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Measuring market power in the Greek manufacturing and services industries

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This paper investigates the level of market power in the Greek manufacturing and services industry over the period 1970–2007. Based on the Roeger methodology, we investigate the competitive conditions in the examined industries at a disaggregated level (two and three digit ISIC codes). The empirical results indicate that the Greek manufacturing and services industries operate in non-competitive conditions. Moreover, average mark-up ratios are heterogeneous across sectors, with manufacturing having higher mark ups on average than services. In contrast to other related studies, we provide sufficient evidence about the movements of mark-up ratios over time. According to our findings, the mark-up ratios in the manufacturing sectors are, on average, higher in the post European Union (EU) accession period (1982–1992), as a result of the merger wave in the manufacturing industry. However, this upward trend stopped within the period (1993–2007), and the relevant ratios have decreased substantially. The econometric results are quite robust when the Two Stage Least Squares (2SLS) and the bootstrap method are applied. Lastly, the results of our analysis have a number of interesting implications for policy makers and government officials in light of the recent financial crisis that hit Greece.

Keywords: mark-up ratio; Lerner index; manufacturing; services; bootstrap

JEL Classifications: L13; L16; L60; D43

1. Introduction

Estimating the degree of competition in an industry/sector is crucial for regulatory and competition authorities as well as the policy-makers. Regulators would like to know whether current regulation is conducive to competition. Likewise, competition authorities might gauge the current competitive situation in a sector (Christopoulou and Vermeulen 2012).

As a consequence, boosting competition in the markets for goods and services is a growing economic policy concern, as evidenced by the policies employed by the European Commission and the OECD. Especially for Greece, the OECD has launched an extensive investigation report aimed at lifting regulatory restrictions that impede the level of effective competition in certain manufacturing sectors (food processing, retail trade, building materials and tourism sectors). This report identified 555 problematic regulations making more than 320 recommendations on legal

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provisions that should be amended or repealed (OECD 2013). On the other hand, the European Commission, has recently announced its intention to amend the competition law legislation by fine-tuning certain regulatory measures (i.e. EC merger regulation, leniency program, application of State aid rules, etc.) in order to facilitate competitive conditions across the member states.

It is noteworthy, that competition *inter alia* enhances economic activity and increases the level of employment by improving purchasing power and spurring firms to innovate. In this context, there is a need for structural indicators allowing the researchers and the government officials to identify clearly those sectors of the economy for which competition could be increased. Among the most commonly used indicators are the degree of market concentration in the sector and the degree of sectoral regulation. However, these indicators do not always reflect the real degree of competition in a sector (Trèsor-Economics 2008).

An alternative approach is to use national accounts data to infer conclusions about the difference between the selling price (P) and the marginal cost (MC), since the less competitive is a sector, the more the price can diverge from the marginal production cost. In other words, we can use the ratio between the sale price and the marginal production cost (mark up ratio) in order to gauge the intensity of competition in a sector. As a consequence, mark-up estimates of different sectors and different countries allowing for comparisons of the degree of competition and should help in identifying which sectors and/or countries would benefit most from changes in legislation or regulation that affect competition.

The approach adopted here is to estimate econometrically the level of market power by following the methodology adopted by Roeger (1995). This methodology is based on the hypothesis that in perfect competition the selling price is equal to marginal cost. The equality of marginal cost and price is essential for the efficiency of the economy since, first, competitive markets can achieve higher productivity levels, and second, competition provides consumers with products of higher quality, increased variety and lower prices (Rezitis and Kalantzi 2013). However, this condition does not apply in a less competitive environment (i.e. oligopoly markets, monopolies), since the price substantially deviates from marginal cost. Therefore, the ratio between the selling price and marginal cost assesses the competitiveness of the market. However, while selling price is directly observable, the marginal production cost is not. This drawback was overcome by Hall (1988) and Roeger (1995) who both showed that under perfect competition, the nominal growth rate of the Solow residual is independent of the nominal capital productivity growth rate. It then follows that the coefficient linking the nominal growth rate of the Solow residual to the nominal capital productivity growth is the Lerner Index defined as the ratio of the price minus marginal cost to price (P-MC/P).

Despite the voluminous amount of work on the topic, there are only a few studies that examine this relationship for smaller countries such as Greece (Rezitis and Kalantzi 2013; Polemis 2014). Concretely, only one study has attempted to examine the level of competition in the Greek services sectors (Bottini and Molnár 2010). However this study, fails to incorporate the movement of mark-up ratios over time. This paper aims to cover this gap in the empirical literature. Furthermore, unlike previous studies, we use an array of econometric techniques (OLS, 2SLS and bootstrap method) to test the robustness of the results. The scope of this paper is that its empirical findings might be used as a benchmark to other European countries in

order to assess the degree of competition in certain manufacturing and services sectors.

In this paper, the well-known Roeger (1995) methodology is applied in order to empirically investigate the market power of the Greek manufacturing and services industry at a disaggregated level. In particular, the empirical model assesses the extent of the mark-up for each of the sub-sectors of the two industries over the period 1970–2007 (88 sectors in total). The remainder of this paper is organised as follows: Section 2 reviews the literature, while Section 3 discusses the data and outlines the methodology applied. Section 4 illustrates and evaluates the results of the empirical analysis and, finally, Section 5 concludes the paper and provides some policy implications.

2. Survey of the literature

The estimation of the market power has been of interest to economists for a long time and there is a substantial body of literature assessing the main elements of competition in various countries and industries. In principle, there are two different methodological approaches in assessing the level of market power. The first is a reduced form method proposed by Roeger (1995) estimating the average Lerner index and the mark-up ratio by relaxing the assumption of perfect competition. The second approach consists of the estimation of supply and demand relations, and can be complemented with input demand functions (Bresnahan 1982). In other words, it aims at estimating marginal cost and, in addition, to the Lerner index, it incorporates the elasticity of demand and the elasticity-adjusted Lerner index as parameters to be estimated.

Based on the above, the majority of these studies apply Roeger (1995) methodology in order to estimate industry mark-ups (see Table 1). Most of these studies consent that mark-up ratios exceed unity denoting the absence of competitive conditions in certain sectors/industries (see for example Martins, et al 1996; Dobbelaere 2004; Borg 2009; Molnár 2010; Bottini and Molnár 2010; Christopoulou and Vermeulen 2012). This finding constitutes a major hypothesis that is empirically tested by using different econometric techniques, such as panel data methods (fixed, random effects) or cross-section analysis, in order to assess the level of competitive conditions in an industry.

Considering the above, Martins, et al. (1996) apply the Roeger (1995) approach, extended to include intermediate goods, in order to estimate mark-ups in the manufacturing industries for 14 OECD countries including Greece, over the period 1970–1992 by using the OECD STAN database. According to their findings, the estimated mark-ups are positive and statistically significant in all of the countries considered. The level of mark-ups appears to be related to the market structure of a particular industry, while there is a considerable variation of mark-ups across countries and industries.

Christopoulou and Vermeulen (2012), employ the same methodology in order to provide estimates of mark-ups for 50 sectors in eight euro area countries (Germany, France, Italy, Spain, Netherlands, Belgium, Austria and Finland) and the US. The data are taken from the EU KLEMS database and cover the period 1981–2004. This study concurs with the perception that perfect competition can be rejected for all sectors in all the examined countries, since the relevant mark-up ratios exceed unity. Furthermore, average mark-ups are heterogeneous across countries and sectors, with

Table 1. Main empirical studies estimating mark-up ratios.

