MEASURING COMPETITION IN THE PORTUGUESE ECONOMY USING PROFIT ELASTICITIES*

*João Amador** | *Ana Cristina Soares***

ABSTRACT

This article takes the set of Portuguese markets and computes a new competition measure suggested by Boone (2008), which draws on the concept of profit elasticity to marginal costs in a given market. The article concludes that the majority of markets presented a reduction in competition in the period 2000-2009, though there is substantial heterogeneity. In addition, markets that faced competition reductions represent the large majority of sales, gross value added and employment in the Portuguese economy. The non-tradable sector presents lower competition intensity than the tradable sector. Moreover, reductions in competition are relatively widespread across markets in both sectors, but in terms of sales, gross value added and employment these reductions are more substantial in the non-tradable sector.

1. Introduction

Economic growth is driven by the adoption of new technologies and the emergence of new products, which replace old ones. In the Schumpeterian terminology this dynamics is commonly known as *creative destruction*. Competition plays an extremely relevant role in this dynamics. Nevertheless, the paradigm of perfect competition, with prices equalling marginal costs and zero economic profits in the long-run, is almost non-observable in reality. Instead, firms tend to have some degree of market power, *i.e.*, they are able to set and sustain positive mark-ups. Therefore, competition measures are important policy indicators. The new competition measure suggested by Boone (2008) is particularly suited to assess competition in a context of reallocation of resources in the economy.

This article computes the measure of profit elasticity to marginal costs in the Portuguese markets suggested by Boone (2008), based on firm level data from Central de Balanços for 2000-2004 and Informação Empresarial Simplificada for 2005-2009. The article reports profit elasticity levels and trends for the different markets. In addition, this analysis complements and assesses the robustness of the results included in Amador and Soares (2012a), which focuses on the set of classical competition indicators for the Portuguese economy.

The analysis carried out is fundamentally distinct from the one conducted by competition authorities, aiming to set an overall scenario for competition developments and not to draw conclusions for individual markets. As in Amador and Soares (2012a), the distinction between tradable and non-tradable and manufacturing and non-manufacturing sectors is highlighted. In fact, it is important to assess whether there is margin for an increase in competition in the Portuguese economy, particularly in the non-tradable sector. In this case, an increase in competition would contribute to a more efficient alloca-

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** Banco de Portugal, Economics and Research Department.

tion of resources, favouring the correction of existing macroeconomic imbalances. The article concludes that the majority of markets presented a reduction in competition in the period 2000-2009, though there is substantial heterogeneity. In addition, markets that faced reductions in competition account for the large majority of sales, gross value added and employment in the Portuguese economy. The non-tradable sector presents lower levels of competition than the tradable sector. Moreover, reductions in competition are widespread across markets in both sectors but, in terms of sales, gross value added or employment, competition reductions are more substantial in the non-tradable sector.

From a competition policy point of view, it is important to select indicators that can unequivocally identify markets where practices followed by firms reduce aggregate welfare. Finding robust indicators to measure competition is an enormous challenge. Competition authorities often rely on traditional measures of competition based on market profitability and concentration such as, for instance, the price-cost margin (PCM) and the Herfindahl-Hirschman index (HHI). Nevertheless, traditional indicators are not monotonic in competition, *i.e.*, an increase (reduction) in the PCM does not always translate a reduction (increase) in the intensity of competition in the market, thus potentially leading to inaccurate market competition assessments. For example, an increase in firms' aggressiveness is likely to lead to a redistribution of market shares amongst incumbents, benefiting more efficient firms (reallocation effect) and potentially forcing inefficient ones to exit the market (selection effect). In this scenario, there may be an increase in market's PCM, wrongly suggesting a reduction in competition. Similarly, competition analysis based on the HHI may also lead to inaccurate conclusions due to the presence of reallocation and selection effects. In fact, if efficient firms put more pressure on competitors and the least efficient ones exit, there may be an increase in market concentration, suggesting a fall in competition when the opposite actually occurred.

The non-monotonicity of traditional competition indicators is a highly undesirable feature from a policy perspective. In addition, Griffith *et al*. (2005) argue that traditional measures are poor indicators of competition in markets where firms have different marginal costs and goods are symmetrically differentiated. Besides, Boone *et al*. (2007) argues that competition analysis based on PCMs tends to fail in more important markets, *i.e.*, when there is a reduced number of firms, which are more likely to present anti-competitive practices.

