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COMPETITION IN THE PORTUGUESE ECONOMY

INSIGHTS FROM A PROFIT ELASTICITY APPROACH

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Abstract

This article segments the Portuguese economy into fairly disaggregated markets and estimates a new competition measure suggested by Boone (2008), which draws on the concept of profit elasticity to marginal costs. In addition, robustness of results across econometric specifications is discussed, along with their consistency with classical competition indicators. The article concludes that the majority of Portuguese markets exhibited 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 shows 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. In the majority of markets the assessment on the evolution of competition using profit elasticities is similar to that obtained with classical competition indicators.

Keywords: Market competition, Portuguese economy

JEL Codes: L10, L60, O50

Non-technical summary

Competition in the product market is a key ingredient to productivity and welfare as it promotes an efficient allocation of capital and labour across firms and markets. Furthermore, competition plays an extremely relevant role in economic growth through the incentives given to the adoption of new technologies and the development of new products, which replace old ones. Nevertheless, the paradigm of perfect competition is almost non-observable in reality. Instead, firms tend to have some degree of market power, sustaining positive mark-ups. Therefore, there is a very important role for competition policy, which interplays with the broader monetary policy transmission mechanism. Different product market competition setups translate into different responses to monetary policy decisions.

Defining and measuring competition is a huge challenge both from theoretical and policy points of view. Market competition can assume different forms because firms can use several strategic variables (e.g., price, product quality and brand). Given the wide range of channels at play, there is not a unique indicator of competition that can unequivocally detect changes in competition intensity. In addition, the empirical assessment of competition faces obstacles in terms of data availability and definition of relevant markets.

This paper estimates one recent measure of competition - profit elasticity - proposed by Boone (2000, 2008), which corresponds to the drop in profits due to a one percent increase in marginal costs. The profit elasticity complements classical competition measures like the Herfindahl–Hirschman Index (HHI) or the price-cost margin (PCM). One of the main disadvantages of these classical measures is that they may incorrectly signal competition changes. For example, a tougher competition setup may lead to a reallocation of market shares, potentially forcing some firms to exit the market. In this case both HHI and the PCM may increase, suggesting that competition has weakened when, in fact, the opposite occurred. Boone (2000, 2008) proves that, under a set of assumptions, the profit elasticity is robust to this shortcoming. The underlying intuition is that the stronger the market competition, the harsher is the punishment of relatively less efficient firms and the bigger is the reward of relatively more efficient ones, i.e., more competitive markets are those where marginal cost reductions translate into larger profit increases (higher elasticity of profits to marginal costs, in absolute terms).

The paper estimates profit elasticity levels and trends for individual markets using Portuguese firm-level data for 2000-2009. A relevant feature of the paper is the estimation of profit elasticities under different econometric specifications, thus allowing for higher robustness. In addition, the consistency with results obtained using HHI and PCM, presented in Amador and Soares (2012), is discussed. Another relevant feature of the analysis is the distinction between tradable and non-tradable markets. This distinction relies on export-to-sales ratios, for each market, instead of the traditional classification based on manufacturing and services.

In terms of policy implications, the results are used to discuss to what extent the macroeconomic imbalances faced by the Portuguese economy in the context of the monetary union may have been partially driven by a poor competition setup, particularly in product markets where international trade plays a small role. In the presence of low competition intensity in non-tradables, capital and labour may have moved towards this sector, reducing the overall competitiveness of the country.

The main conclusions of the paper are the following: **i)** Most of the markets exhibited a reduction in the intensity of 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 (GVA) and employment in the Portuguese economy; **ii)** Reductions in competition are widespread across tradable and non-tradable sectors but, in terms of sales, GVA or employment, competition reductions are more substantial in the non-tradable sector. This result suggests that the macroeconomic imbalances may have been partially influenced by the competitive setup in the Portuguese Economy; **iii)** In terms of aggregates, results are generally found consistent across different specifications and estimation approaches. Nevertheless, results for some specific markets can differ; **iv)** For around half of the markets, the results are consistent with the assessment based on traditional indicators, such as the PCM and the HHI.

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 designated 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, in this complex setting, 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 profit elasticities to marginal costs in the Portuguese markets, 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. This analysis complements and assesses the robustness of the results included in Amador and Soares (2012), which computes classical competition indicators for the Portuguese markets. In fact, consistency of results across specifications and indicators is particularly relevant from a policy perspective.

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 (2012), 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 allocation of resources, favouring the correction of existing macroeconomic imbalances. The article concludes that the majority of markets experienced 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 (GVA) and employment in the Portuguese economy. The non-tradable sector shows lower levels of competition than the tradable sector. Moreover, reductions in competition are widespread across markets in both sectors but, in terms of sales, GVA or employment, 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, thus potentially leading to inaccurate assessments. For example, a tougher competitive setup may 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. Furthermore, 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. In addition, Boone et al. (2007) argue that competition analysis based on PCMs tends to fail in more important markets, i.e., when there is a small 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) as a measure of competition. The author noticed that increases in competition associated, for instance, to a fall in entry costs or to an increase in pressure posed upon competitors, are always associated 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 Boone (2008) 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 (2008) indicator are its need for a measure of efficiency (marginal costs) that is unobservable in the data, its dependence on a definition of 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 competition indicators. The empirical literature on Boone (2008) based measures is growing and recent contributions include Maliranta et al. (2007), Braila et al. (2010) and Devine et al. (2011).

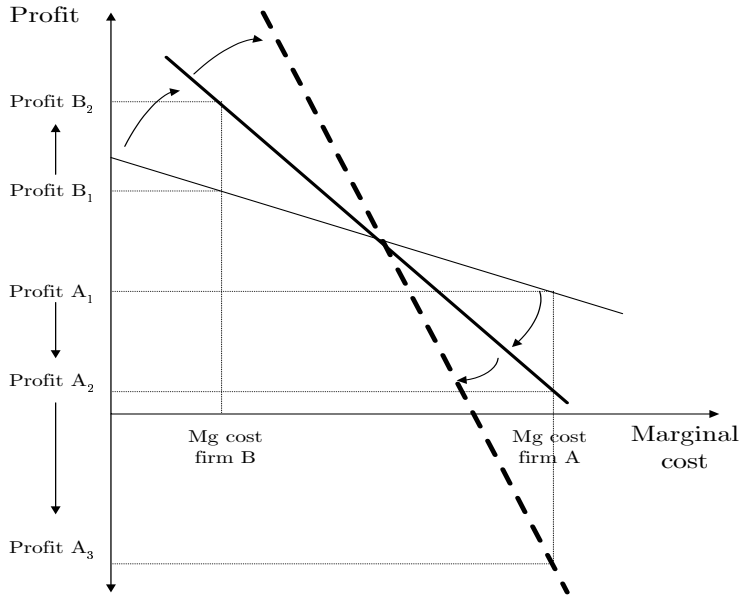
The article is organized as follows. Section 2 discusses the details of the empirical methodology, including a description of the profit elasticity indicator and the different estimation approaches, as well as a description of the database. Section 3 presents the results obtained for Portuguese markets and compares them with those obtained using classical competition indicators. 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 (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, reflecting the intensity of competition in the market and offering the basis for an empirical competition measure. Figure 1 illustrates this relation in a scenario of an increase in 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 is strong enough, i.e., if type A profits turn negative, these firms are forced to exit the market (selection effect).

Figure 1: An increase in market competition



Note that figure 1 illustrates a linear relation but this may not be necessarily the case for all the markets in the economy.

Similarly to traditional competition indicators, Boone (2008) requires the 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 can 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 such criticism. In addition, as previously mentioned, the measurement of firm's 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 a problem in the presence of non-constant returns to scale and other factors such as brand loyalty, firm reputation and product quality. Nevertheless, if returns to scale, product quality and other factors related to reputation and brand 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 in each market and each year. Two methodologies can be adopted. The first methodology is non-parametric and con-

sists 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. Conversely, non-parametric methods face convergence problems for several markets and years, hindering their practical usefulness. For this reason the article adopts the regression-based methodology.