Study	Country(ies)	Sectors	Period	Methodology/Econometric technique	Main Findings
Martins et al. (1996)	USA, Japan, Germany, France, Italy, United Kingdom, Canada, Australia, Belgium, Denmark, Finland, Netherlands, Norway, Sweden.	36 manufacturing sectors	1970–1992	Roeger (1995) / OLS in time series	(a) The estimated mark-ups are positive and statistically significant in all of the countries considered (b) The level of mark-ups appears to be related to the market structure of a particular industry. (c) There is a considerable variation of mark-ups across countries and across industries.
Nishimuraa, et al. (1999)	Japan	21 manufacturing and service sectors	1971–1994	Elasticity method / Panel data techniques	(a) There is strong evidence of imperfect competition. (b) The mark-up rate differs considerably among firms and its distribution is skewed. (c) The mark-up ratios show strong procyclicality and sensitivity to changes within the industry.
Maioli (2004)	France	30 manufacturing and service sectors	1977–1997	a) Roeger (1995) / OLS in time series b) Lopez, et al. (2002) / nonlinear three stages least squares (N3SLS)	(a) The mark-up ratios are generally larger than one in both methodologies. (b) Average mark-ups are heterogeneous across industries.

(*Continued*)

Table 1. (*Continued*).

Study	Country(ies)	Sectors	Period	Methodology/Econometric technique	Main Findings
Christopoulou and Vermeulen (2012)	USA, Germany, France, Italy, Spain, Netherlands, Belgium, Austria, Finland.	50 manufacturing and service sectors	1981–2004	Roeger (1995) / OLS in time series	(a) The mark-up ratios are generally larger than one. (b) Average mark-ups are heterogeneous across countries. (c) Mark-ups are heterogeneous across sectors, with services having higher mark-ups on average than manufacturing. (d) Services sectors generally have higher mark-ups in the euro area than the US, whereas the pattern is the reverse for manufacturing.
Borg (2009)	Cyprus, Lithuania, Italy, Latvia, Poland, Malta, Norway, Estonia, Austria, Slovakia, Czech, Luxemburg, France, Germany, Finland, Netherlands, Portugal, United Kingdom, Denmark, Sweden, Belgium, Switzerland.	15 manufacturing and service sectors	1990–2006	Roeger (1995) / OLS in time series	(a) Mark-ups differ considerable across sectors with mark-ups being higher within services than in the manufacturing sectors (b) The level of market competition is positively related to openness while it is negatively related to the size of the economy and the level of development.
Molnár, (2010)	Slovenia	37 manufacturing and service sectors	1993–2006	Roeger (1995) / OLS in panel fixed effects	(a) The mark-ups are high in some industries, such as real estate and food and beverages. (b) Mark-ups also appear high in transport, catering and professional services, (c) Mark-ups are lower for most manufacturing industries, traded

					services and other industries (i.e. construction, computer services and retail and wholesale trade).
Bottini and Molnár, (2010)	France, Germany, Italy, United Kingdom, Austria, Belgium, Czech Republic, Denmark, Finland, Greece, Hungary, Iceland, Ireland, Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland.	28 services sectors.	1993–2006	Roeger (1995) / OLS in panel with and without fixed effects	(a) The mark-ups are higher for professional services, real estate, renting and utilities (b) They are lower for construction, computer services, retail and wholesale trade and catering. (c) There is also large variation across countries in terms of the sizes of the estimated mark-ups. (d) Competitive pressures should be large in the United Kingdom and most Scandinavian countries, and relatively small in Central European countries, Sweden and Italy.
Rezitis and Kalantzi (2011)	Greece	Manufacturing sector	1984–2007	Hall - Roeger (1995) / panel data techniques	(a) The whole Greek manufacturing industry, as well as each sector of the industry, operates in non-competitive conditions (b) Labour intensity, the sector size, and the number of establishments influence the mark-up at the sectoral level. (c) Labour intensity, growth and the number of establishments affect the mark-up over time.
Rezitis and Kalantzi (2012a)	Greece	9 sub-sectors of food and beverages industry	1984–2007	Extended Hall (1988) and Roeger (1995) / bootstrap method	(a) The degree of market power is about 0.24 and the mark-up is about 2.44 (b) The net welfare loss is 0.11% and the total welfare loss is 0.97%.

(*Continued*)

Table 1. (*Continued*).

Study	Country(ies)	Sectors	Period	Methodology/Econometric technique	Main Findings
Rezitis and Kalantzi (2012b)	Greece	9 sub-sectors of food and beverages industry	1984–2007	Hall – Roeger (1995) / panel data techniques	(a) The whole Greek food and beverages manufacturing industry, as well as each sector of the industry, operates in non-competitive conditions. (b) The industry operates in non-competitive conditions for certain sub-periods of the period 1984–2007. (c) The sector size, capital intensity and the number of establishments influence the mark-up of the industry.
Rezitis and Kalantzi (2013)	Greece	Manufacturing sector	1983–2007	Bresnahan 1982/bootstrap method	(a) Each sector of the Greek manufacturing industry operates under imperfect competition, with the food and drink sector, the coke and refined sector and the communication equipment sector showing the highest degree of market power (b) The transport equipment sector has the lowest degree of market power. (c) There is a fluctuation in the degree of market power during the period 1983–1992.

Source: Author's elaboration.

services having higher mark-ups on average than manufacturing. Lastly, services sectors depict higher mark-ups in the euro area than the US, whereas the pattern is the reverse for manufacturing. Lastly, there is sufficient evidence that the magnitude of the mark-ups does not significantly change when splitting the time span.

In a similar study (Molnár 2010), mark-up ratios are estimated using Roeger (1995) methodology for manufacturing and service industries in Slovenia at a sectoral disaggregated level. The estimation is performed for the period 1993–2006 and uses firm level data of the Amadeus database. The empirical findings show that the estimated mark-ups are higher for services than manufacturing industries. The same results hold in the empirical study of Bottini and Molnár (2010). In this paper, mark-ups are estimated for the services industries in European OECD countries (including Greece) over the period 1993–2006. In general, the estimated mark-ups are higher for professional services, real estate, renting and utilities, while they tend to be substantially lower for construction, computer services, retail and wholesale trade and catering. There is also large variation across countries in terms of the sizes of the estimated mark-ups. Competitive pressures according to these mark-ups should be large in the United Kingdom and most Scandinavian countries, and relatively small in Central European countries, Sweden and Italy.

Unfortunately, there is a lack of studies estimating the mark-up level of the Greek manufacturing and services industries. More specifically, the only recent studies that solely investigate the market structure of the Greek manufacturing industry at the two-digit SIC level are those undertaken by Rezitis and Kalantzi (2011, 2012a, 2012b, 2013). These studies reveal that there is significant market power in the investigated sectors and extend the Hall (1988) and Roeger (1995) approach, in order to evaluate the degree of market power in the Greek manufacturing industries.

On the contrary, Nishimuraa et al. (1999), implied to a panel of 21 Japanese industries over the period 1971–1994 an alternative method based on the identity between the short-run elasticity of output to inputs, the mark-up ratio, and the factor shares respectively. They argue that there is strong evidence of imperfect competition, where internationally competitive industries show low mark-ups. Moreover, they conclude that the mark-up rate differs considerably among firms and its distribution is skewed, while the mark-up rate over marginal cost shows strong procyclicality.

Maioli (2004) calculates mark-ups for 30 French manufacturing industries over the period 1977–1997 according to two different methodologies. The first is based on the classical Solow residual approach, as adapted by Roeger (1995), while the second jointly estimates mark ups and returns to scale. The results reveal the absence of competitive conditions since the mark-up ratios are generally larger than one in both methodologies, while there is heterogeneity in the magnitude of the ratios across the manufacturing sectors.

Summarizing, the studies presented above conclude that the following major relationships that may constitute or augment the hypotheses of the present study: (a) estimated mark-up ratios are generally larger than one, denoting the absence of competitive conditions in certain sectors/industries; (b) there is a considerable variation of mark-up ratios across countries and industries; (c) services sectors generally have higher mark-ups compared with manufacturing.