Given these problems, the elasticity of profits to marginal costs was proposed by Boone (2008), who noticed that increases in competition, associated, for instance, to a fall in entry costs or to an increase in pressure posed upon competitors, always implies a transfer of profits from relatively less efficient firms towards relatively more efficient ones. Based on this fact, the author presented an alternative competition indicator with several theoretical and empirical advantages relatively to the traditional competition setup. Firstly, the indicator is monotonic in competition under the assumptions of product homogeneity, firms' symmetry (except on marginal costs), constant marginal costs and simultaneous and independent choice of the strategic variable. Nevertheless, under predatory prices, collusion and first mover's advantage, this result does not necessarily hold. Secondly, the indicator does not require that the universe of firms is observed, *i.e.*, the estimated profit transfer among a subset of firms conveys information for the market. Thirdly, empirical studies find that it tends to be less sensitive to the business cycle than the PCM. In fact, Boone (2008) regressed PCMs on sector and year dummies and found the latter significant and positively correlated with the business cycle. In addition, Griffith *et al*. (2005) compared the performance of different competition measures and refer that profit elasticity estimates are significantly less affected by cyclical downturns than the PCM.

The main empirical limitations of the Boone (2000, 2008) indicator are its need for a measure of firm efficiency (marginal costs) that is unobservable in the data, its dependence on a definition for the relevant market, its sensitiveness to the sample of firms and estimation methodologies used and the non-existence of an upper bound. Only these last two caveats are not extensive to the classical competi-

tion indicators. The empirical literature on Boone based measures is growing and recent contributions include Maliranta *et al*. (2007), Braila *et al*. (2010) and Devine *et al*. (2011).

The article is organized as follows. section 2 discusses the details of the empirical methodology, including a description of the profit elasticity indicator and the different estimation approaches, as well as a description of the database. Section 3 presents the results obtained for Portuguese markets. Section 4 offers some concluding remarks.

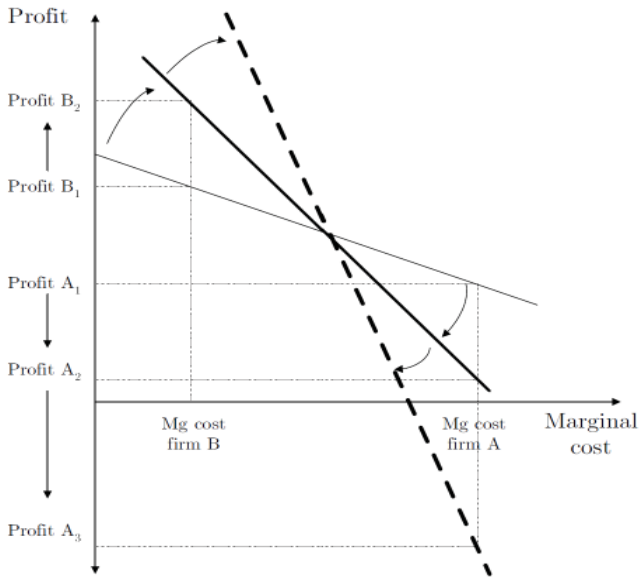
2. Methodology and Data

2.1. The profit elasticity indicator

The conceptual idea behind the profit elasticity indicator suggested by Boone (2000, 2008) is that competition leads to a transfer of profits towards relatively more efficient firms (those with lower marginal costs) at the expense of less efficient ones. In this context, the higher the intensity of market competition, the harsher is the punishment of relatively less efficient firms and the bigger the reward of relatively more efficient ones. It should be noted that relatively efficient firms may see their profits decrease as a result of an increase in competition, but in this case the reduction in profits is more severe for less efficient firms. In other words, a larger cost differential maps into a larger profit differential. In graphical terms, the empirical relation between profits and marginal costs is negative and its slope translates the concept of profit elasticity. It reflects the intensity of competition in the market, offering the basis for an empirical competition measure. Chart 1 illustrates this relation in a scenario of increased market competition. Relatively more efficient firms (type B) are rewarded with relatively higher profits and relatively inefficient firms (type A) face relatively lower profits. If the redistribution of profits across firms due to an increase in competition is strong enough, *i.e.*, if type A profits turn negative, these firms are forced to exit the market (selection effect). Note that the chart illustrates a linear relation, though this may not be necessarily the case for all the markets.

Chart 1

MARKET PROFIT ELASTICITY IN THE PRESENCE OF AN INCREASE IN COMPETITION



Similarly to traditional competition indicators, it is necessary to establish a definition of the relevant market. An accurate definition of the relevant market takes into account the degree of product substitution, transportation costs and the geographic location of producers and consumers. However, in this type of studies the aim is to set an overall competition assessment, thus it is assumed that markets can be correctly identified through an economic activity classification such as NACE. Nevertheless, this assumption may imply a substantial bias. For example, in the case of multi-product firms that sell goods that are not close substitutes. An analysis based on a high sectoral disaggregation may mitigate some problems. In addition, as previously mentioned, the measurement of firm efficiency is particularly difficult as it is directly related to marginal costs, which are unobservable in the data. In fact, the use of average variable costs as a proxy for marginal costs is problematic in the presence of non-constant returns to scale and other factors such as, brand loyalty, firm reputation and product quality. Nevertheless, if these features are constant over time, changes in the profit elasticity can still be correctly interpreted as changes in market competition.