2.2.1 Cross-section regressions

In theory, relatively efficient firms are rewarded more significantly in markets that exhibit more intense competition. Therefore, profit elasticities are expected to be negative and lower for markets facing more intense competition (or higher in absolute terms). An empirical test of the theory can be implemented through the estimation of cross section regressions as follows:

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

where Π_{it}^{j} stands for profits and C_{it}^{j} stands for a proxy of marginal costs of firm i, operating in market j in period t. One of the specifications widely used in the literature is the log-log, which takes into account the skewness in the distribution of profits and variable costs.

The absence of a control variable for firm size may yield non-negative or non-significant profit elasticities. Therefore, Peroni and Ferreira (2011) and CPB (2000) introduce an explicit control for firm size based on the number of employees and logarithm of sales, respectively.[2] To some extent, the introduction of sales or number of workers as regressors also allows to control for unobserved heterogeneity associated, for instance, to firm reputation, brand loyalty or product quality. Therefore, an alternative specification is:

$$ln(\Pi_{it})^{j} = \alpha^{j} + \beta ln(C_{it})^{j} + \gamma ln(S_{it})^{j}, \quad \text{for each } j \text{ (market) and } t \text{ (period)} \tag{2}$$

where S_{it}^{j} stands for sales of firm i, operating in market j in period t.

Another aspect is that the coefficient associated to profit elasticity in regression 2 refers to intensity of competition, whereas the main issue of interest is changes in competition

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

[2] Boone (2000) suggests the use the least and most competitive firms for efficiency as an additional control. Although relevant in theoretical terms, the control for the least and most competitive firms is typically disregarded in the empirical literature as these firms may be outliers (CPB (2000)). Note that adding the logarithm of sales as a size control may also enhance the endogeneity problem, which relates to the fact that sales and variable costs are in both sides of the regression.

through time. One way to address this issue is suggested by Maliranta et al. (2007), consisting on the estimation of the regressions for each t and j and, in a second step, fitting a linear trend to yearly profit elasticity estimates.

2.2.2 Panel data regressions

Panel data models, such as two-way fixed effect models, are a widely used approach to measure competition intensity in different markets. For example, Braila et al. (2010), Polder et al. (2009), Boone (2000) and Boone et al. (2007) introduce firm and time fixed effects to assess competition developments for Belgian and Dutch firms, respectively. This specification has two advantages compared to a cross sectional approach. First, it captures unobserved heterogeneity by using firm fixed effects, partly addressing the issue of different product quality across firms. In fact, in the presence of unobserved firm-level heterogeneity that is correlated with the measure of efficiency, the exclusion of firm fixed effects generates inconsistent estimates. Second, year fixed affects adjust for the impact of sectoral shocks and control for the business cycle. Therefore, the proposed specification is:

$$ln(\Pi_{it}^{j}) = \alpha_i^j + d_t^j + \beta^j ln(C_{it}^{j}), \quad \text{for each } j \text{ (market)} \tag{3}$$

where α_i^j and d_t^j stand for firm and time dummies, respectively.

Note that equation 3 does not include a control for size like the logarithm of sales. However, the unobserved heterogeneity is captured by firm's fixed effects and the non-inclusion of the logarithm of sales reduces the potential for endogeneity problems. The estimation of an explicit trend coefficient for competition requires a specification such as:

$$ln(\Pi_{it}^{j}) = \alpha_i^j + d_t^j + (\beta^j + \gamma^j t) ln(C_{it}^{j}), \quad \text{for each } j \text{ (market)} \tag{4}$$

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

2.2.3 Robustness

One criticism raised about the profit elasticity indicator as a competition measure is its sensitivity to econometric specifications, estimation methodologies, the set of firms considered and potential non-linearities. Moreover, this measure may be affected by endogeneity and selection problems. In order to address these issues, a large battery of robustness tests was performed.

Regarding econometric specifications, we have considered both log-log and semi-log approaches. Both approaches are valid under the proposed setup and results should be robust. Hence, results using the two approaches are presented in this paper. Considering estimation methodologies, we used not only panel data methods but also cross section regressions. Moreover, within a panel data model we have also run regressions with firm random effects. The Hausman (1978) and Hausman robust (Wooldridge (2002)) tests were used to compare fixed versus random effects, under the hypothesis that the individual effects are uncorrelated with the other regressors in the model. CPB (2000) also tests fixed versus random effects, when estimating profit elasticities, but only in the pharmaceutical sector.

The use of average costs as a proxy for marginal costs creates an endogeneity problem in all regressions (Leuvensteijn et al. (2008)). Since average costs are used to compute profits, they are present in both sides of the regression, potentially misleading competition assessment. However, it is possible to estimate firms' yearly efficiency with a two-step approach. Initially, a stochastic production frontier approach can be used to estimate a production function for each market, with output being proxied by sales and inputs by capital stock, wage bill and cost of materials. Next, firms' distance to the market's stochastic production frontier is taken as the efficiency measure.[3] Nevertheless, it is difficult to estimate stochastic production frontiers at a high level of disaggregation because of the reduced number of observations and convergence issues. Altomonte et al. (2010) estimate production frontiers for some markets at a 2 digit level of NACE and use them to compute firm-level efficiency at a 3 digit level. Alternative solutions to the endogeneity problem consist in using instrumental variables or alternative proxies for firm-level efficiency, such as labour productivity or sales per employee. The referred solutions for the endogeneity problem were tested in this article, though results were invariably weak as profit elasticities turned positive or non-significant for several markets.

Moreover, it must be recalled that the profit elasticity methodology imposes the exclusion of firms with non-positive profits creating a sample bias. The selection bias may be particularly important in Portugal as 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.[4] In order to test and correct for the potential sample selection, the two-step Heckman (1979) procedure was used. 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

[3] This approach assumes that firms' efficiency is independent and identically distributed and product is homogeneous.

[4] In this context, Leuvensteijn et al. (2008) studies competition in the Dutch insurance industry and considers market shares instead of profits, thus allowing for the inclusion of firms with non-positive profits.

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 observations in the dataset.[5] Moreover, it was only possible to estimate the procedure for firms with positive total assets and information regarding firms' age. In the same vein, in order to test the sensitivity of results to the set of firms considered, a two-year balanced panel was also considered. This requirement implies a severe reduction in the number of observations.

The relation between profits and marginal costs was assumed to be linear, which is not necessarily always the case. Boone et al. (2007) fits a quadratic relation between the logarithm of profits and the logarithm of average variable costs, though in this case there is not a unique coefficient in the regression to correctly identify market profit elasticity. Instead, profit elasticities vary according to firms' level of efficiency. In this case, obtaining profit elasticity levels or trends would require establishing a benchmark for firm efficiency and results could be substantially different depending on that choice. Moreover, the significance of the quadratic term may derive from a misspecification and not from the existence of a non-linear relation. Therefore, a linear relation between the logarithm of profits and the logarithm of average variable costs was assumed.

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.[6] Both databases, whose main difference is firm-level coverage, offer extensive information on items of firms' balance sheets and income statements. The latter database includes virtually the universe of non-financial firms, while CB comprises mainly larger firms, still representing more than 65 per cent of GVA in the years considered. The raw dataset coincides with the one used in Amador and Soares (2012), 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 NACE classification, which seems a reasonable compromise between the consideration of products that are close substitutes and the existence of a reasonable 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

[5] The lowest 1 per cent observations in the pooled distribution of the price-cost margin was eliminated, consisting of unreasonably negative values.

[6] 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.

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.

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.[7] Fourthly, the existence of two versions of NACE in the sample period implied a harmonization procedure, which led to the reclassification of some firms.[8] 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 is 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 (2012), the set of tradable markets corresponds to all manufacturing markets plus those markets with a ratio of exports to sales above 15 per cent.[9]

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. The reason is that the response rate for this variable is reduced, thus its exclusion from total costs of services could introduce another type of bias in the results.