3. Data and methodology

The approach used in this paper is based on a methodology developed by Hall (1988) and extended by Roeger (1995). His basic insight is that the traditional Solow residual (SR) should be independent of variation in the log-change of output in the absence of monopoly power. The main contribution of Roeger (1995) is that he showed how the differences between the production-based (primal) Solow residual (SR) and the cost based (dual) Solow residual (DSR) can be used to eliminate the unobservable productivity shock in order to obtain an unbiased estimate of market power (Rezitis and Kalantzi 2012b).

Assume that the production function, which is homogeneous of degree λ (returns to scale) is defined by the following neoclassical equation:

$$Y = Af(L, M, K) \tag{1}$$

where Y is output, A is the multifactor productivity growth (Hicks-neutral productivity term) and there are three basic inputs in the production process. More specifically, L denotes labour, M is the intermediate inputs, and K stands for capital. The inclusion of intermediate inputs allows defining the mark-up ratios using gross output, and hence overcoming the upward bias that would result if value added were used instead (Martins, et al. 1996; Bottini and Molnár 2010). After log-differentiation and re-arranging we get the following equation:

$$SR = y - a_L l - a_m m - a_k k = B(y - k) + (1 - B)a \tag{2}$$

where SR is the primal Solow residual, a_i is the input share of factor i and B is the Lerner index,[1] which relates the mark up ratio μ:[2]

$$B = \frac{P - MC}{P} = 1 - \frac{1}{\mu} \tag{3}$$

From equation (3) it is evident that the mark-up ratio μ can be computed as $\mu = \frac{1}{1-B}$. Roeger (1995) showed that an equivalent expression can be derived for the dual productivity measure (price-based Solow residual) by using the cost function associated with the production function (equation (1)) as follows:

$$SRP = a_L w + a_M p_m + a_K r - p = (1 - B)a - B(p - r) \tag{4}$$

where w denotes the wages, p_m is the price of intermediate inputs, r is the rental price of capital and p is the price of output. By subtracting equation (4) from equation (2) and assuming constant returns to scale ($\lambda = 1$), a suitable expression of B can be obtained by the following interpretation:

$$(p + y) - a_L(w + l) - a_M(p_m + m) - (1 - a_L - a_M)(r + k) = B[(p + y) - (k + r)] \tag{5}$$

For the sake of simplicity the above equation can be re-written after adding a disturbance term (ε) as follows:

$$\Delta y = B\Delta x + \varepsilon \tag{6}$$

where

$$\Delta y = (p + y) - a_L(w + l) - a_M(p_m + m) - (1 - a_L - a_M)(r + k) \text{ and } \Delta x = (p + y) - (k + r)$$

It is worth mentioning that different error terms are assumed for the sector-based estimation of mark-ups. As the unobservable productivity term, a cancels out with this subtraction, equation (6) is relatively easy to estimate by applying econometric techniques. The estimation of equation (2), in contrast, would result in bias and inconsistency of the mark-up estimates as the input variables are correlated with the productivity shocks (Bottini and Molnár 2010).

In order to perform an in depth investigation of industry competitiveness in Greece, we use an extended data-set for 88 manufacturing sectors at the two and three digit level (ISIC Rev. 3 classification) covering the period 1970–2007. The data are taken from the EU KLEMS database[3]. The interpretation of the variables, which are expressed in their natural logarithms comes as follows: y and p denote the gross output volume and price indices respectively (2005 = 100). L denotes the number of employees and w measures the compensation of employees (millions of euros). M and p_m denote the intermediate inputs indices for volume and price respectively (2005 = 100). K is the capital compensation at basic current prices and r is the user (rental) cost of capital. According to the database methodology, capital compensation is derived as the value added minus labour compensation, which in turn is derived by applying the ratio of hours worked by total persons engaged to hours worked by employees to compensation. Since the database does not contain a price series for capital we have to construct it, by following the Hall and Jorgensen (1967) approach. Therefore, the rental price of capital r can be computed by the following equation:

$$r = (i - \pi_e + \delta)P_i \tag{7}$$

where P_i is the fixed asset investment deflator, $(i-\pi_e)$ denotes the real interest rate, and δ is the depreciation rate, which is set at 5% across all sectors (Martins, et al. 1996). Real interest rate is the long-term interest rate minus the expected inflation rate. For P_i we use the fixed capital deflator for the total economy since sector-specific deflators were not available for Greece and for $(i-\pi_e)$ the real interest rate, both taken from the AMECO database. Mark-up ratios are estimated by directly computing the relevant input shares (coefficients α_1 and a_m). This method relies on computation of the revenue shares of factor inputs instead of econometric estimation of the production function.[4]

4. Empirical results

In this section, the empirical findings of the estimation of mark-up ratios in Greek manufacturing and services industries are presented over the estimated period (1970–2007). The software, which has been used for the econometric estimation of the Lerner indices and the mark-up ratios is Econometric Views (EVIEWS ver.7).

The empirical results of the estimation of equation (6) are shown in Table 2. According to the empirical findings, the estimated mark-up coefficients (column 2) are, on average, statistically significant at any conventional level of significance. In addition, the F-statistics support the jointly statistical significance of the estimated regressions, while the error terms are not correlated over time (lack of autocorrelation). Regarding the magnitude of the relevant estimates, there is significant variation but all of the mark-up ratios exceed unity, implying the presence of non-competitive conditions for the Greek manufacturing and services industry over

Table 2. Estimation of mark-up ratios by sector, 1970–2007

		Panel A - OLS					Panel B - 2SLS				
ISIC	Sector	Lerner Index	Mark-up ratio	Adjusted R^2	F-statistic	LM-test	Lerner Index	Mark-up ratio	Adjusted R^2	F-statistic	LM-test
15t16	Food, Beverages and Tobacco	0.18* {0.19*} (4.32) {4.79}	1.220 {1.239}	0.59 {0.43}	39.74*[0.00]	1.16[0.32]	0.36*(3.94)	1.557	0.53	11.89*[0.00]	1.39[0.49]
15	Food and beverages	0.18* {0.19*} (5.42) {4.94}	1.220 {1.241}	0.72 {0.50}	72.16*[0.00]	0.96[0.39]	0.36*(3.24)	1.557	0.53	11.68*[0.00]	1.42[0.49]
16	Tobacco	0.23* {0.23*} (7.95) {6.85}	1.299 {1.295}	0.75 {0.53}	68.75*[0.00]	3.68*[0.04]	0.36*(4.06)	1.571	0.52	12.90*[0.00]	1.24[0.54]
17t19	Textile, Leather and Footwear	0.28* {0.28*} (3.68) {3.58}	1.389 {1.391}	0.44 {0.41}	20.50*[0.00]	3.03***[0.07]	0.49*(3.38)	1.946	0.19	9.92*[0.01]	1.29[0.52]
17t18	Textiles and textile	0.27* {0.16**} (3.61) {2.05}	1.370 {1.188}	0.45 {0.38}	21.65*[0.00]	3.39**[0.05]	0.47*(3.70)	1.902	0.31	12.23*[0.00]	1.23[0.54]
17	Textiles	0.30*{0.28*} (3.74) {3.28*}	1.429 {1.385}	0.39 {0.38}	14.74*[0.00]	5.32*[0.01]	0.49*(4.49)	1.945	0.20	10.03*[0.01]	1.29[0.52]
18	Wearing Apparel, Dressing And Dying Of Fur	0.31*{0.28*} (4.49) {3.36*}	1.449 {1.384}	0.59 {0.46}	36.17*[0.00]	1.66[0.21]	0.47*(4.35)	1.879	0.37	13.72*[0.01]	1.18[0.55]
19	Leather, leather and footwear	0.23*{0.17*} (3.57) {1.99**}	1.299 {1.201}	0.23 {0.31}	7.15*[0.01]	7.93*[0.003]	0.52*(5.52)	2.102	0.44	4.07*[0.01]	1.13[0.57]
20	Wood and of wood and cork	0.29*{0.26*} (7.47) {4.70}	1.408 {1.356}	0.92 {0.61}	256.80*[0.00]	0.00[1.00]	0.32*(8.42)	1.474	0.96	170.73*[0.00]	1.84[0.40]
21t22	Pulp, paper, printing and publishing	0.19*{0.23*} (3.81) {4.18}	1.235 {1.295}	0.59 {0.48}	36.74*[0.00]	3.56**[0.04]	0.31*(12.46)	1.442	0.90	79.66*[0.00]	1.22[0.54]
21	Pulp, paper and paper	0.35*{0.30*} (6.08) {4.00}	1.538 {1.431}	0.85 {0.54}	128.80*[0.00]	0.36[0.70]	0.32*(6.89)	1.466	0.82	38.95*[0.00]	1.49[0.47]
22	Printing, publishing and reproduction	0.19**{0.21*} (2.90) {3.19}	1.235 {1.272}	0.62 {0.43}	38.75*[0.00]	0.00[1.00]	0.27*(9.70)	1.436	0.95	53.90*[0.00]	2.27[0.32]
221	Publishing	–	–	–	–	–	–	–	–	–	–
22x	Printing and reproduction	–	–	–	–	–	0.61***(6.17)	2.576	0.95	40.98***[0.10]	2.12[0.29]
23t25	Chemical, rubber, plastics and fuel	0.24*{0.22*} (6.11) {6.81}	1.316 {1.277}	0.75 {0.51}	80.79*[0.00]	4.73*[0.01]	0.52**(2.26)	2.098	0.24	5.33**[0.03]	1.15[0.56]
23	Coke, refined petroleum and nuclear fuel	0.23*{0.22*} (5.92) {4.95}	1.299 {1.279}	0.66 {0.49}	45.00*[0.00]	4.46**[0.02]	0.59**(2.58)	2.468	0.83	3.43***[0.08]	1.26[0.53]