2.2. Estimation

The empirical implementation of Boone (2008) involves estimating the slope of the relation between profits and a measure of efficiency for firms operating in each market and year. Two methodologies can be adopted. The first methodology is non-parametric and consists in computing the frontier between profits and efficiency using Data Envelopment Analysis (DEA).[1] The second methodology is parametric and relies on regressions to estimate the relation between profits and efficiency. The non-parametric approach may be a better choice in markets with a reduced number of players, where regression-based methods may turn out to be relatively weak due to the reduced number of degrees of freedom. Nevertheless, non-parametric methods may face convergence problems for several markets and years, hindering their practical usefulness. For this reason the article adopts the regression-based methodology.

Panel data models, such as two-way fixed effect models, are widely used to measure competition intensity in different markets. For example, Braila *et al*. (2010), Polder *et al*. (2009) and Boone *et al*. (2007) introduce firm and time fixed effects to assess competition developments for Belgian and Dutch firms, respectively. In this context, the log-log specification is often preferred in the empirical literature as it takes into account the skewness in the distribution of profits and average variable costs.

This specification has two advantages compared to a cross sectional approach. First, it captures unobserved heterogeneity by using firm fixed effects. In the presence of unobserved firm-level heterogeneity that is correlated with a measure of efficiency, the exclusion of firm fixed effects generates inconsistent estimates. Second, year fixed affects absorb the impact of sectoral shocks and control for the business cycle.

In theory, relatively more efficient firms are rewarded more significantly in markets that exhibit more intense competition. Therefore, profit elasticities are expected to be not only negative, but also lower in markets facing more intense competition (or higher in absolute value). Therefore, the proposed formulation is:

$$\ln(\Pi_{it}^{j}) = \alpha_{i}^{j} + d_{t}^{j} + \beta^{j} \ln(C_{it}^{j}), \quad \text{for each } j \text{ (market)} \tag{1}$$

where Π_{it}^{j} stand for profits and C_{it}^{j} a proxy of marginal costs of firm i operating in market j in period t. Firm and year fixed effects are α_{i}^{j} and d_{t}^{j}, respectively.

1 References to the DEA approach in the context of competition analysis are Simar and Wilson (2005) and Schiersch and Schmidt-Ehmcke (2010).

It should be noted that the panel specification does not include a control for firm size. This variable tends to be included as a way to capture some unobserved heterogeneity. The use of fixed effects for the firm allows for the absorption of this heterogeneity. Thus, firm size (measured by firm sales) is not included as a regressor, which minimizes possible endogeneity problems.[2]

Note also that the coefficient referring to the profit elasticity in equation 1 refers to the intensity of competition, whereas the main issue of interest are changes in competition through time. The estimation of an explicit trend coefficient for competition requires a formulation such as:

$$\ln(\Pi_{it}^{j}) = \alpha_{i}^{j} + d_{t}^{j} + (\beta^{j} + \gamma^{j} t)\ln(C_{it}^{j}),\ \text{for each } j\ (\text{market}) \qquad (2)$$

where a positive (negative) trend coefficient γ^{j} implies a competition reduction (increase) in the market.

The methodology suggested by Boone (2000, 2008) entails the exclusion of firms with non-positive profits, creating a potential sample bias, which may lead to inconsistent results. Hence, ensuring robust results requires addressing this bias. The selection bias may be particularly important in Portugal since the proportion of firms with negative profits is not negligible. In approximately 90 per cent of markets, at least 20 per cent of firms exhibit negative operational profits. In order to test and correct for the potential sample selection bias, the two-step Heckman (1979) procedure was used, jointly estimating the participation and outcome equations. The exclusion restrictions used were firm´s age and total assets (tangible and intangible, in logarithm). The logarithm of sales was introduced both in the participation and outcome equations to capture unobserved heterogeneity. It should also be noted that the implementation of the Heckman (1979) procedure requires the reintroduction in the database of firms with negative operational profits, representing around 30 per cent of the observations.[3] Moreover, it was only possible to estimate the procedure for firms with positive total assets and information regarding age.

2.3. Database

The data used in this article draws on information about the annual accounts of Portuguese corporations reported under *Central de Balanços* (*CB*) for 2000-2004 and *Informação Empresarial Simplificada* (*IES*) for 2005-2009.[4] Both databases, whose main difference is firm-level coverage, offer extensive information on items of firms' balance sheets and income statements. The IES database includes virtually the universe of firms, while CB comprises mainly larger firms, representing more than 65 per cent of gross value added (GVA) in the years considered. The raw dataset coincides with the one used in Amador and Soares (2012a), which computes a set of classical competition indicators for the Portuguese economy.

Competition analysis is always conditional on a market definition. The article defines markets at a 3-digit level in NACE classification, which seems a reasonable compromise between the consideration of products that are close substitutes and the existence of an acceptable number of firms in each market. This option is broadly in line with similar empirical studies conducted for other countries. Nevertheless, not all sectors were considered. Apart from ''Financial activities'' and ''Public administration, defence and compulsory social security'', which are not covered in the database, ''Agriculture, hunting and forestry'' along with ''Mining and quarrying'' were excluded due to their specific nature and small contribution to total GVA. In addition, ''Education'', ''Health and social work'' and ''Other community, social and personal service activities'' were not included given the high weight of the public sector in these markets.