3 Results

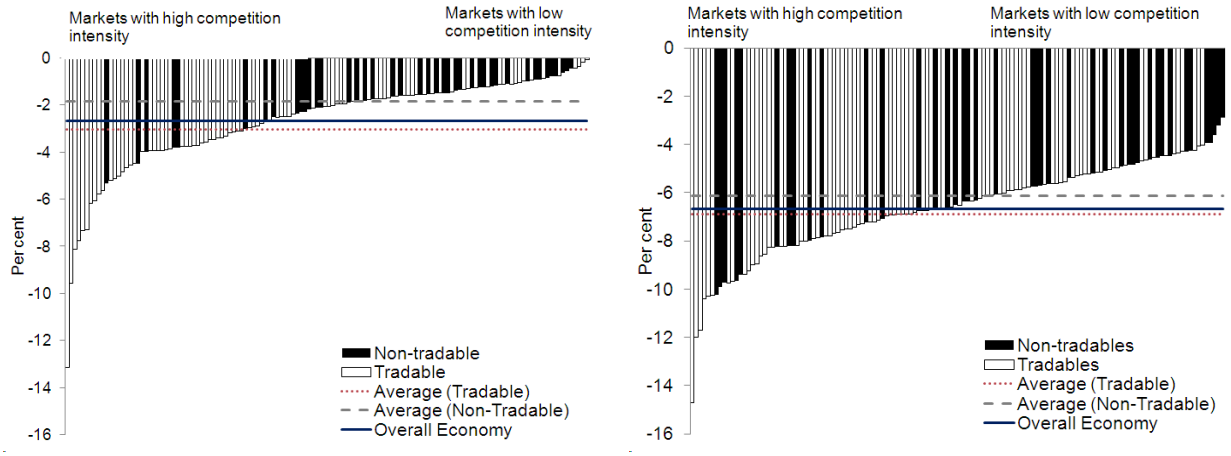
This section presents a competition assessment for the Portuguese markets, based on profit elasticity *levels* and *trends*. The baseline specification for the estimation of profit elasticity *levels* is the two-way fixed effects model (equation 3) for the period 2005-

[7] Firms with negative *operational* profits have been excluded, though some of the remaining may be operating at a loss.

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

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

Figure 2: Profit elasticity and semi-elasticity levels per market (2005-2009)



(a) Elasticites (b) Semi-elasticities

Note: Elasticities and semi-elasticities were estimated by two-way fixed effects regressions. Black bars correspond to non-tradable markets, as defined in Amador and Soares (2012).

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 4). Profit elasticity levels and trends could be estimated together in equation 4. However, the break in the database implies the inclusion in equation 4 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 two following subsections present profit elasticity *levels* and *trends*, respectively, departing from individual markets and highlighting the distinction between those that have a tradable and non-tradable nature. Next, some sectoral aggregations are presented.

3.1 Profit elasticity and semi-elasticity levels

Comparisons of profit elasticity levels across markets must be cautious as they 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.

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

Firstly, there is a significant dispersion across market profit elasticities and semi-elasticities. Profit elasticity estimates range from 0 to 13 per cent and semi-elasticities range between 3 and 15 per cent, in absolute value, i.e., the intensity of competition varies considerably across markets.[10] In addition, within the set of 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 stand 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). 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 EU-6, respectively.[11]

Table 1 details the information on profit elasticity and semi-elasticity levels, aggregating markets by sectors and weighting according to their share on sales, GVA and employment. Results qualitatively hold when different aggregation variables are used, though weighting tends to lower profit elasticities in absolute value. This result implies that larger markets within each sector tend to show lower competition intensity. This is especially noticeable in "Electricity and water supply" and "Construction". When the main non-manufacturing sectors are detailed, "Electricity and water supply" and "Other services" stand out as those potentially least competitive, with absolute elasticities of 1.2 per cent in the period 2005-2009. The lower panel of table 1 replicates the decomposition and weighting options for the semi-log specification and the set of conclusions stays mostly unaltered.

[10] Estimates for the profit elasticity in each individual market are presented in the Appendix.
[11] Contrary to this paper, the non-manufacturing sector in Braila et al. (2010) includes the financial sector.

Table 1: Profit elasticities and semi-elasticities per sector (2005-2009) (percentage)

Sectors	**Nb. markets**	**Non-weighted average**	**Weighted average**			**Var. coef.**	**Std. dev.**	**Min**	**Max**
			Sales	**GVA**	**Employ-ment**				
Specification: Log-Log									
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 & 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 & 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
Specification: Semi-log									
Overall Economy	132	-6,7	-6,3	-6,0	-6,3	-0,3	1,9	-14,7	-2,9
Tradable	90	-6,9	-6,6	-6,5	-6,8	-0,3	1,9	-14,7	-4,0
Non-tradable	42	-6,1	-6,1	-5,7	-5,9	-0,3	1,9	-10,2	-2,9
Manufacturing	80	-7,1	-7,3	-7,3	-7,2	-0,3	1,9	-14,7	-4,0
Non-manufacturing	52	-5,9	-6,0	-5,5	-5,8	-0,3	1,8	-10,2	-2,9
Electricity & water supply	3	-4,2	-3,8	-3,8	-4,3	-0,1	0,6	-4,8	-3,6
Construction	4	-5,8	-4,9	-4,9	-5,0	-0,2	1,0	-6,7	-4,5
Trade	23	-7,3	-7,1	-7,2	-7,3	-0,2	1,7	-10,2	-4,5
Transports & communications	8	-5,2	-5,4	-5,3	-5,5	-0,1	0,5	-5,7	-4,5
Other services	14	-4,5	-4,3	-4,3	-5,1	-0,2	1,0	-6,6	-2,9

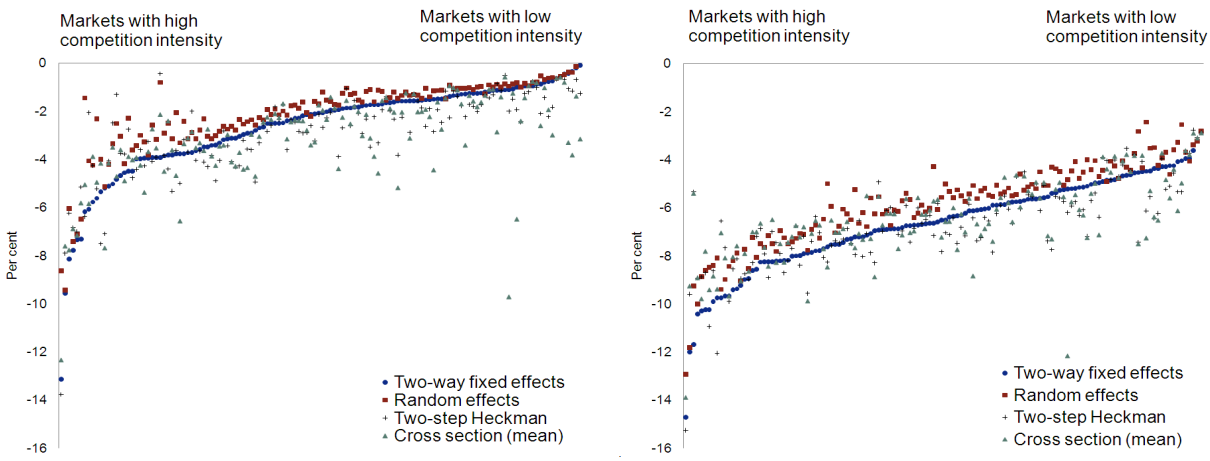
Note:Elasticities and semi-elasticities are estimated by two-way fixed effects regressions.

As previously referred, conducting robustness tests is extremely relevant in this type of analysis. Figure 3 overlaps the estimated profit elasticities (panel a) and semi-elasticities (panel b) under several econometric approaches, sorting according to the two-way fixed effects competition levels. The alternative approaches considered are cross section regressions, firm random effects and two-step Heckman (1979). The cross section approach consists in the estimation of regressions of profits on average variable costs, in logarithms, for each year and market, using the logarithm of sales as a control for firm size.[12] The values for profit elasticities result from the average of the coefficients associated to average variable costs between 2005 and 2009.[13] 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, firm random effects and two-step Heckman (1979), respectively. Therefore, taking into account the sample selection bias improves the significance of profit elasticities.