24	Chemicals and chemical products	0.24*{0.25*} (6.23) {6.07}	1.316 {1.336}	0.73 {0.55}	62.52*[0.00]	3.35**[0.05]	0.49*(3.24)	1.977	0.10	6.73**[0.02]	1.08[0.58]
244	Pharmaceuticals	–	–	–	–	–	–	–	–	–	–
24x	Chemicals excluding pharmaceuticals	–	–	–	–	–	–	–	–	–	–
25	Rubber and plastics	0.15*{0.20*} (3.04) {2.99}	1.176 {1.245}	0.52 {0.38}	27.85*[0.00]	6.64*[0.005]	0.47*(3.44)	1.898	0.14	8.17*[0.01]	1.01[0.60]
26	Other non-metallic mineral	0.28*{0.25*} (7.33) {5.28}	1.389 {1.325}	0.82 {0.56}	125.78*[0.00]	2.63[0.10]	0.33*(6.16)	1.499	0.81	50.29*[0.00]	1.81[0.40]
27t28	Basic metals and fabricated metal	- {0.21*}- {3.13}	-{1.258}	-{0.46}	–	–	0.49***(1.80)	1.971	0.32	3.71***[0.08]	0.74[0.69]
27	Basic metals	- {0.24***}- {1.92}	-{1.314}	-{0.21}	–	–	–	–	–	–	–
28	Fabricated metal	–	–	–	–	–	–	–	–	–	–
29	Machinery, n.e.c.	–	–	–	–	–	–	–	–	–	–
30t33	Electrical and optical equipment	0.27*{0.18**} (5.05) {2.23}	1.370 {1.215}	0.73 {0.43}	68.06*[0.00]	0.00[1.00]	–	–	–	–	–
30	Office, accounting and computing machinery	0.21*{0.17**} (5.50) {2.68}	1.266 {1.202}	0.84 {0.58}	108.54*[0.00]	0.95[0.40]	0.29***(3.47)	1.408	0.68	7.26**[0.02]	0.11[0.94]
31t32	Electrical engineering	0.32*{0.26*} (5.77) {3.28}	1.471 {1.354}	0.85 {0.51}	130.83*[0.00]	0.75[0.48]	0.17**(2.47)	1.201	0.81	12.79*[0.00]	1.84[0.55]
31	Electrical machinery and apparatus, n.e.c.	0.34*{0.21**} (5.60) {2.49}	1.515 {1.262}	0.76 {0.47}	72.90*[0.00]	1.06[0.36]	0.17**(2.14)	1.201	0.81	12.52*[0.00]	1.95[0.66]
313	Insulated wire	–	–	–	–	–	–	–	–	–	–
31x	Other electrical machinery and apparatus n.e.c.	- {0.10***}- {1.81}	-{1.114}	-{0.30}	–	–	–	–	–	–	–
32	Radio, television and communication equipment	0.35*{0.28*} (8.02) {2.82}	1.538 {1.391}	0.86 {0.54}	141.43*[0.00]	3.41[0.05]	0.16**(2.67)	1.192	0.80	14.29*[0.00]	2.31[0.87]
321	Electronic valves and tubes	–	–	–	–	–	–	–	–	–	–

(*Continued*)

Table 2. (*Continued*).

		Panel A - OLS					Panel B - 2SLS				
ISIC	Sector	Lerner Index	Mark-up ratio	Adjusted R^2	F-statistic	LM-test	Lerner Index	Mark-up ratio	Adjusted R^2	F-statistic	LM-test
322	Telecommunication equipment	–	–	–	–	–	–	–	–	–	–
323	Radio and television receivers	–	–	–	–	–	–	–	–	–	–
33	Medical, precision and optical instruments	0.29*{0.24*} (7.16) {4.27}	1.408 {1.315}	0.84 {0.60}	117.72*[0.00]	1.43[0.26]	0.25*(3.04)	1330	0.83	21.13*[0.00]	1.67[0.29]
331t3	Scientific instruments	0.46*** -(8.93) - Panel A – OLS	1.852-	0.99-	362.48*[0.00]	–	– Panel B - 2SLS	–	–	–	–
334t5	Other instruments	–	–	–	–	–	–	–	–	–	–
34t35	Transport equipment	–	–	–	–	–	–	–	–	–	–
34	Motor vehicles, trailers and semi-trailers	–	–	–	–	–	–	–	–	–	–
35	Other transport equipment	–	–	–	–	–	–	–	–	–	–
351	Building and repairing of ships and boats	–	–	–	–	–	–	–	–	–	–
353	Aircraft and spacecraft	–	–	–	–	–	–	–	–	–	–
35x	Railroad equipment and transport equipment n.e.c.	–	–	–	–	–	–	–	–	–	–
36t37	Manufacturing, n.e.c., recycling	0.16**{0.13**} (2.10) {2.13}	1.190 {1.155}	0.58 {0.42}	33.35*[0.00]	0.48[0.62]	–	–	–	–	–
36	Manufacturing n.e.c.	0.24*{0.18*} (5.57) {3.00}	1.316 {1.213}	0.82 {0.55}	95.66*[0.00]	2.02[0.16]	0.16**(2.62)	1.192	0.83	17.64*[0.00]	2.12[0.18]
37	Recycling	–	–	–	–	–	–	–	–	–	–
E	Electricity, gas and water supply	0.10**{0.11**} (2.16) {2.15}	1.113 {1.115}	0.45 {0.24}	23.35*[0.00]	1.43[0.24]	–	–	–	–	–