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2 The endogeneity problem is related to the fact that sales and variable costs are in both sides of the regression.

3 The observations referring to lowest 1 per cent in the pooled distribution of the price-cost margin were eliminated, consisting of unreasonably negative values.

4 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. Firstly, observations associated to null sales or null variable costs were removed. Secondly, in order to obtain meaningful regressions, only markets with at least 5 firms per year in the entire time span are included (minimum of 50 observations). Thirdly, as previously mentioned, observations with non-positive profits must be excluded.[5] Fourthly, the existence of two versions of NACE in the sample period implied a harmonization procedure that led to the reclassification of some firms.[6] The final dataset includes 937,206 observations from 2000 to 2009. It comprises 285,236 different firms and each firm has an average of 3.3 observations. There are a total of 132 markets, 90 of which are considered as tradable and 42 as non-tradable. The latter sector represents 62 per cent of GVA, 66 per cent of sales and 54 per cent of total employment in the period 2005-2009. As argued in Amador and Soares (2012a), the set of tradable markets corresponds to all manufacturing markets plus those with a ratio of exports to sales above 15 per cent.[7]

Concerning the definition of variables, profits are computed as sales of products and services deducted from variable costs, which comprise costs with employees, costs of goods sold and external supplies. Under the current methodological approach, capital is assumed to be a fixed input, thus its cost is not included in variable costs. Therefore, rents should be excluded from variable costs, though this was not the case in this article. As a matter of fact, the response rate for this variable is reduced, hence its exclusion from total costs of services might introduce another type of bias in the results.

3. Results

This section presents a competition assessment for the Portuguese markets, based on profit elasticity levels and trends.[8] The baseline specification for the estimation of profit elasticities levels is the two-way fixed effects model (equation 1) for the period 2005-2009. The baseline estimation of trend profit elasticities is the two-way fixed effects model with an explicit trend coefficient for the period 2000-2009 (equation 2).[9] The two following subsections present profit elasticity levels and trends, respectively, starting from individual markets and highlighting the distinction between those that have a tradable and non-tradable nature. In addition, some sectoral aggregations are presented.

3.1. Profit elasticity levels

Comparisons of profit elasticity levels across markets must be cautious as their levels reflect not only competition intensity, but also features such as returns to scale, product quality, brand loyalty and firm reputation. Thus, conclusions are more robust if based on the ranking of market profit elasticities rather than on actual levels. In addition, the comparison of markets or aggregates across countries with similar institutional setups is also relatively robust.

Estimated profit elasticity levels are negative, as predicted by the theory, and significant for virtually all markets considered (Chart 2). Time dummies were generally found non-significant, indicating that profit elasticities present low sensitivity to the business cycle.

5 Firms with negative operational profits have been excluded, though some firms may still operate at a loss.

6 Data from 2006 onwards correspond to NACE Rev. 2 and was adjusted to NACE Rev. 1.1 to be compatible with the remaining information.

7 The list of tradable and non-tradable markets is available in the Appendix of Amador and Soares (2012b). Note that the set of markets considered in the article does not fully coincide with that in Amador and Soares (2012b), as those with less than 5 firms in each year were excluded from this analysis.

8 More detailed results, including robustness tests, can be found in Amador and Soares (2012b).

9 Profit elasticity levels and trends could be estimated jointly in equation 2. Nevertheless, the break in the database implies the inclusion in equation 2 of an interaction step-dummy for the period after 2005, implying different elasticity levels for the two sub-periods. Nevertheless, estimated elasticity levels for the period 2005-2009 under equations 1 and 2 are not very different.

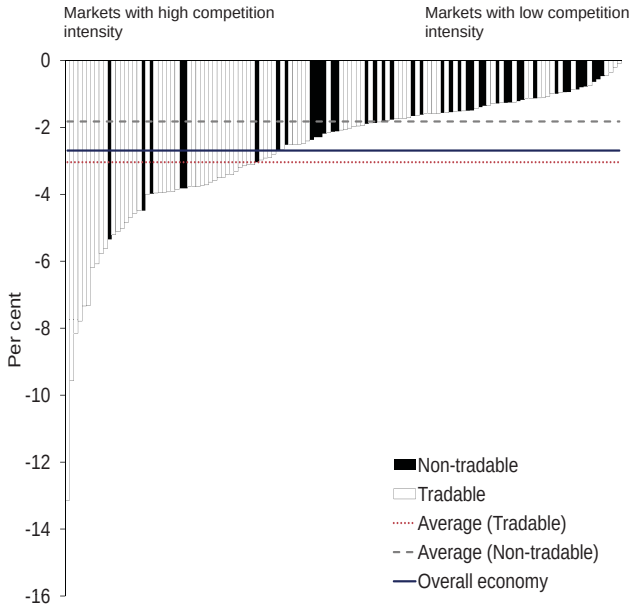
The ranking of elasticities across markets, from highest to lowest competition intensity, provides some insights (Chart 2). Firstly, there is a significant dispersion among profit elasticities in the markets. Estimated elasticities range between 0 and 13 percent, in absolute value, *i.e.*, the intensity of competition varies considerably across markets. It is noteworthy that among the markets with highest competition intensity (below the first quartile of the distribution of profit elasticity levels), 88 per cent refer to manufacturing markets and the remaining to ''Trade''. Secondly, average absolute profit elasticity in tradable and non-tradable sectors is 3.1 and 1.9 per cent, respectively, suggesting a lower intensity of competition in the latter sector. In addition, several non-tradable markets are amongst those with lowest competition. Around 48 per cent of the markets with lowest competition intensity (above the fourth quartile) correspond to non-tradable markets and only one-third correspond to manufacturing markets.