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

[13]In order to control for potential problems of heterocedasticity the White (1980) procedure was used.

Figure 3: Profit elasticities and semi-elasticities under different estimation approaches (2005-2009)



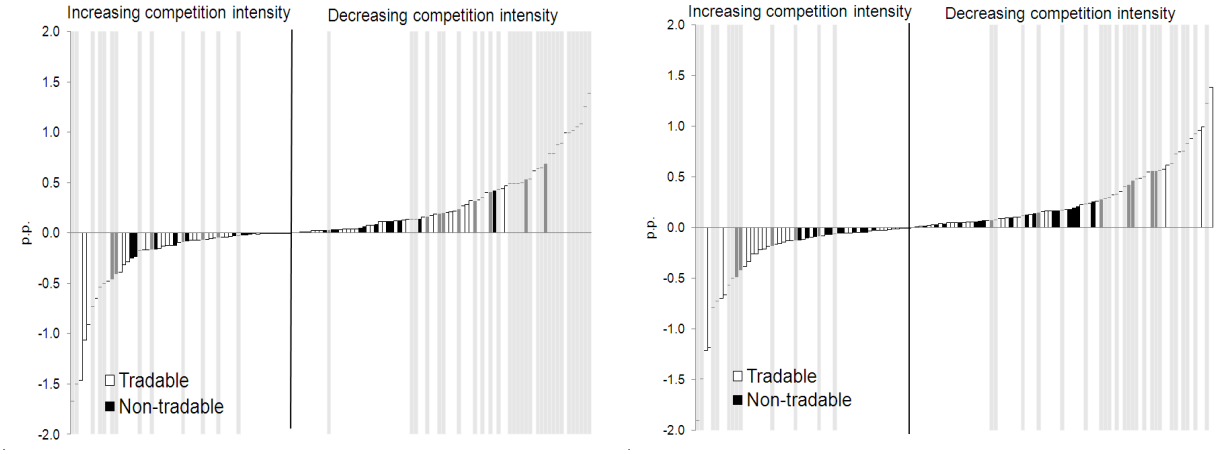
(a) Elasticites (b) Semi-elasticities

Note: Elasticities and semi-elasticities are ranked according to two-way fixed effects estimates.

The ranking of estimated elasticities under fixed and firm random effects is very similar, except in some of the markets with higher competition. The ranking of elasticities using firm random effects is close to the one obtained under the benchmark specification though, the classical Hausman (1978) test does not strongly support that option. At a 5 per cent level, random effects are rejected in 80 per cent of markets, while 87 per cent are rejected using the Hausman robust test (Wooldridge (2002)). Results obtained through cross section regressions are somewhat different from the benchmark specification. One of the reasons for this fact is that, at odds with the alternative econometric approaches, the cross section approach does not take into account the effect of the business cycle. The two-step Heckman (1979) procedure does not reject the existence of a selection bias in around 60 per cent of the markets. Nevertheless, the significance of the exclusion restrictions is somewhat limited as age and total assets (in logarithm) are significant in only 64 and 55 per cent of markets, respectively. The resulting corrected profit elasticity estimates are typically not far from those obtained under fixed effects and its ranking across markets is not substantially changed.

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

Figure 4: Competition trends (2000-2009) - Tradable vs non-tradable



(a) Elastitcity trends

(b) Semi-elasticity trends

Note: Elasticities and semi-elasticities were estimated by two-way fixed effects regressions. Black bars correspond to non-tradable markets, as defined in Amador and Soares (2012). The light grey vertical shades identify markets where the estimated trends are significant at 10 per cent.

3.2 Profit elasticity and semi-elasticity trends

Profit elasticity and semi-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 reflect changes in competition.

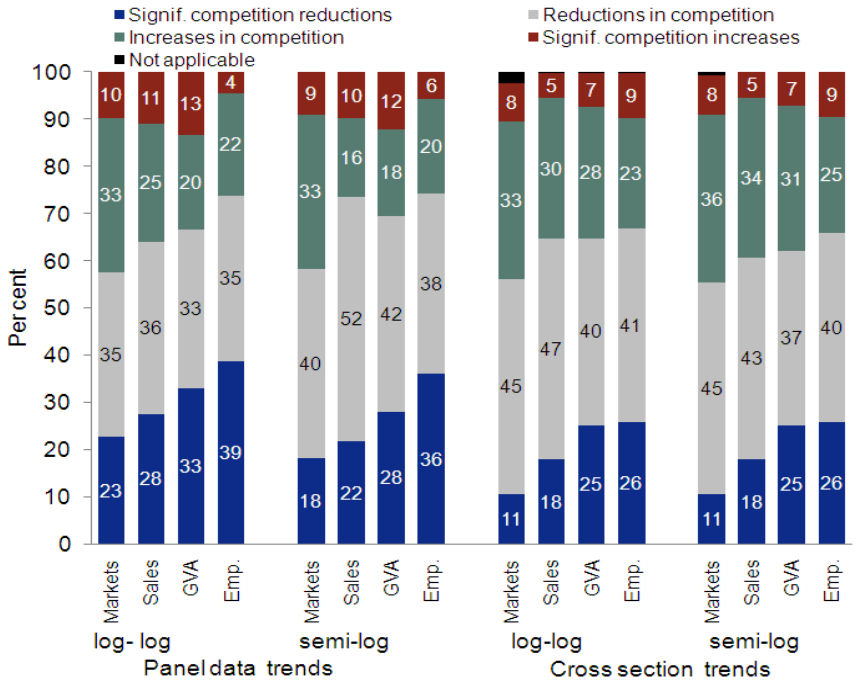
Figure 4 presents the profit elasticity and semi-elasticity trend coefficients estimated under two-way fixed effects for each market (equation 4).[14] Positive bars identify potential competition reductions, i.e., the level of the profit elasticity increases (decreases in absolute value). Figure 4 shows that 58 per cent of markets record positive trends (58 per cent for semi-elasticity trends), 29 per cent of which are non-tradable (33 per cent for semi-elasticities). Nevertheless, the percentage of non-significant estimates is substantial (67 and 73 per cent of markets for profit elasticities and semi-elasticities, respectively). In addition, as referred previously regarding profit elasticity levels, there is a significant heterogeneity between profit elasticity trends across markets.

Figure 5 displays 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.[15] The weights used are based on the average

[14] The estimates for the trend profit elasticity in each individual market are presented in the Appendix.

[15] 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. The weights for each market refer to 2005-2009 because the coverage of the database in this period is close to the universe firms, contrary to what happens in the period prior to 2005.

Figure 5: Competition trends in 2000-2009 - Overall economy



Note: Significant estimates are identified according the 10 per cent threshold. The "not applicable" category corresponds to markets where trends cannot be computed because the underlying elasticity levels are not significant.

of the period 2005-2009, hence there is no structure effect. This figure presents the proportion of markets with positive and negative profit elasticity and semi-elasticity trends, highlighting significant trends at 10 per cent.

The majority of Portuguese markets presented a reduction in the degree of competition in the 2000-2009 period. Moreover, if these markets are weighted according to sales, GVA and employment, competition reductions become more substantial, reaching three-quarters in the latter option. This result implies that markets facing competition reductions account 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. Taking significant estimates, 40 per cent of total employment in the economy is allocated to markets that reported reductions in the degree of competition. Overall, reductions in competition are generalized across markets and relevant in terms of sales, GVA and employment. The results qualitatively hold using the semi-log specification.