40	Electricity and gas	0.09***{0.09***} (1.74) {1.85}	1.094 {1.100}	0.30 {0.12}	12.63*[0.00]	1.21[0.28]	–	–	–	–	–
40x	Electricity supply	–	–	–	–	–	–	–	–	–	–
402	Gas supply	–	–	–	–	–	–	–	–	–	–
41	Water supply	–	–	–	–	–	–	–	–	–	–
F	*Construction*	***0.22***{0.20*} **(6.32)** {4.77}	***1.282*** {1.253}	***0.86*** {0.56}	***172.90***[0.00]*	***1.36[0.26]***	***0.24***(4.87)*	***1.314***	***0.71***	***21.29***[0.00]*	***1.06[0.58]***
G	*Wholesale and retail trade*	***0.09***{0.13*} **(2.85)** {3.56}	***1.099*** {1.154}	***0.65*** {0.36}	***57.14***[0.00]*	***1.63[0.21]***	***0.09****(2.06)*	***1.094***	***0.56***	***16.34***[0.00]*	***2.06[0.35]***
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of fuel	0.08*{0.12*} (2.28) {2.61}	1.087 {1.130}	0.69 {0.38}	66.46*[0.00]	0.90[0.41]	***0.07*****(1.76)*	***1.081***	***0.55***	***6.75***[0.02]*	***2.17[0.33]***
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	0.13*{0.13*} (3.55) {4.05}	1.149 {1.149}	0.52 {0.29}	31.74*[0.00]	1.68[0.20]	0.14*(3.61)	1.157	0.64	12.28*[0.00]	3.33[0.16]
52	Retail trade, except of motor vehicles and motorcycles; repair of household goods	0.07*{0.12*} (2.04) {2.65}	1.075 {1.133}	0.53 {0.26}	34.69*[0.00]	3.75[0.03]	0.08***(1.74)	1.087	0.42	13.41*[0.00]	1.23[0.54]
H	*Hotels and restaurants*	***0.13***{0.14*} **(2.86)**{4.04}	***1.149*** {1.161}	***0.58*** {0.33}	***42.32***[0.00]*	***1.12[0.33]***	0.11*(4.50)	1.122	0.93	105.21*[0.00]	1.81[0.40]
I	*Transport and storage communication*	***0.17***{0.21*} **(5.31)** {4.08}	***1.205*** {1.268}	***0.73*** {0.45}	***81.45***[0.00]*	***0.00[1.00]***	0.23*(5.57)	1.298	0.79	31.22*[0.00]	3.44[0.18]
60t63	Transport and storage	0.19*{0.21*} (6.19) {3.94}	1.235 {1.270}	0.83 {0.54}	125.43*[0.00]	2.34[0.12]	0.23*(5.57)	1.298	0.79	31.22*[0.00]	3.44[0.18]
60	Inland transport	0.19*{0.22*} (6.56) {4.61}	1.235 {1.278}	0.82 {0.55}	113.98*[0.00]	2.60[0.10]	0.23*(5.57)	1.298	0.79	31.21*[0.00]	3.44[0.18]
61	Water transport	0.18*{0.21*} (5.68) {4.09}	1.220 {1.272}	0.71 {0.42}	73.61*[0.00]	1.51[0.24]	0.23*(5.75)	1.292	0.78	32.69*[0.00]	3.60[0.16]
62	Air transport	0.19*{0.22*} (6.56) {4.48}	1.235 {1.279}	0.82 {0.54}	113.55*[0.00]	2.60[0.010]	0.23*(5.57)	1.299	0.79	31.10*[0.00]	3.43[0.18]

(*Continued*)

Table 2. (*Continued*).

		Panel A - OLS					Panel B - 2SLS				
ISIC	Sector	Lerner Index	Mark-up ratio	Adjusted R^2	F-statistic	LM-test	Lerner Index	Mark-up ratio	Adjusted R^2	F-statistic	LM-test
63	Supporting and auxiliary transport activities; activities of travel agencies	0.19*{0.21*} (6.86) {7.94}	1.235 {1.269}	0.89 {0.64}	228.18*[0.00]	1.75[0.19]	0.20*(3.82)	1.244	0.80	2.11***[0.10]	2.43[0.11]
64	Post and telecommunications	0.18*{0.21*} (4.68) {5.42}	1.220 {1.274}	0.73 {0.53}	78.46*[0.00]	2.33[0.12]	0.24*(5.38)	1.320	0.78	42.28*[0.00]	3.88[0.14]
JtK	*Finance, insurance, real estate and business services*	***0.07****{0.10**} ***(1.86)*** {2.40}	***1.075*** {1.110}	***0.73*** {0.55}	***78.69**** ***[0.00]***	***0.00[1.00]***	0.06*(3.04)	1.068	0.95	249.72*[0.00]	3.02[0.13]
J	*Financial intermediation*	***0.07****{0.10**} ***(2.22)*** {2.32}	***1.075*** {1.106}	***0.78*** {0.50}	***102.01**** ***[0.00]***	***1.49[0.24]***	–	–	–	–	–
65	Financial intermediation, except insurance and pension funding	0.06**{0.09**} (2.05) {2.06}	1.064 {1.098}	0.84 {0.58}	158.17*[0.00]	3.97[0.03]	0.06**(2.15)	1.059	0.93	190.66*[0.00]	2.77[0.25]
66	Insurance and pension funding, except compulsory social security	–	–	–	–	–	–	–	–	–	–
67	Activities related to financial intermediation	0.07*{0.09**} (2.68) {2.00}	1.075 {1.104}	0.81 {0.50}	113.21*[0.00]	0.61[0.55]	0.05***(1.72)	1.050	0.86	60.80*[0.00]	2.31[0.31]
K	*Real estate, renting and business activities*	***0.12******{0.28*} ***(1.79)*** {4.27}	***1.136***{ }	***0.45***{ }	***24.61**** ***[0.00]***	***4.69[0.01]***	0.09*(4.05)	1.096	0.95	290.78*[0.00]	4.29[0.12]
70	Real estate activities	–	–	–	–	–	–	–	–	–	–
71t74	Renting of m&eq and other business activities	0.12*{0.14*} (3.93) {3.30}	1.136 {1.158}	0.73 {0.48}	73.03*[0.00]	2.69[0.09]	0.09*(3.90)	1.099	0.88	47.15*[0.00]	4.00[0.13]
71	Renting of machinery and equipment	0.15*{0.28**} (2.66) {2.16}	1.111 {1.182}	0.69 {0.37}	56.82*[0.00]	3.62[0.04]	0.16*(5.16)	1.190	0.88	43.48*[0.00]	4.62***[0.09]
72	Computer and related activities	–	–	–	–	–	–	–	–	–	–

