Applied Economics Letters
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/rael20

Empirical estimation of market power in Greece

Michael L. Polemis[a]
[a] Department of Economics, University of Piraeus, Greece and Hellenic Competition Commission, Athens, Greece
Published online: 01 Apr 2014.

To cite this article: Michael L. Polemis (2014): Empirical estimation of market power in Greece, Applied Economics Letters, DOI: 10.1080/13504851.2014.887186

To link to this article: http://dx.doi.org/10.1080/13504851.2014.887186

Applied Economics Letters, 2014
http://dx.doi.org/10.1080/13504851.2014.887186

Routledge
Taylor & Francis Group

Empirical estimation of market power in Greece

Michael L. Polemis

Department of Economics, University of Piraeus, Greece and Hellenic Competition Commission, Athens, Greece
E-mail: mpolemis@epant.gr

The aim of this study is to estimate industry markups for 2-digit Greek manufacturing and services industries over the period 1970 to 2007. The empirical model estimates the markups following the Roeger (1995) methodology, separately for the two industries by using two different panel data econometric techniques. The results are robust revealing that Greek manufacturing and services industry operate in noncompetitive conditions. The findings also support the view that markup ratios vary significantly between the two industries, with services having higher markups than manufacturing.

Keywords: markup ratio; Greece; manufacturing; services

JEL Classification: L10; B41; C13; C23

I. Introduction

The estimation of market power has been of interest to economists for a long time and there is a substantial body of literature devoted to this topic. 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[1] and the markup 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). 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.

The majority of the empirical studies apply Roeger (1995) methodology. This approach extends earlier work by Hall (1988), who uses the definition of marginal costs to estimate the markup ratio (Weiss, 2000). Most of these studies consent that markup ratios exceed unity denoting the absence of competitive conditions in certain sectors/industries (see, for example, Martins *et al.,* 1996; Weiss, 2000; Borg, 2009; Molnar, 2010; Bottini and Molnar, 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.

Despite the great number of empirical studies devoted on this topic, few of them have investigated the competitive conditions of the services industry. Concretely, none of the studies has examined the level of competition in the Greek services sectors. Furthermore, unlike previous studies, we use an array of econometric techniques (ordinary least squares – OLS and two-stage least squares – 2SLS) to test the robustness of the results. This article attempts to contribute to the debate on the estimation of market power, by using a panel data set to determine whether

[1] The index ranges from one to zero, with higher numbers implying greater market power.

there is any link between markup ratios and the level of competition in the Greek manufacturing and services industries.

II. Methodology

Assume that the production function which is homogenous of degree λ is defined by the following neoclassical equation:

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

where Y is output, A is the multifactor productivity growth and there are three basic inputs in the production process. L denotes labour, M is the intermediate inputs and K stands for capital. The inclusion of intermediate inputs allows defining the markup 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 Molnar, 2010). After log-differentiation and rearranging, we get the following equation:

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

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

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

From Equation 3, it is evident that the markup 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:

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

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 (λ = 1), a suitable expression of B can be obtained by the following interpretation:

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

The above equation can be rewritten after adding a disturbance term (ε) as follows:

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

where

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

As the unobservable productivity term, a_i cancels out with this subtraction, Equation 6 is relatively easy to estimate by applying econometric techniques. The interpretation of the variables 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 (million 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. The rental price of capital can be computed by the following equation (Hall and Jorgensen, 1967):

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

where P_i is the fixed asset investment deflator, (i-π_e) denotes the real interest rate and δ is the depreciation rate, which is set at 5% across all sectors (Martins *et al.*, 1996).[3] Markup ratios are estimated by directly computing the relevant input shares (coefficients α_L and a_m).

III. Data and Results

Annual data from 1970 to 2007 were used to estimate the markup ratios. The data covering the Greek manufacturing and services industries at the two-digit level were obtained from the EU KLEMS database, except for the fixed capital deflator and the real interest rate which are taken from the AMECO database. The empirical results are reported in Table 1. More specifically, the estimated markup ratio in the Greek manufacturing is statistically significant and exceeds unity in all of the alternative methodologies, implying that the manufacturing industry in Greece is characterized by significant market power (SMP). This result coincides with other empirical studies (Rezitis and Kalantzi, 2013). However, the magnitude of the relevant coefficients varies significantly ranging from 1.090 to 1.352. This may be attributed to the different econometric methodologies applied for the panel data models.

[2] The lower case indicates log-differentiation.
[3] For P_i, I use the fixed capital deflator for the total economy since sector-specific deflators were not available for Greece.