Consistently with results for the overall economy, the majority of markets in the tradable and non-tradable sectors presented a reduction 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

Table 2: Trend profit elasticities and semi-elasticities per sector (2000-2009) (percentage)

		Panel data								Cross section							
		Log-log				Semi-log				Log-log				Semi-log			
Sector		Markt.	Sales	GVA	Emp.	Markt.	Sales	GVA	Emp.	Markt.	Sales	GVA	Emp.	Markt.	Sales	GVA	Emp.
Tradable | non-trad.																	
Competition reductions																	
Total	NT	52	69	74	84	57	80	76	83	64	72	75	78	64	68	72	78
	T	60	54	54	61	59	61	59	64	52	51	49	53	51	46	46	51
Signif. 10%	NT	21	32	41	43	17	22	32	41	12	20	30	36	19	31	37	40
	T	23	19	20	33	19	21	21	31	10	14	19	14	11	16	21	20
Competition increases																	
Signif. 10%	NT	14	10	13	3	12	10	13	6	10	2	3	2	2	0	0	0
	T	8	13	14	7	8	10	11	5	8	12	14	19	6	8	9	12
Manuf. | non-manuf.																	
Competition reductions																	
Total	M	60	58	59	70	58	65	64	72	53	54	52	60	53	53	51	59
	NM	54	66	69	76	60	76	71	75	62	68	69	71	60	63	66	69
Signif. 10%	M	25	27	30	42	24	26	29	38	9	12	12	13	10	15	15	20
	NM	19	28	34	37	19	28	34	37	13	20	30	33	19	30	36	36
Competition increases																	
Signif. 10%	M	8	8	7	4	9	8	9	8	8	10	11	19	5	3	3	2
	NM	13	12	15	5	19	28	15	5	10	5	6	9	4	3	4	7

Note:Elasticities and semi-elasticities are estimated by two-way fixed effects regressions.

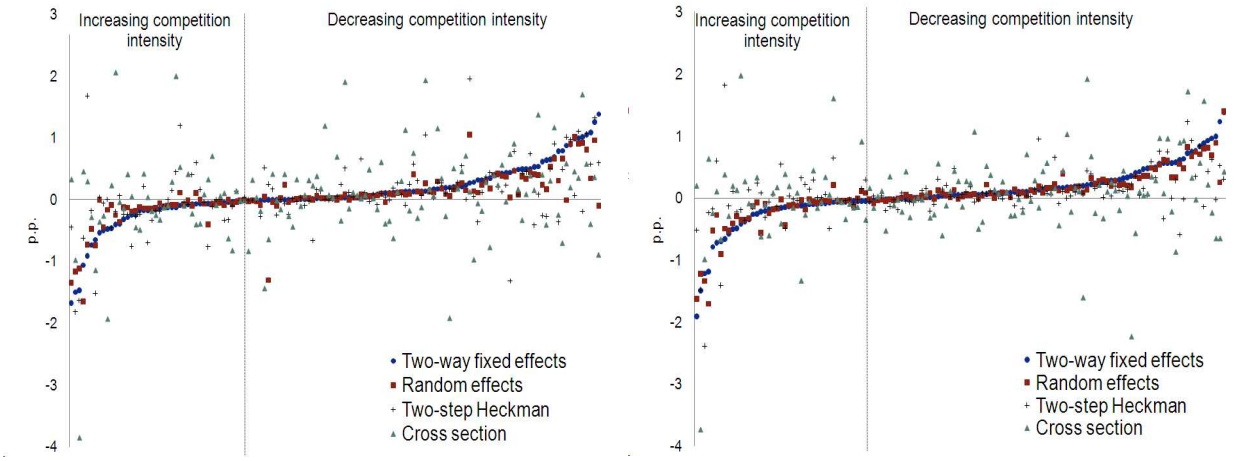
if these reductions are weighted using sales, GVA and employment shares. More than 70 per cent of GVA and employment of the non-tradable sector refers to markets that faced competition reductions. Thus, competition reductions are more substantial in terms of resources in the non-tradable sector, though less generalized across markets.

Results become weaker if only significant trends are considered, yet the percentage of non-tradable markets with reductions in competition is above 40 per cent of GVA and employment in the sector. Furthermore, results are qualitatively unchanged using the manufacturing versus non-manufacturing distinction and they are robust across the estimation approaches considered. At sectoral level, the most striking result lays in the "Construction" sector, where virtually all markets report weaker competition using as weights either sales, GVA or employment.

Results obtained using alternative econometric approaches, considered as robustness tests, are presented in figure 6. The conclusions based on these estimations are qualitatively similar to those obtained with fixed effects regressions and the ranking of markets is broadly unchanged. The results obtained with the cross section specification are also presented in figure 5 and in the right panel of table 2.[16] These results

[16]The cross-section specification is implemented in two-steps. Firstly, regressions of profits on average variable costs, with a control for size (the logarithm of sales) using the White (1980) procedure to correct for heteroscedasticity, are estimated. 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. Linear trends are only fitted if coefficients were found significant at a 5 per cent level for all years. In addition, the estimation of the linear trends includes a step-dummy to take account of the increase in the number of observations in 2005. It should be noted that the number of markets for which profit elasticity trends are estimated significantly through cross section regressions is smaller than through panel data regressions, partly

Figure 6: Profit elasticity and semi-elasticity trends (2000-2009)



(a) Elasticites (b) Semi-elasticities

Note: Elasticity and semi-elasticity trends are sorted according to two-way fixed effect estimates.

are qualitatively similar to those obtained with the benchmark specification, though the ranking of estimated profit elasticity trends is somewhat different (figure 6). As previously mentioned, one of the reasons for this fact is that the cross section approach does not take into account the effect of the business cycle and there is a potential mismeasurement of unobserved heterogeneity.

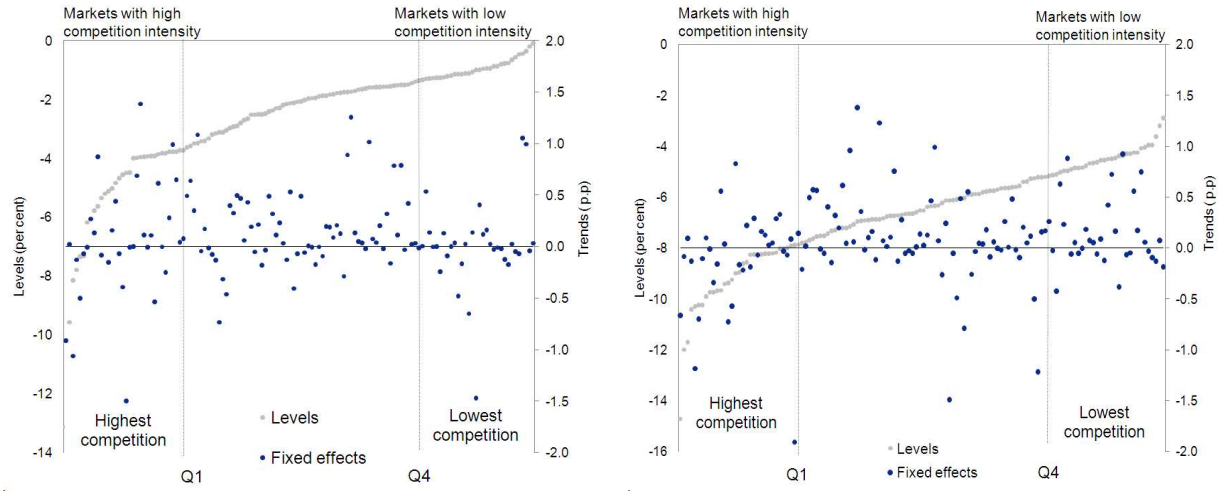
The results obtained through the two-step Heckman (1979) procedure show an increase in the percentage of significant trends and the percentage of tradable and non-tradable markets with reductions in competition is more balanced, though clearly above 50 per cent in both sectors for the different weighting options.[17] Random effects regressions were also run as robustness tests. Nevertheless, using the Hausman (1978) and the Hausman robust (Wooldridge (2002)) tests, this specification is widely rejected. Moreover, the estimated parameters are close to those obtained under the benchmark fixed effects. Finally, trends obtained using a two-year balanced panel yield results similar to those obtained under the benchmark specification.

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 the least competitive markets are also the ones that have become less competitive, i.e., reported a positive trend for the profit elasticity. Such a scenario entails a more negative assessment of competition. Figure 7 presents profit elasticity trends sorted according to the levels 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

because trends are estimated on a time span of only 10 years, implying reduced degrees of freedom.