73	Research and development	–	–	–	–	–	0.09*(4.47)	1.103	0.93	99.38*[0.00]	2.40[0.52]
74	Other business activities	0.07* –(2.43) -	1.075-	0.78-	85.58*[0.00]	1.53[0.24]	0.09*(3.85)	1.101	0.87	40.28*[0.00]	3.72[0.15]
741t4	Legal, technical and advertising	–	–	–	–	–	–	–	–	–	–
745t8	Other business activities, n.e.c.	–	–	–	–	–	–	–	–	–	–
LtQ	*Community, social and personal services*	***0.12**{0.13*} **(4.07)*** {3.48}	***1.136*** {1.153}	***0.72*** {0.52}	***72.23*[0.00]***	***0.60[0.55]***	0.13*(4.64)	1.150	0.79	14.47*[0.00]	1.72[0.62]
L	*Public administration and defence; compulsory social security*	–	–	–	–	–	–	–	–	–	–
M	*Education*	***0.13**{0.16***} **(3.30)*** {1.84}	***1.149*** {1.185}	***0.94*** {0.73}	***188.71*[0.00]***	***0.31[0.74]***	***0.16*(3.41)***	***1.188***	***0.96***	***50.00*[0.00]***	***4.10[0.13]***
N	*Health and social work*	***0.14**{0.15*} **(2.99)*** {4.75}	***1.163*** {1.176}	***0.15*** {0.39}	***5.99**[0.02]***	***5.98[0.00]***	–	–	–	–	–
O	*Other community, social and personal services*	***0.14**{0.15*} **(4.05)*** {3.80}	***1.163*** {1.174}	***0.75*** {0.51}	***99.33*[0.00]***	***2.40[0.11]***	***0.16*(4.04)***	***1.187***	***0.76***	***17.64*[0.00]***	***2.14[0.52]***
90	Sewage and refuse disposal, sanitation and similar activities	0.16*{0.17*} (8.03) {7.56}	1.190 {1.205}	0.98 {0.78}	1344.70*[0.00]	2.10[0.14]	***0.17*(2.78)***	***1.211***	***0.88***	***3.32***[0.08]***	***3.55[0.17]***
91	Activities of membership organizations n.e.c.	0.15*{0.17*} (6.65) {5.17}	1.176 {1.202}	0.85 {0.60}	152.09*[0.00]	2.64[0.10]	0.17*(4.82)	1.206	0.85	9.43*[0.00]	1.02[0.59]
92	Recreational, cultural and sporting activities	0.14*{0.17*} (4.69) {4.93}	1.163 {1.200}	0.79 {0.55}	112.10*[0.00]	3.21[0.06]	0.14*(4.77)	1.157	0.85	42.94*[0.00]	1.22[0.51]
93	Other service activities	–	–	–	–	–	–	–	–	–	–

The numbers in brackets {} denote the estimations of the Lerner indices and the mark-up ratios by applying the bootstrap method. Figures in parentheses () denote t-ratios, while figures in square brackets are the reported *p*-values. Significant at *1%, **5% and ***10% respectively. Reported mark-ups estimates are statistically significant at 5% level. '-' indicates that no data were available or that the estimated mark-up was not statistically significant

Source: Author's calculations based on EU-KLEMS database.

the period 1970–2007. It is worth mentioning that the magnitude of the (OLS) estimations does not vary significantly from that reported by the bootstrap method, implying that the results are quite robust.[5] In other words, the bootstrap estimators reveal that the OLS findings are robust to any simultaneity bias between the control variables and the error terms. Lastly, it is important to note that we reach the same conclusion by applying the 2SLS method (see Table 2 – Panel B).

Regarding the manufacturing sectors (15 to 37 two-digit codes), the mark-up ratios range from 1.176 to 1.852 (Scientific instruments). This range seems more plausible than the high mark-ups obtained in previous studies for Greece (Bottini and Molnár 2010; Rezitis and Kalantzi 2011; Rezitis and Kalantzi 2013). One explanation for this discrepancy is due to the adjustment for intermediate inputs. This adjustment tends to lower mark-ups substantially, in particular for sectors with a large share of intermediate input in total output (i.e. rubber and plastics, pulp, paper, printing and publishing, etc.). It is worth mentioning that these sectors are characterised by a small number of players and significant barriers to entry. However, the recent debt financial crisis, along with the extended recession in the real economy, has negatively affected the relevant sectors across Greece, thus overshooting the magnitude of the mark-up ratio.

On average, mark-up ratios in Greek industries do not appear particularly high in comparison with other OECD countries (Maioli 2004; Molnár 2010; Christopoulou and Vermeulen 2012) but the average reveals large differences across sectors (heterogeneity). This is not surprising given that, on the one hand, sector-specific characteristics affect the mark-up companies' pricing behaviour (prices above average costs), while on the other hand, the regulatory barriers (i.e. legalities) vary considerably across sectors distorting the level of competition.

While mark-ups tend to be higher in highly-regulated and less tradable services industries, in Greece, the mark-up ratio in food and beverages industry (code 15), which accounts for the 27.3% of the total gross output in manufacturing (2007) exceeds unity by about 22%. This could be explained by the presence of vertical integration of retailers and food processors, allowing for significant mark-ups that can be passed on to consumers in the form of higher prices due to a high concentration in the sector and to occasional symptoms of collusive behaviour among its major players (see Decisions HCC 2007a; HCC 2007b; HCC 2009). Another possible explanation may be the specialisation in high-value-added sub-segments such as fruits and vegetables, which allows for charging higher mark-ups (Molnár 2010).

Mark-ups are also relatively high in some tradable services industries, such as construction (1.282 or 1.253), which registers one of the lowest mark-up ratios among services in OECD countries (Molnár 2010). High concentration in the construction sector and the growth of construction output outpacing that of GDP, especially during the period prior to the Olympic Games in Athens (2000–2004), have allowed construction firms to charge high mark-ups. However, the recent debt financial crisis combined with the extended recession in the real economy, has negatively affected the specific sector overshooting the magnitude of the Lerner index and thus the estimated mark-up ratio.

In the services industry (two-digit codes from 50 to 93), the mark-up ratios range from 1.075 (OLS estimation) or 1.106 (bootstrapped estimation) regarding the Financial intermediation sector to 1.235 (OLS estimation) or 1.278 and 1.279 bootstrapped estimations for the inland and air transport sectors respectively. More specifically, mark-up ratios are relatively high in transport and storage communication,

but not in comparison with other OECD countries (Bottini and Molnár 2010). This finding can be explained by the fact that these sectors constitute networks industries, which in general exhibit higher mark-ups than competitive non-network sectors owing to the large sunk and fixed costs (Molnár 2010). Such features of network industries may inhibit the development of competitive markets.

On the other hand, mark-ups are low in highly traded services such as sale, maintenance and repair of motor vehicles (1.087 or 1.130) as well as in other trade related activities (retail trade, repair of household goods, etc.), implying large competitive pressure in these industries. Moreover, professional services (i.e. financial insurance real estate activities, etc.) depict low mark-ups as a result of the adequate competitive pressure. Finally, the retail sale of fuel exhibits low mark-up ratio (1.087 or 1.130) revealing that the retail segment of the oil industry in Greece operates in a competitive way. This finding coincides with other empirical studies (see Polemis 2012). However, the oil sector in Greece, exhibits several distortions as a consequence of the existing legal framework, such as the absence of hypermarkets, and regulatory barriers in fuel transportation (Polemis 2012; Fafaliou and Polemis 2012).

Figure 1 encapsulates the mark-up ratio in each sub-period of the time span 1970–2007 for the 23 and 26 manufacturing and services sub-sectors respectively.[6] More specifically, the relevant sub-periods include the time period prior to the accession of Greece to the European Economic Community (1970–1981), the period prior to the Single European Union (1982–1992) and finally the period afterwards (1993–2007).

According to the relevant figure, during the period 1982–1992 there was an increase in the manufacturing mark-up ratios compared with the previous period (1970–1981). This is mainly attributed to the wave of mergers and acquisitions that took place in the Greek manufacturing industry especially in the period 1989–1992[7] and the accession of Greece to the European Economic Community (1981), which led some firms to exit the market. It is important to note that the mark-up ratios of all of the two-digit manufacturing sectors (except for pulp and paper) have been increased during this period (Table 3). The biggest increase compared with the previous period (1970–1981) is estimated to be 67% (wearing apparel, dressing and dying of fur).

In addition, the findings do support that each sector of the Greek manufacturing industry appears to operate under imperfect competition for the period under consideration, with the wearing apparel sector (SIC 18), the textiles sector (SIC 17) and the other non-metallic mineral sector (SIC 26) showing the highest degree of market power, whereas the manufacturing n.e.c. (SIC 36) has the lowest degree of market power (1.325).