The average profit elasticity for the Portuguese economy in 2005-2009 was 2.7 per cent, in absolute value, which is similar to figures found for Luxembourg (2.8 per cent) by Peroni and Ferreira (2011). The profit elasticities obtained for the Portuguese manufacturing and non-manufacturing sectors are, in absolute value, 3.3 and 1.8 per cent, respectively. Braila *et al*. (2010) report absolute profit elasticities in these sectors in the period 1997-2004 of 2.0 and 1.1 per cent for Belgium and 2.3 and 1.3 per cent for the EU-6, respectively.[10]

Table 1 details the information on profit elasticity levels, aggregating along different economic sectors and weighting according to their share in terms of markets, sales, GVA and employment. The intensity of competition for the aggregates presented tends to be lower in terms of sales and GVA. This result implies that larger markets within each sector tend to show lower competition. This is especially noticeable in ''Electricity and water supply'' and ''Construction''. Still, the intensity of competition does not substantially differ across different aggregation variables. The tradable sector remains with higher intensity of competition than the non-tradable, and this result holds for the case of manufacturing versus non-manufacturing sectors. In the non-manufacturing sector, ''Electricity and water supply'' and ''Other services'' stand out as the ones potentially exhibiting lowest competition intensity, with absolute

Chart 2

PROFIT ELASTICITIES ACROSS MARKETS IN THE PERIOD 2005 TO 2009



Source: Authors' calculations.

Notes: Markets are ranked according to profit elastitcity levels obtained using the two-way fixed effect model. Black bars correspond to non-tradable markets as defined in Amador and Soares (2012a).

10 Contrary to this article, the non-manufacturing sector in Braila *et al*. (2010) includes the financial sector.

Table 1

PROFIT ELASTICITIES BY SECTOR IN THE PERIOD FROM 2005 TO 2009

		Average (per cent)							
		Unweighted	Weighted						
	N. of markets		Sales	GVA	Employ-ment	Variation coef.	Standard Deviation	Min.	Max.
Overall economy	132	-2.7	-2.0	-1.9	-2.2	-0.7	2.0	-13.1	-0.1
Tradable	90	-3.1	-2.6	-2.6	-2.9	-0.7	2.2	-13.1	-0.1
Non-tradable	42	-1.9	-1.6	-1.5	-1.7	-0.6	1.1	-5.3	-0.5
Manufacturing	80	-3.3	-3.2	-3.2	-3.2	-0.7	2.2	-13.1	-0.1
Non-manufacturing	52	-1.8	-1.6	-1.5	-1.7	-0.6	1.0	-5.3	-0.5
Electricity and water supply	3	-1.2	-0.8	-0.7	-0.9	-0.7	0.9	-2.1	-0.5
Construction	4	-2.0	-1.2	-1.2	-1.3	-0.4	0.7	-2.5	-0.9
Trade	23	-2.2	-1.8	-1.9	-2.1	-0.6	1.3	-5.3	-0.8
Transports and communications	8	-1.8	-2.1	-2.1	-2.3	-0.3	0.5	-2.5	-1.1
Other services	14	-1.2	-1.0	-1.0	-1.4	-0.3	0.4	-1.8	-0.6

Source: Authors' calculations.

elasticities of 1.2 per cent in the period 2005-2009.

As previously referred, the computation of robustness tests is extremely relevant in this type of analysis. Chart 3 overlaps the estimated profit elasticity levels under several econometric approaches, sorting according to the two-way fixed effects competition levels. The alternative approaches considered are cross section regressions, random effects for firms and two-step Heckman (1979). The cross section approach consists in estimating regressions of profits on average variable costs for each year and market, using the logarithm of sales as a control for firm size.[11] Profit elasticities are taken as the average of the coefficients associated to average variable costs between 2005 and 2009.[12] Results obtained under the cross section approach, also yield negative and significant elasticities in their large majority. This result holds for the remaining approaches. At a 5 per cent level, profit elasticities were significant in around 89, 86 and 99 per cent of markets for two-way fixed effects, random effects for firms and two-step Heckman (1979), respectively. Therefore, taking into account the sample selection bias improves the significance of profit elasticities.