[17]The trend is estimated by pooled OLS in a panel data setup with trend and step interaction dummies by market.

Figure 7: Profit elasticity and semi-elasticity levels vs trends (2000-2009)



(a) Elasticites (b) Semi-elasticities

Note: Elasticity and semi-elasticity trends are sorted according to two-way fixed effects estimates.

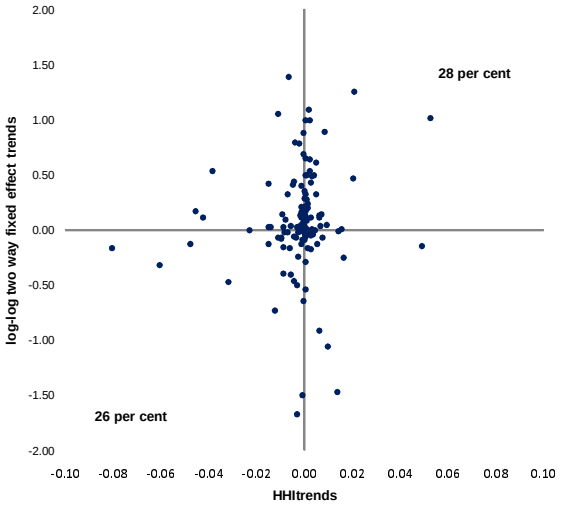
profit elasticity distribution) present positive profit elasticity trends, i.e., they did not improve their degree of competition (52 per cent in the two-way fixed effects model and 58 per cent using two-step Heckman(1979)). The figures for the semi-log approach are 61 and 73 per cent, respectively.

3.3 Comparison with classical competition indicators

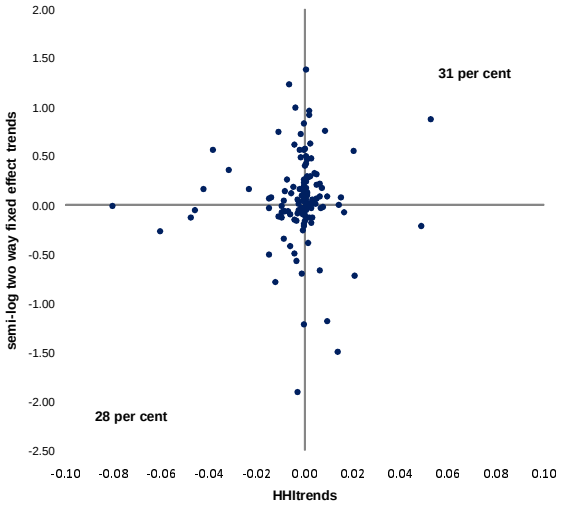
A robust assessment of competition in each market is highly relevant, particularly if the goal of the exercise is to draw policy guidelines. As initially mentioned, the aim of the article is to map competition developments across markets in the Portuguese economy, implicitly selecting those where deeper competition analysis could take place. Therefore, this subsection compares results obtained through the profit elasticity measure with those of classical competition indicators, as published in Amador and Soares (2012).

Panels a) and b) of figure 8 plot the results obtained for the trend in the HHI in each market with the corresponding estimated trends of profit elasticity, taking the two-way fixed effects approach under log-log and semi-log specifications for the 2000-2009 period. The percentage of markets that stand in the first and third quadrants is 54 and 59 per cent in the log-log and semi-log specifications, respectively. Therefore, in more than half of the markets there is a similar competition assessment in the two indicators. Panels c) and d) offer a similar comparison but taking trend PCMs by market, considering only the set of firms with non-negative profits. In this case

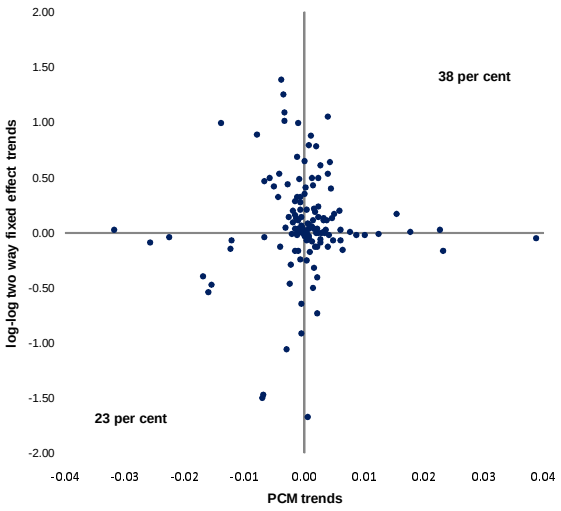
Figure 8: Consistency of price-cost margin, HHI and profit elasticity trends



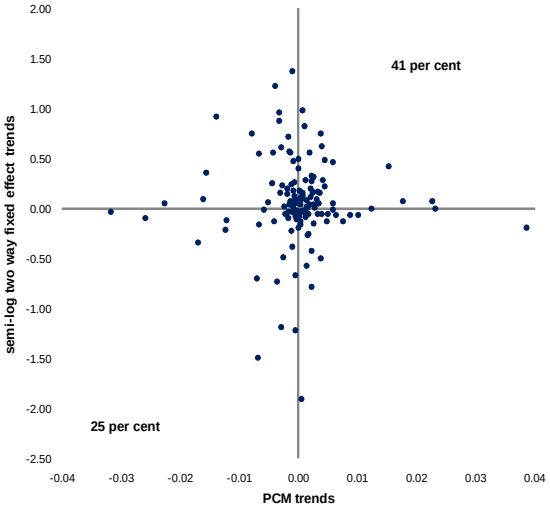
(a) HHI and log-log panel data trends



(b) HHI and semi-log panel data trends



(c) Conditional PCM and log-log panel data trends



(d) Conditional PCM and semi-log panel data trends

the percentage of markets in the first and third quadrants is 61 and 66 per cent in the log-log and semi-log specifications, respectively.[18] Overall, in nearly two thirds of markets positive/negative PCM trends also correspond to positive/negative trend profit elasticities.

The existence of markets for which the competition assessment is not consistent across measures may be explained by the intrinsic nature of indicators. As previously stated, an increase in market competition may lead to reallocation and selection effects, which tend to be incorrectly perceived by classical competition indicators. Although this is

[18] When the exercise is made using the unconditional PCM trends, i.e., considering also firms with negative profits, the percentages drop to 46 and 47 per cent, respectively. As referred, this is not the set of firms considered in the calculation of Boone (2008) measure.

likely to be one of the main reasons for the partial divergence between the competition assessment resulting from HHI, PCM and profit elasticity trends, data problems such as lack of representativeness and misreporting may also play an important role. Moreover, sensitivity to the sample of firms and estimation approaches can also drive some differences.

Authors like Griffith et al. (2005) and Peroni and Ferreira (2011) present correlations between estimated profit elasticity levels and PCMs. However, these results are not comparable to those presented above because they focus on profit elasticity levels and not on competition trends.

4 Concluding remarks

The assessment of competition developments in an economy is an important element for applied policy-analysis. This article uses firm-level data from 2000-2009 to assess competition in the Portuguese markets using the measure of profit elasticity 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. In addition, robustness of results across econometric specifications is discussed, along with their consistency with classical competition indicators presented in Amador and Soares (2012).

The article concludes that there is a significant dispersion of profit elasticity levels across markets. 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 the 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 conclusion of the article is that the majority of markets presented reductions in competition in the 2000-2009 period, 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 exhibit an increase in competition.

One criticism pointed to the profit elasticity indicator is its sensitivity to econometric specifications, the set of firms considered or the time period chosen for analysis. For this reason a large battery of robustness tests is presented in the article. Reassuringly, the different robustness tests sustain the main conclusions presented. Finally, in more than half of the markets there is an agreement between the competition assessment based on the trend profit elasticity indicator and the trends of the classical HHI and PCM competition measures.