On the other hand, the mark-up ratios in the services sectors (see Table 4) show a modest rate of increase ranging from 2.3% (wholesale trade and commission trade) to 12.2% (sewage and refuse disposal, sanitation and similar activities). Within this industry, the renting of machinery and equipment sector (SIC 71) together with the sewage and refuse disposal, sanitation and similar activities sector (SIC 90) have shown the highest degree of market power (1.305 and 1.285 respectively), whereas the financial intermediation sector (SIC 65) has shown the lowest degree equal to 1.092.

On the contrary, in the next period (1993–2007), the relevant mark-up ratios have decreased substantially. The completion of the Single European Market (1992)

and the implementation of various developmental laws and operational programs resulted in the enhancement of free trade among Greece and the other European Union members. This caused a fall of the profit margin as well as a drop in the mark-up ratios (Rezitis and Kalantzi 2013). On the other hand, foreign businesses made significant investments in the Greek manufacturing sectors (food and beverages, basic metals, chemicals, etc.) increasing the competitive pressure in the industry and lowering the significant marker power (SMP).

5. Concluding remarks and policy implications

The aim of this study was to investigate the level of market power of the Greek manufacturing and services industries over the period 1970–2007. The empirical analysis was performed at a disaggregated level (two- and three-digit code), with the aim of investigating possible heterogeneity across different subsectors of the above industries.

The empirical findings indicate that manufacturing and services industries operate in non-competitive conditions during the investigated period and certain subperiods since the estimated mark-up ratios are generally larger than one in all of the specifications. Average mark-up ratios are heterogeneous across sectors, with manufacturing having higher mark-ups on average than services. Regarding the services industry the mark-up ratios are relatively high in transport and storage communication sector (network industries), compared with highly traded services sectors (e.g. maintenance and repair of motor vehicles, retail trade, repair of household goods, financial insurance, real estate activities, etc.), where the mark-up ratios are relatively low, revealing large competitive pressure in these industries. The econometric results do not dramatically change when the bootstrap and the 2SLS method are employed, denoting the robustness of the results.

When splitting the time span into certain discrete periods, some interesting results emerge. First, the mark-up ratios in the manufacturing sectors have been increased during the period 1982–1992 due to the wave of mergers and acquisitions, as well as the accession of Greece to the European Economic Community (1981). This upward trend stopped within the next period (1993–2007). As a consequence, the relevant mark-up ratios have decreased substantially. However, the mark-up ratios in the services sectors have followed the opposite pattern. More specifically, the implementation of the Single European Market (1992), which led to the increase of free trade among Greece and other EU members, caused a fall of the profit margin as well as a drop in the mark-up ratios. In addition, the increase in the foreign direct investments (FDI) targeted at the sectors of the 'new economy' (i.e. computer and related services, information technology, etc.) have boosted competition, decreasing the SMP of the incumbents and the subsequent mark-up ratios.

From the empirical findings it is evident that sectors that are more open to internationalisation such as textiles, computers, electrical and other transportation equipment, experience relatively low mark-up ratios revealing lower degrees of 'collusion'. In order to enhance the level of internationalisation in the manufacturing sectors, the policy makers and the government officials could pursue horizontal strategies focusing on the further opening of the markets. Since the vast majority of the manufacturing firms in Greece are small and medium-sized (SMEs), the government must improve the access of micro and SMEs to existing financial support

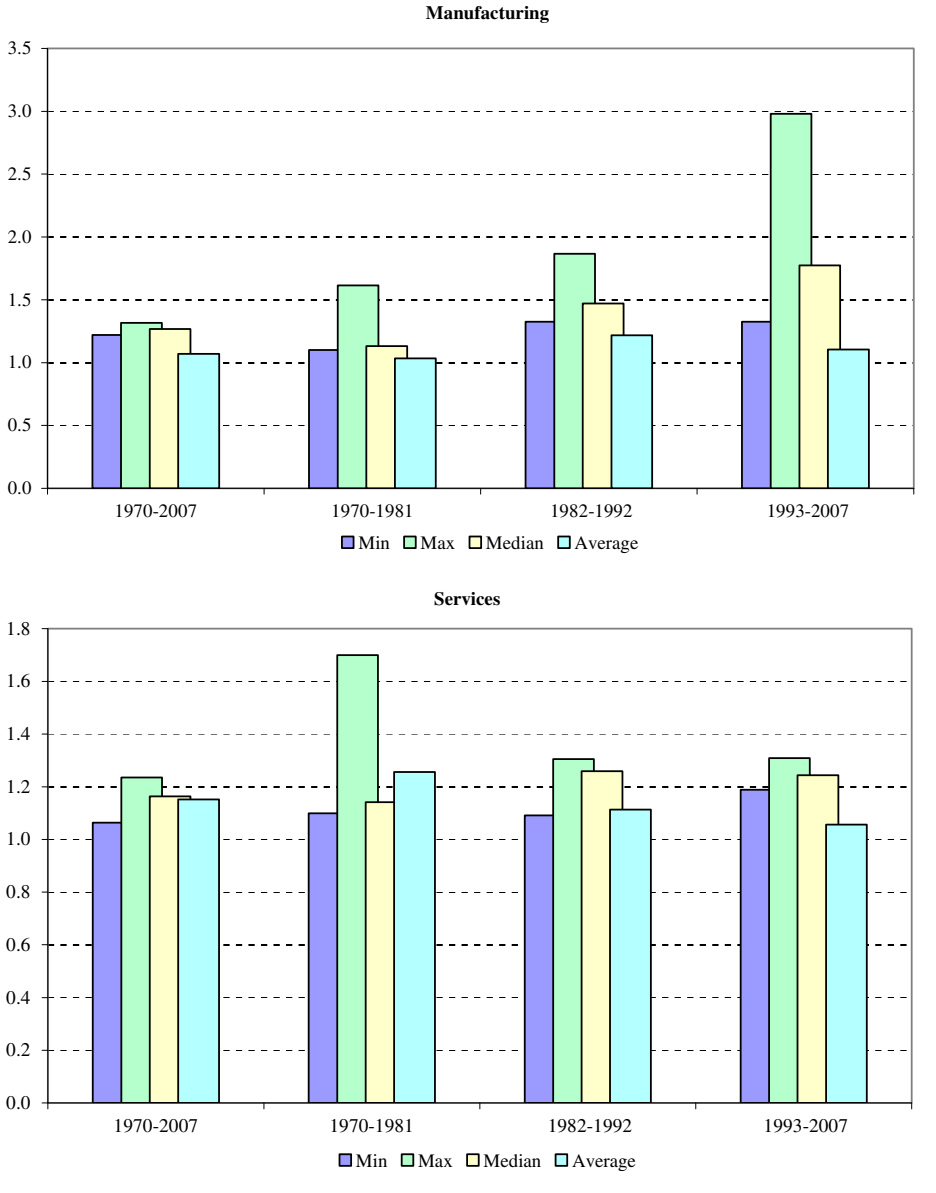

Figure 1. Mark-up ratios in manufacturing and services industry for various periods* (*) Average mark-up ratios are weighted by 2005 gross output shares taken by EU-KLEMS database. Source: Author's calculations based on model estimates.

mechanisms (i.e., specific business funds, business angels, etc.) and to relevant information sources.