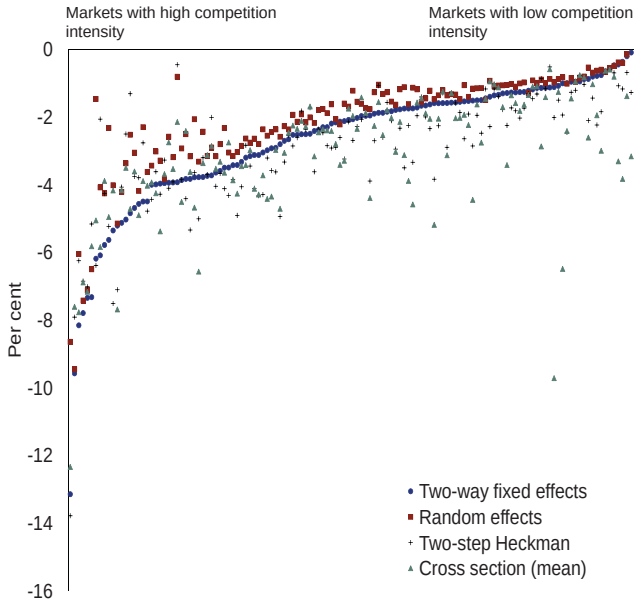
The ranking of estimated elasticities under fixed and random effects for firms is very similar, except in some of the markets with higher competition, though the classical Hausman (1979) test does not strongly support the latter specification. At a 5 per cent level, random effects are rejected in 80 per cent of the markets, while 87 per cent are rejected using the Hausman robust test (Wooldridge (2002)). Results obtained through cross section regressions are somewhat different. One of the reasons for this result is that, at odds with alternative econometric approaches, cross section regressions do not take into account the effect of the business cycle. The two-step Heckman (1979) procedure used to control for the potential sample selection bias does not reject the existence of bias in around 60 per cent of the markets. Nevertheless, the significance of the exclusion restrictions is somewhat limited as firm age was significant in only 64 per cent of markets and total assets (in logarithm) in 55 per cent of markets. Even so, corrected profit elasticity estimates are typically not far from those obtained under fixed effects

11 Without the control for firm size, profit elasticities are not always negative and significant.

12 In order to control for potential problems of heterocedasticity, the White (1980) procedure was used.

Chart 3

PROFIT ELASTICITIES ACROSS MARKETS ACCORDING TO SEVERAL ECONOMETRIC APPROACHES IN THE PERIOD FROM 2005 TO 2009



Source: Authors' calculations.

Notes: Markets are ranked according to profit elastitcity levels obtained using the two-way fixed effect model.

and its ranking across markets is not substantially changed.

Finally, the results reported in this section are based on the 2005-2009 period, for which the database covers the universe of firms. Nevertheless, for the period 2000-2009, estimates using two-way fixed effects and alternative econometric approaches yield results which are extremely close to those reported.

3.2. Profit elasticity trends

Profit elasticity trends are more robust indicators of market competition developments than their levels, particularly if different estimation methodologies and specifications provide consistent results. If returns to scale, product quality, firm reputation, brand loyalty and institutional setups are relatively stable through time, trends are more likely to translate changes in competition.

Chart 4 presents profit elasticity trends estimated under two-way fixed effects for each individual market (equation 2).[13] Positive bars identify potential competition reductions, *i.e.*, the level of the profit elasticity increases (decreases in absolute value). Chart 4 reports that 58 per cent of markets record positive trends, 29 per cent of which are non-tradable. Nevertheless, the percentage of non-significant estimates is substantial (67 per cent of markets). In addition, as previously mentioned regarding profit elasticity levels, there is a significant dispersion between profit elasticity trends across markets.

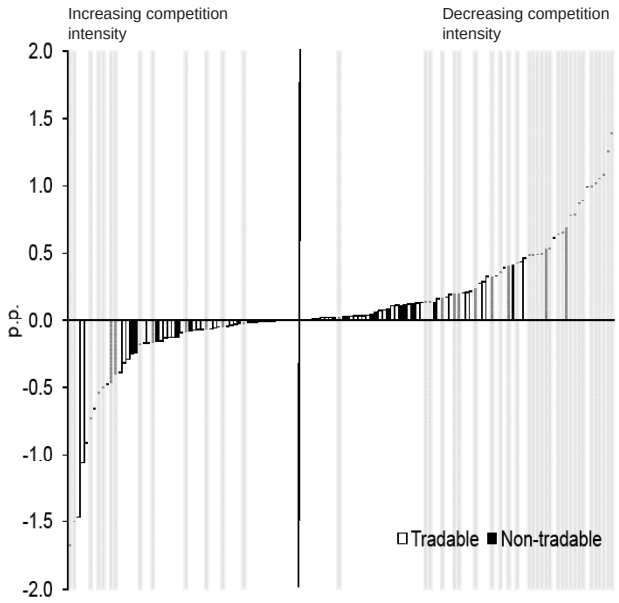
Table 2 presents competition trends estimated under the two-way fixed effects specification for the overall economy in the period 2000-2009, using as weights the share of markets, sales, GVA and employment.[14] The weights used for each market refer to 2005-2009 as the coverage of the database