The analysis carried out in this paper would benefit from having comparable results across other euro area countries. In fact, it would be important to assess differences in the intensity of competition for each market across different countries. Such comparison is useful to identify the best practices, thus providing key information for policy makers. Nevertheless, firm-level data required for this cross-country analysis is typically hard to gather, mostly due to national confidentiality restrictions. A possible way forward would be to setup national teams to run a common code on their databases and discuss the results. This allows for an integrated assessment of competition intensity in the euro area, which is clearly within the scope of the ESCB Competitiveness Research Network (CompNet).

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Table 3: **Level and trend profit elasticities for different markets**

CAE2.1	Market	Profit Elast. 2005-09	Nb.ob. 2000-09	Two-way fixed effects		Cross-section	
				log-log	semi-log	log-log	semi-log
151	Prod., processing and preserving of meat and meat products	-2.0	1,998	-0.06	0.11	0.70	0.70
152	Processing and preserving of fish and fish products	-3.8	637	0.28	0.57	-0.97	-0.87
153	Processing and preserving of fruit and vegetables	-4.7	601	-0.07	-0.14	0.32	0.38
154	Manuf. of vegetable and animal oils and fats	-1.6	1,066	0.04	0.09	0.07	0.10
155	Manuf. of dairy products	-3.9	972	0.11	0.09	-0.39	-0.29
156	Manuf. of grain mill products, starches and starch products	-0.8	492	-0.17	-0.38	0.04	0.27
157	Manuf. of prepared animal feeds	-0.1	692	0.03	0.73**	1.9***	1.72***
158	Manuf. of other food products	-3.4	13,791	-0.05	-0.16	0.10	0.17
159	Manuf. of beverages	-2.0	2,421	0.00	0.01	-0.16	-0.03
171	Preparation and spinning of textile fibres	-5.6	530	0.87**	0.83**	0.58	0.56
172	Textile weaving	-1.7	932	-0.29	0.03	0.41	0.55*
173	Finishing of textiles	-5.0	1,289	0.16	-0.03	0.17	0.11
174	Manuf. of textile articles, except apparel	-3.3	2,181	-0.01	-0.05	-0.19	-0.16
175	Manuf. of other textiles	-4.0	2,920	0.00	-0.01	0.07	-0.03
176	Manuf. of knitted and crocheted fabrics	-1.6	1,000	0.20	-0.03	0.50	0.34
177	Manuf. of knitted and crocheted articles	-3.5	1,659	0.35*	0.4*	-0.77	-0.57
182	Manuf. of other wearing apparel and accessories	-3.8	15,722	0.65***	0.5***	0.30	0.28**
191	Tanning and dressing of leather	-3.0	412	0.40	0.49	0.39	0.34
192	Manuf. of luggage, handbags and the like, saddlery and harness	-2.9	418	0.33	0.07	0.28	0.13
193	Manuf. of footwear	-3.9	6,772	-0.01	0.05	0.41*	0.27
201	Sawmilling and planing of wood; impregnation of wood	-1.5	2,128	0.78***	0.57*	-0.25	-0.22
202	Manuf. of sheets, plywood, laminboard, particle board and fibre board	-8.1	167	-1.06	-1.18	0.45	0.63
203	Manuf. of builders carpentry and joinery	-3.6	4,864	0.49**	0.33**	0.08	0.03
204	Manuf. of wooden containers	-3.4	350	0.17	-0.05	1.15***	0.91**
205	Manuf. of other wood products, cork articles, straw and plaiting materials	-1.3	3,521	0.53***	0.63***	1.37*	0.92*
211	Manuf. of pulp, paper and paperboard	-3.9	198	-0.54***	0.10	-0.36	-0.28
212	Manuf. of articles of paper and paperboard	-2.4	6,594	0.49**	-0.01	-0.33	-0.31
221	Publishing	-1.7	3,558	0.14*	0.23**	-0.30	-0.25
222	Printing and service activities related to printing	-1.7	3,656	0.04	-0.03	-0.15	-0.16
241	Manuf. of basic chemicals	-1.9	739	-0.17	-0.09	0.41	0.44
243	Manuf. of paints, varnishes and similar coatings, printing ink and mastics	-4.5	658	-1.5**	-0.70	-0.98**	-0.67**
244	Manuf. of pharmaceuticals, medicinal chemicals and botanical products	-1.9	581	-0.09	0.05	0.52***	0.43***
245	Manuf. of soap and detergents and cleaning preparations	-7.3	649	-0.5**	-0.57**	-0.26	-0.29
246	Manuf. of other chemical products	-1.7	479	1.26***	-0.72*	0.36	0.10
251	Manuf. of rubber products	-7.8	543	-0.13	-0.13	-0.10	-0.16
252	Manuf. of plastic products	-1.3	3,374	0.13	0.04	-0.18	-0.12
261	Manuf. of glass and glass products	-5.8	1,381	0.13	0.22	0.75***	0.67***
262	Manuf. of ceramic products	-1.0	1,345	0.12	0.24	0.30	0.21
263	Manuf. of ceramic tiles and flags	-3.5	266	1.09**	0.96	-0.40	-0.24
264	Manuf. of bricks, tiles and construction products, in baked clay	-0.2	461	-0.04	0.06	-0.63**	-0.5**
265	Manuf. of cement, lime and plaster	-4.6	139	-0.39	-0.34	-0.05	-0.09
266	Manuf. of articles of concrete, plaster and cement	-1.8	1,862	0.19	-0.26	0.34	0.33
267	Cutting, shaping and finishing of ornamental and building stone	-2.5	4,879	-0.03	-0.19	-0.82	-0.61
268	Manuf. of other non-metallic mineral products	-9.6	297	0.02	-0.08	0.38	0.33
273	Other first processing of iron and steel	-1.1	177	-0.65	-1.21	-1.14	-0.99
274	Manuf. of basic precious and non-ferrous metals	-4.0	321	1.38***	1.23***	-0.89	-0.65
275	Casting of metals	-0.4	519	1***	0.92**	0.35	0.21
281	Manuf. of structural metal products	-3.6	11,620	0.64***	0.29**	-0.41**	-0.20
282	Manuf. of tanks, reservoirs, metal containers, central heating radiators and boilers	-7.3	392	-0.07	-0.16	-0.41	-0.41
284	Forging, pressing, stamping and roll forming of metal; powder metallurgy	-1.7	1,118	0.89***	0.76*	0.19	-0.03
285	Treatment and coating of metals; general mechanical engineering	-3.2	7,693	-0.13	-0.05	-0.13***	-0.10
286	Manuf. of cutlery, tools and general hardware	-1.6	1,623	0.32	0.18	-0.06	0.16
287	Manuf. of other fabricated metal products	-2.7	4,024	0.43**	0.02	-0.03	-0.27
291	Manuf. of machinery for the prod. and use of mechanical power	-2.8	645	0.47	0.55	0.90	0.96
292	Manuf. of other general purpose machinery	-2.5	2,306	-0.18*	-0.03	-0.49*	-0.53*
293	Manuf. of agricultural and forestry machinery	-5.2	377	-1.67*	-1.91*	0.33	0.20
294	Manuf. of machinetools	-3.2	463	-0.07	-0.11	-0.23	-0.27
295	Manuf. of other special purpose machinery	-2.5	4,415	0.21	0.01	0.46	0.06
297	Manuf. of domestic appliances n.e.c.	-4.8	333	0.44	0.61	0.73	0.89
311	Manuf. of electric motors, generators and transformers	-3.9	306	0.11	0.16	-0.35	-0.45
312	Manuf. of electricity distribution and control apparatus	-6.1	469	0.27	0.13	0.12	-0.16
313	Manuf. of insulated wire and cable	-13.1	108	-0.91	-0.66	0.29	0.37
315	Manuf. of lighting equipment and electric lamps	-3.9	690	0.61	0.32	0.40	0.43
316	Manuf. of electrical equipment n.e.c.	-3.1	1,085	-0.74**	-0.79**	-0.29	-0.25
321	Manuf. of electronic valves and tubes and other electronic components	-5.1	290	-0.15	-0.21	-0.33	-0.11

Note: nt identifies non-tradable sectors. ***,** and * stand for significance levels of 1, 5 and 10 per cent, respectively.
Trends (in the last four columns of the table) are expressed in p.p. Due to confidentiality reasons, some results are not reported.