Furthermore, policy instruments for international business should not only be aimed at potential exporters but also at importers. Exports do indeed bring in 'foreign currency', but for many economic sectors efficient access to required inputs is a very important factor in staying (internationally) competitive. Given that in most

Table 3. Mark-up ratios over time for the two-digit manufacturing sectors

ISIC	Sector	1970–2007	1970–1981	1982–1992	1993–2007	Gross output share (2005)
15	Food and beverages	1.220	1.120	1.386	1.271	0.282
16	Tobacco	1.299	1.119	1.388	1.640	0.012
17	Textiles	1.429	1.117	1.795	n/a	0.034
18	Wearing Apparel, Dressing and Dying of Fur	1.449	1.118	1.865	n/a	0.066
19	Leather, leather and footwear	1.299	1.116	1.570	n/a	0.012
20	Wood and of wood and cork	1.408	1.141	1.602	n/a	0.017
21	Pulp, paper and paper	1.538	1.614	1.507	n/a	0.017
22	Printing, publishing and reproduction	1.235	1.160	1.403	n/a	0.050
23	Coke, refined petroleum and nuclear fuel	1.299	1.101	1.444	n/a	0.116
24	Chemicals and chemical products	1.316	1.103	1.470	n/a	0.057
25	Rubber and plastics	1.176	1.104	1.481	n/a	0.023
26	Other non-metallic mineral	1.389	1.127	1.691	1.325	0.061
27	Basic metals	n/a	1.402	n/a	n/a	0.078
28	Fabricated metal	n/a	n/a	n/a	n/a	0.044
29	Machinery, n.e.c.	n/a	n/a	n/a	n/a	0.028
30	Office, accounting and computing machinery	1.266	n/a	n/a	n/a	0.000
31	Electrical machinery and apparatus, n.e.c.	1.515	1.136	1.325	2.980	0.021
32	Radio, television and communication equipment	1.538	1.143	1.338	2.346	0.014
33	Medical, precision and optical instruments	1.408	1.181	1.398	1.774	0.006
34	Motor vehicles, trailers and semi-trailers	n/a	n/a	n/a	n/a	0.008
35	Other transport equipment	n/a	n/a	n/a	n/a	0.023
36	Manufacturing n.e.c.	1.32	1.136	1.325	n/a	0.031
37	Recycling	n/a	n/a	n/a	n/a	0.001
D	Manufacturing*	1.070	1.034	1.216	1.105	1.000

(*) Average mark-up ratios for manufacturing are weighted by 2005 gross output shares taken by EU-KLEMS database. The mark-up ratios have been estimated by applying the OLS methodology. However the 2SLS and the bootstrap method provided similar results, which are available from the author upon request.
Source: Author's calculations based on EU-KLEMS database.

of the cases SMEs commence their internationalisation process with imports and later go into export markets, supporting importers will also result in promoting more exports. In addition to the aforementioned strategies, policies must be developed to support greater use of the Internet by SMEs and especially of electronic commerce as this lowers barriers for internationalisation for smaller companies. Finally, policies targeted at the increase of FDI either by financial (i.e., low corporate taxes, preferential tariffs, soft loan or loan guarantees, etc.) or political mechanisms (i.e., infrastructure subsidies, derogation from regulations for very large projects, etc.) should also enhance the competitive conditions of the sectors involved.

To sum up, our analysis will be a useful policy tool to achieve structural micro-economic goals in light of the existing financial crisis. First, given the primary indications regarding the high mark-ups for selected industries in the services sector,

Table 4. Mark-up ratios over time for the two-digit services sectors

ISIC	Sector	1970–2007	1970–1981	1982–1992	1993–2007	Gross output share (2005)
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of fuel	1.087	1.168	1.215	1.313	0.029
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	1.149	1.165	1.191	1.408	0.046
52	Retail trade, except of motor vehicles and motorcycles; repair of household goods	1.075	1.166	1.198	n/a	0.087
H	Hotels and restaurants	1.149	1.166	1.194	1.453	0.103
60	Inland transport	1.235	n/a	1.260	1.297	0.021
61	Water transport	1.220	n/a	1.261	1.309	0.029
62	Air transport	1.235	n/a	1.260	1.298	0.004
63	Supporting and auxiliary transport activities; activities of travel agencies	1.235	n/a	1.260	1.203	0.012
64	Post and telecommunications	1.22	n/a	1.260	n/a	0.035
65	Financial intermediation, except insurance and pension funding	1.064	n/a	1.092	n/a	0.038
66	Insurance and pension funding, except compulsory social security	n/a	n/a	n/a	n/a	0.006
67	Activities related to financial intermediation	1.075	1.100	1.178	1.213	0.008
70	Real estate activities	n/a	n/a	n/a	n/a	0.098
71	Renting of machinery and equipment	1.111	1.195	1.305	n/a	0.005
72	Computer and related activities	n/a	n/a	n/a	n/a	0.004
73	Research and development	n/a	n/a	n/a	n/a	0.001
74	Other business activities	1.075	1.113	1.185	n/a	0.024
LtQ	Community, social and personal services	1.136	1.121	1.254	1.275	0.210
L	Public administration and defence; compulsory social security	n/a	n/a	n/a	n/a	0.084
M	Education	1.149	1.699	1.214	n/a	0.037
N	Health and social work	1.163	1.127	1.254	n/a	0.053
O	Other community, social and personal services	1.163	1.144	1.283	1.278	0.033
90	Sewage and refuse disposal, sanitation and similar activities	1.19	1.146	1.285	1.211	0.004
91	Activities of membership organizations n.e.c.	1.176	1.140	1.275	1.188	0.003
92	Recreational, cultural and sporting activities	1.163	1.146	1.283	1.210	0.020
93	Other service activities					0.006
-	Services*	1.152	1.256	1.113	1.056	1.000

(*) Average mark-up ratios for manufacturing are weighted by 2005 gross output shares taken by the EU-KLEMS database. The mark-up ratios have been estimated by applying the OLS methodology. However the 2SLS and the bootstrap method provided similar results, which are available from the author upon request.
Source: Author's calculations based on EU-KLEMS database.

a suitable ex ante policy is linked with a thorough investigation of mergers and acquisitions. Secondly, in order to enhance the level of internationalisation in manufacturing, the government could pursue horizontal strategies focusing on the further opening of the markets.

Given the above considerations, our analysis can be further extended in order to tackle a number of constraints, which may be addressed in future work. An analysis using more disaggregated firm level data may enrich our conclusions. Given the validity of the econometric results, the mark-up ratios may be improved with the addition of new parameters, especially those regarding price formulation. Furthermore, as more information and data become available, especially at the firm level, and more companies enter the sample, more in-depth analysis should be made in order to examine aspects that are not covered by the existing database, since it may not collect information from all the new small entrants. Such a consideration will better capture the competitive dynamism of the manufacturing and services industries and lead the research to further outcomes on developing a consumer policy. To allow for cross-country comparisons, the analysis could be extended to include other European or OECD countries except for Greece. Finally, the methodology applied could be further refined, by estimating the input coefficients of the production function (shares). These are important issues for European countries, particularly in the context of convergence and remain the subject of future research.

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Notes

1. The index ranges from zero to one, with higher numbers implying greater market power. For a perfectly competitive firm (where $P = MC$), $L = 0$. Alternatively, the Lerner index describes the relationship between elasticity and price margins for a profit-maximizing firm. If the Lerner index can't be greater than one, then elasticity can never be greater than –1.
2. The lower case indicates log-differentiation.
3. The main reason for not using the OECD STAN database is that it provides limited data for the Greek sub-sectors.
4. It is noteworthy that the alternative method of computing the input factor shares by estimating the elasticities of the production function has severe problems concerning the biasness of the relevant coefficients (Basanetti et al. 2008).
5. The bootstrap method involves estimating a model many times using simulated data. Quantities computed from the simulated data are then used to make inferences from the actual data. The estimation of the bootstrap method was suggested by an anonymous referee of this journal in order to provide more accurate estimates of the Lerner indices and the mark-up ratios.
6. Due to space limitations, the point estimates for each of the sub-sectors are available from the author upon request.
7. In the food and beverages sector, Grand Metropolitan acquired Metaxa and the French company food BSN acquired Henninger Hellas in 1989. Also, Nestle and Jacobs Suchard acquired three of the leading Greek confectioners (Loumidis, Ion, Pavlidis) in 1990. Lastly, the Italian food company Barilla purchased the Greek pasta producer, Misko, in 1991 (Rezitis and Kalantzi 2012b).

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