13 The estimates for the trend profit elasticity in each individual market are presented in Amador e Soares (2012b).

14 In order to take account of the increase in the number of observations in 2005, due to the beginning of IES database, an interaction step-dummy was included in this year and found to be statistically significant.

Chart 4

PROFIT ELASTICITY TRENDS ACROSS MARKETS IN THE PERIOD FROM 2000 TO 2009



Source: Authors' calculations.

Notes: Light gray bars identify significant trend coefficients at 10 per cent. Black bars correspond to non-tradabe markets as defined in Amador and Soares (2012a).

in this period coincides with the universe firms, contrary to the previous years. Weights are based on the average period, hence there is no structure effect. This table presents the proportion of markets with positive and negative profit elasticity trends, reporting also such proportions if trends are significant at a 10 per cent level.

The majority of Portuguese markets presented a reduction in the intensity of competition in the period 2000-2009. Moreover, using sales, GVA and employment, competition reductions become more substantial, reaching three-quarters in the latter option. This result implies that the set of markets that faced competition reductions accounts for the large majority of sales, GVA and employment in the Portuguese economy. If only significant estimates are considered, competition reductions become less relevant in quantitative terms, though they are still considerably more important than increases in competition. Around 40 per cent of total employment in the economy is allocated to markets that reported a decreasing level of competition. Overall, this implies that decreases in competition are generalized across markets and relevant in terms of sales, GVA and employment.

Consistently with results for the overall economy, the majority of markets in the tradable and non-tradable sectors presented a decrease in the degree of competition (Table 2). In addition, the non-tradable sector exhibits a lower incidence of competition reductions compared to the tradable sector in terms of percentage of markets but not if these are weighted using sales, GVA and employment shares. In fact, competition reductions in the non-tradable sector are substantially relevant in terms of resources. More than 70 per cent of GVA and employment of the non-tradable sector refers to markets that faced competition reductions.

Results become milder if only significant trends are considered, even though the percentage of non-tradable markets with decreasing competition is still above 40 per cent of GVA and employment in the sector. Furthermore, results are qualitatively unchanged if the manufacturing versus non-manufacturing distinction is used and they are robust across the estimation approaches considered. At sectoral level,

Table 2

TREND PROFIT ELASTICITIES: AGGREGATIONS BY SECTOR | PER CENT

			Markets	Sales	GVA	Employment
Reduction in competition (Increase in profit elasticity, $\gamma > 0$)		Overall economy	58	64	67	74
		Non-tradable	52	69	74	84
		Tradable	60	54	54	61
	Signif. 10%	Overall economy	23	28	33	39
		Non-tradable	21	32	41	43
		Tradable	23	19	20	33
Increase in competition (Decrease in profit elasticity, $\gamma < 0$)	Signif. 10%	Overall economy	10	11	13	4
		Non-tradable	14	10	13	3
		Tradable	8	13	14	7

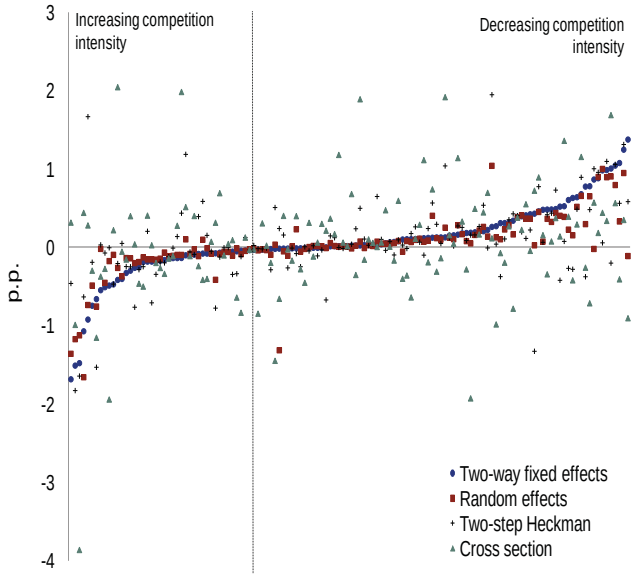
Source: Authors' calculations.

the most striking result lays in the ''Construction'' sector, where virtually all markets exhibit decreases in competition using as weigths either sales, GVA or employment.