Table 3: **Level and trend profit elasticities for different markets (cont.)**

CAE2.1	Market	Profit Elast. 2005-09	Nb.ob. 2000-09	Two-way fixed effects		Cross-section	
				log-log	semi-log	log-log	semi-log
323	Manuf. of television and radio receivers, sound or video equipments	-1.6	120	1.02**	0.88	1.7***	1.56***
331	Manuf. of medical and surgical equipment and orthopaedic appliances	-2.0	1,617	0.01	-0.13	0.22	0.19
332	Manuf. of instruments and appliances for measuring	-1.1	154	-0.48	0.36	-1.93	-2.24
333	Manuf. of industrial process control equipment	-3.1	933	-0.32	-0.26	-0.15	-0.12
334	Manuf. of optical instruments and photographic equipment	-6.2	138	-0.01	-0.22	-0.65	-0.62
342	Manuf. of motor vehicles, trailers and semi-trailers	-1.5	730	0.79*	0.99	-0.70	-0.65
343	Manuf. of parts and accessories for motor vehicles and their engines	-3.7	1,084	0.04	0.16	0.01	0.15
351	Building and repairing of ships and boats	-3.7	832	0.08	0.10	-0.16	-0.23
354	Manuf. of motorcycles and bicycles	-3.8	232	0.99	1.38	0.45	0.42
361	Manuf. of furniture	-2.9	8,777	0.5***	0.29*	0.38	0.12
362	Manuf. of jewellery and related articles	-2.1	1,536	0.49***	0.48**	0.17	0.07
365	Manuf. of games and toys	-1.0	114	-1.47	-1.49**	-3.85*	-3.74*
366	Miscellaneous manufacturing n.e.c.	-1.8	2,138	0.21	0.26	0.17	0.10
371	Recycling of metal waste and scrap	-0.4	499	1.05***	0.75	0.57	0.32
372	Recycling of non-metal waste and scrap	-2.2	650	-0.13	-0.5*	0.29	0.19
401 nt	prod. and distribution of electricity	-0.5	1,753	-0.07***	-0.13**	0.08	0.08
402 nt	Manuf. of gas; distribution of gaseous fuels through mains	-2.1	188	0.53**	0.56*	0.15	0.07
410 nt	Collection, purification and distribution of water	-1.0	595	0.41***	0.18	0.23	0.10
451	Site preparation	-2.1	3,341	-0.07	-0.01	-0.39	-0.23
452 nt	Building of complete constructions or parts thereof; civil engineering	-0.9	83,926	0.16***	0.42***	0.06*	0.1*
453 nt	Building installation	-2.3	25,463	0.23**	0.28***	0.71*	0.25*
454 nt	Building completion	-2.5	16,482	0.19**	0.46***	-0.27	0.03
501 nt	Sale of motor vehicles	-1.9	10,510	0.2**	0.20	-1.92	-1.61
502 nt	Maintenance and repair of motor vehicles	-4.5	18,301	-0.01	0.04	-0.02	0.11
503 nt	Sale of motor vehicle parts and accessories	-4.0	9,310	0.69***	0.56***	1.16***	0.96***
504 nt	Sale, maintenance and repair of motorcycles and related parts and accessories	-5.3	2,188	-0.08	-0.01	0.41	0.42
505 nt	Retail sale of automotive fuel	-0.9	6,067	-0.01	-0.12	-1.44	-1.34
511	Wholesale on a fee or contract basis	-1.3	12,319	0.00	0.05	-0.44	-0.14
512 nt	Wholesale of agricultural raw materials and live animals	-0.8	4,625	-0.13	0.21	1.99	1.92*
513 nt	Wholesale of food, beverages and tobacco	-1.6	22,806	-0.02	0.06	-0.84	-0.39
514 nt	Wholesale of household goods	-1.3	29,882	0.00	0.07	0.32	0.37**
515 nt	Wholesale of non-agricultural intermediate products, waste and scrap	-2.2	24,863	0.03	0.14	0.69	0.43
518 nt	Wholesale of machinery, equipment and supplies	-1.5	18,110	-0.03	0.13	0.13	0.28
519	Other wholesale	-1.1	11,422	0.04	0.12*	0.11	-0.05
521 nt	Retail sale in non-specialized stores	-1.5	14,542	0.11	0.10	0.12	-0.02
522 nt	Retail sale of food, beverages and tobacco in specialized stores	-3.8	18,610	0.00	-0.10	-0.27**	-0.06
523 nt	Retail sale of pharmaceutical and medical goods, cosmetic and toilet articles	-1.3	9,973	0.14	-0.07	1.93***	1.6***
524 nt	Other retail sale of new goods in specialized stores	-2.7	89,464	0.06	0.05	0.48	0.27
526 nt	Retail sale not in stores	-3.0	2,544	-0.46**	-0.49***	0.23	0.12
527 nt	Repair of personal and household goods	-3.8	1,920	-0.25	-0.07	0.05	0.05
551 nt	Hotels	-1.7	9,017	0.05	-0.08**	0.07	-0.07
552 nt	Camping sites and other provision of short-stay accommodation	-1.6	1,989	-0.02	-0.06	-0.02	-0.07
553 nt	Restaurants	-1.8	39,170	0.09	0.15**	0.60	0.56
554 nt	Bars	-2.3	30,909	0.11	0.03	-0.63	-0.61
555 nt	Canteens and catering	-1.3	1,303	-0.24	0.01	-0.45***	-0.32
602	Other land transport	-2.5	70,806	-0.05	-0.02	-0.09*	-0.12*
611	Sea and coastal water transport	-1.1	548	0.02	0.06	1.19	1.07
631 nt	Cargo handling and storage	-1.1	883	-0.17**	0.00	-0.19	-0.04
632	Other supporting transport activities	-1.4	1,581	0.02	0.05	0.18***	0.24**
633 nt	Activities of travel agencies and tour operators	-2.1	3,656	-0.41***	-0.42***	2.05	1.97
634	Activities of other transport agencies	-1.6	3,599	0.07	0.16	0.02	0.08
641 nt	Post and courier activities	-1.9	755	0.00	0.17	0.41	0.44
642 nt	Telecommunications	-2.4	879	0.32**	0.26	-0.19	-0.33
701 nt	Real estate activities with own property	-0.6	26,884	0.03***	0.07***	0.02***	0.06***
702 nt	Letting of own property	-0.6	4,527	-0.05***	-0.18***	0.05	0.08***
703 nt	Real estate activities on a fee or contract basis	-1.4	15,100	-0.01	0.00	0.03	0.01
711 nt	Renting of automobiles	-1.2	1,598	-0.09**	-0.09	-0.1***	-0.16
713 nt	Renting of other machinery and equipment	-0.9	2,561	0.02	-0.03	0.07	0.02
722	Software consultancy and supply	-1.1	4,385	0.14***	0.17**	-0.13	-0.23
741	Legal, accounting, book-keeping and auditing activities; consultancy	-0.9	62,835	-0.03***	-0.06***	-0.02	-0.02
742	Architectural and engineering activities and related technical consultancy	-1.3	21,866	0.00	0.08***	0.31*	0.26*
743 nt	Technical testing and analysis	-1.5	1,589	-0.16	-0.06	-0.25*	-0.35*
744 nt	Advertising	-0.8	7,790	-0.02	-0.05	0.32	0.16
745 nt	Labour recruitment and provision of personnel	-1.4	1,562	0.03	-0.05	-0.34	-0.35
746 nt	Investigation and security activities	-1.5	985	0.42	0.06	0.56	0.51
747 nt	Industrial cleaning	-1.8	3,750	0.13	0.17	1.12	1.03
748 nt	Miscellaneous business activities n.e.c.	-1.2	19,753	0.00	-0.05	-0.11	-0.15

Note: nt identifies non-tradable sectors. ***,** and * stand for significance levels of 1, 5 and 10 per cent, respectively.
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