6	35.8 (6.6)	38.0 (6.6)	38.1 (6.6)	38.5 (6.7)
Construction	5	0	28.3	47.5	39.3	38.9 (2.8)	44.6 (0.7)	44.1 (0.7)	43.2 (0.7)
Trade	23	0	7.7	57.7	19.0	20.9 (1.8)	17.2 (0.9)	19.7 (0.9)	20.4 (1.0)
Transports and communications	10	0	21.4	56.1	27.8	31.7 (6.5)	26.8 (5.0)	26.3 (5.1)	27.5 (3.7)
Other services	22	0	9.2	61.7	34.0	34.4 (3.9)	32.8 (1.7)	30.3 (1.7)	21.8 (1.7)
Bargaining power									
Overall economy	156	24	-8.6	34.1	13.5	13.5 (5.2)	11.9 (2.6)	12.9 (3.4)	12.8 (2.2)
Manufacturing	93	30	-8.6	30.7	13.8	13.1 (5.8)	11.8 (5.6)	13.0 (4.4)	13.4 (2.9)
Non-manufacturing	63	14	-1.2	34.1	12.3	14.0 (5.2)	11.9 (2.2)	12.8 (3.3)	12.4 (2.0)
Tradable	108	28	-8.6	34.1	13.9	13.5 (5.6)	11.5 (5.0)	11.8 (4.0)	12.7 (2.5)
Non-tradable	48	15	-1.2	27.0	12.2	13.5 (3.7)	12.2 (2.1)	13.7 (3.3)	12.8 (2.1)
Electricity and water supply	3	67	7.6	25.7	8.6	14.0 (6.7)	9.7 (4.5)	10.5 (4.5)	16.0 (4.7)
Construction	5	0	16.0	24.7	19.1	20.6 (2.4)	23.4 (0.6)	23.2 (0.6)	22.8 (0.6)
Trade	23	4	4.7	27.0	10.0	11.4 (1.7)	9.4 (0.8)	10.9 (0.8)	11.6 (1.0)
Transports and communications	10	20	5.3	34.1	16.4	16.1 (5.0)	13.5 (4.4)	12.7 (4.5)	13.0 (3.2)
Other services	22	18	-1.2	30.3	14.5	14.2 (4.0)	11.6 (1.8)	9.7 (2.2)	6.0 (3.5)

Source: Author's calculations.

Notes: (1) Each market corresponds to a 3 digit level in NACE Rev. 1. Coefficients were obtained by OLS with cluster errors, for each market. Standard errors, reported in parenthesis, were computed using the delta method (Greene (1993)). (2) The non-rejection of the hypothesis of perfect competition is evaluated at a significance level of 5 per cent.

5. Conclusions

This article is based on the methodology proposed by Roeger (1995) to estimate price-cost margins in the Portuguese economy for the period 2006-2009, allowing for imperfect competition in the labour market. The perfect competition paradigm is widely rejected in the Portuguese economy both in product and labour markets.

The hypothesis of perfect competition in the product market is not rejected in only 5 per cent of the markets. Estimated price-cost margins are very heterogeneous across markets and figures for the overall economy range between 25 and 28 per cent, depending on the weight used for each individual market. In addition, the price-cost margin in the tradable sector is lower than the one observed in the non-tradable, consistently with the pattern observed in previous studies. Moreover, disregarding labour market imperfection implies that the price-cost margin is underestimated on average by 11 p.p..

In approximately 25 per cent of the markets, the hypothesis of perfect competition in the labour market cannot be rejected. The average workers' bargaining power in the Portuguese economy lies between 12 and 14 per cent, depending on the weight used for each market. Additionally, there is substantial heterogeneity across sectors, reaching higher values for "Construction" and "Transports and Communications". Finally, as mentioned in the literature, workers' bargaining power is strongly and positively correlated with the price-cost margin across markets.

This article confirms previous findings on the existence of a significant scope to improve competition in Portuguese product markets, particularly in the non-tradable sector. The inexistence of a suitable competitive setup in the past may have favoured an over allocation of resources in this sector. Therefore, the improvement of competition is a crucial condition for a successful and sustainable adjustment process in the Portuguese economy, based on an efficient allocation of resources across firms and markets.

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