Results obtained using alternative econometric approaches, considered as robustness tests, are presented in chart 5. The conclusions based on these estimations are qualitatively similar to those obtained with the fixed effects formulation and the ranking of markets is broadly unchanged. Nevertheless, some differences are observed mainly in the cross-section specification.[15]

Chart 5

PROFIT ELASTICITY TRENDS ACROSS MARKETS ACCORDING TO SEVERAL ECONOMETRIC APPROACHES



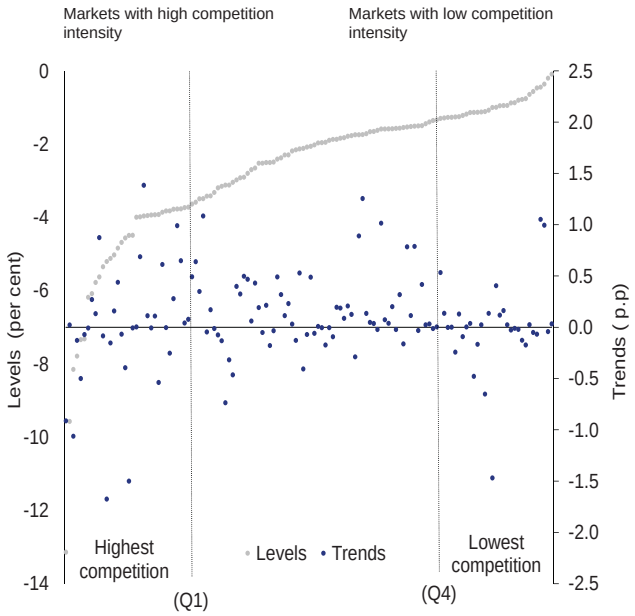
Source: Authors' calculations.
Notes: Markets are ranked according to profit elastitcity trends obtained using the two-way fixed effect model.

15 This specification consists of two steps. Firstly, regressions of profits on average variable costs with a control for size (the logarithm of sales) are estimated, using the White (1980) procedure to correct for heterocedasticity. Secondly, a time trend is fitted on profit elasticities obtained in the first step using Newey-West procedure to control for autocorrelation of first order.

Another dimension in the analysis consists in verifying the evolution of markets that stand in the tails of the distribution of profit elasticity levels, *i.e.*, those potentially least and most competitive. The idea is to check whether least competitive markets are also the ones where competition decreased, *i.e.*, reported a positive trend for the profit elasticity (γ^j). Such a scenario entails a more negative assessment of competition. Chart 6 presents profit elasticity trends sorted according to the levels of the indicator obtained under the two-way fixed effects model for the period 2005-2009. The conclusion is that the majority of markets with lowest competition intensity (above the fourth quartile of the profit elasticity distribution) present positive profit elasticity trends, *i.e.*, reductions in competition (52 per cent in the two-way fixed effects model and 58 per cent using two-step Heckman (1979)). Hence, the majority of markets exhibiting lowest competition intensity did not become more competitive.

Chart 6

PROFIT ELASTICITY LEVELS AND TRENDS (2000-2009)



Source: Authors' calculations.

Notes: Markets are ranked according to profit elastitcity levels obtained using the two-way fixed effect model for the period 2005-2009.

4. Concluding remarks

The assessment of competition developments in an economy is an important element for applied policy-analysis. This article takes firm-level data from 2000-2009 to assess competition in the Portuguese markets using the elasticity of profits to marginal costs, suggested by Boone (2008). The article reports profit elasticity levels and trends for the different markets, focusing mainly on the distinction between tradable and non-tradable sectors.

The article concludes that there is a significant dispersion across market profit elasticity levels. In the benchmark econometric specification, the average absolute profit elasticity in the Portuguese economy is 2.7 per cent in the period 2005-2009, a magnitude similar to the ones presented in studies for other EU countries. Moreover, average absolute profit elasticity in tradable and non-tradable sectors is 3.1 and 1.9 per cent, respectively, suggesting a lower intensity of competition in the latter sector. When individual markets are aggregated using as weights their shares in total sales, GVA and employment, the non-tradable sector remains less competitive.

Since profit elasticity levels are not directly comparable across markets, trends are generally considered a more robust indicator of competition developments. In this context, one important conclusion of the article is that the majority of markets decreased competition intensity in the period 2000-2009, though there is substantial heterogeneity. In addition, markets that faced reductions in competition represent the large majority of sales, GVA and employment in the Portuguese economy. Moreover, the non-tradable sector presents a lower incidence of competition reductions compared with the tradable sector in terms of percentage of markets, but not in terms of their share in sales, GVA and employment. Finally, the majority of markets with lowest levels of competition did not become more competitive.

All in all, there is substantial room to improve competition in the Portuguese economy, specially in the non-tradable sector. Such an increase in competition could lead to a more efficient allocation of resources in the Portuguese economy, contributing to the correction of existing macroeconomic imbalances. In fact, entry and exit of firms across markets and the reallocation of resources towards the most efficient firms within a given market are key elements to increase total productivity. Future research should explore the economic determinants of these effects.

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