Table 1. Panel estimation of markup ratios

Values	FE_OLS (1)	RE_OLS (2)	FE_2SLS (3)	RE_2SLS (4)
Panel A				
Manufacturing (23 two-digit sectors)				
Lerner index (L)	0.09* (4.53)	0.08*** (1.84)	0.26* (4.25)	0.10** (1.90)
Markup ratio	***1.095***	***1.090***	***1.352***	***1.116***
Observations	448	448	362	252
Adjusted R^2	0.45	0.52	0.59	0.67
F-statistic	3.53* [0.00]	17.16* [0.00]	4.40* [0.00]	0.08 [0.77]
Hausman test	–	11.11* [0.00]	–	9.02* [0.00]
WF ($L = 0$)	20.52* [0.00]	3.39*** [0.06]	18.13* [0.00]	3.62** [0.05]
Instrument rank	–	–	22	10
D–W statistic	1.80	1.86	1.36	1.08
Panel B				
Services (26 two-digit sectors)				
Lerner index (L)	0.10* (6.55)	0.12* (2.59)	0.11* (6.94)	0.12* (5.58)
Markup ratio	***1.111***	***1.139***	***1.128***	***1.137***
Observations	448	448	362	252
Adjusted R^2	0.63	0.71	0.55	0.41
F-statistic	2.20* [0.00]	9.36* [0.00]	5.65* [0.00]	0.20 [0.65]
Hausman test	–	3.00*** [0.08]	–	87.56* [0.00]
WF ($L = 0$)	42.99* [0.00]	6.72* [0.00]	48.29* [0.00]	31.14* [0.00]
Instrument rank	–	–	25	7
D–W statistic	2.11	1.98	2.22	1.86

Source: Author's elaboration.
Notes: FE_OLS and RE_OLS denote the OLS panel data estimations with fixed and random effects, respectively. FE_2SLS and RE_2SLS provide fixed and random effects estimations when applying the two SLS method. The F-test evaluates the joint significance of the fixed or random effects estimates. WF is the Wald F-statistic which is used to test the hypothesis that the Lernex index (L) is equal to zero. Hausman test evaluates the null hypothesis that there is no misspecification in the random effects estimation. D–W is the Durbin–Watson statistic for first-order autocorrelation. Figures in parentheses denote t-ratios, while figures in square brackets are the reported p-values. *, ** and ***Significant at 1%, 5% and 10% level, respectively. Reported markups estimates are statistically significant at 5% level.

Regarding the relevant diagnostics tests, it is evident that the Hausman test supports the fixed effects (FEs) estimations in all of the specifications. In addition, the Wald statistic (WF) for testing the hypothesis that the Lerner index is equal to zero indicates that the null hypothesis can be rejected at any conventional level of significance implying the presence of noncompetitive conditions for the Greek manufacturing industry over the investigated period.

The results do not vary significantly, when the analysis is focused on the services industry. The magnitude of the markup ratios is larger than one and ranges from 1.111 to 1.139. Comparing the two industries, it is evident that services industry has higher markup ratios than manufacturing in all but one specification (see column 3). This finding can be explained by the fact that many of the services sectors (e.g., transport and storage communication) constitute networks industries, where in general, exhibit higher markups than competitive non-network sectors owing to the existence of sunk cost (Molnár, 2010).

The relevant estimations pass a series of diagnostic tests, where the Hausman test supports the FEs at any conventional level of significance. Lastly, the Wald statistic rejects the null hypothesis at any conventional level of significance, confirming the existence of SMP in the services industry.

IV. Conclusions

In the present study, we applied panel data techniques in order to assess the SMP of the Greek manufacturing and services industry over the period 1970 to 2007. Based on the well-known Roeger (1995) methodology, the empirical model estimated the markup ratio separately for the two industries by using two different econometric techniques (OLS and 2SLS). The empirical results are in alignment with other related studies indicating that both the Greek manufacturing and services industry operate in noncompetitive conditions. The findings also do support the view that markup ratios vary significantly between the two industries, with services having higher markups than manufacturing.

Given the relevant high estimated markups for services, a suitable *ex ante* policy to prevent the market players from the imposition of exploitative practices (i.e., price fixing, abuse of dominant position) is linked with a thorough investigation of mergers and acquisitions. Mergers in services industries (i.e., transportation, telecommunications and banking) that increase market concentration without creating economies of scale may have anticompetitive effects and increase the market power of the incumbents. In such cases where competition is hampered, the government should develop a closely monitoring of the market in order to prevent the marketers from concerted practices.

References

Borg, M. (2009) Measuring market competition in the EU: the mark-up approach, *Bank of Valletta Review*, **39**, 20–31.

Bottini, N. and Molnar, M. (2010) How large are competitive pressures in services markets? Estimation of mark-ups for selected OECD countries, *OECD: Economic Studies*, **3**, 1–51. doi:10.1787/eco_studies-2010-5kmh5x5dbkf8.

Bresnahan, T. F. (1982) The oligopoly solution concept is identified, *Economics Letters*, **10**, 87–92.

Christopoulou, R. and Vermeulen, F. (2012) Markups in the Euro area and the US over the period 1981–2004: a comparison of 50 sectors, *Empirical Economics*, **42**, 53–77.

Hall, R. E. (1988) The relation between price and marginal cost in U.S. industry, *Journal of Political Economy*, **96**, 921–47.

Hall, R. E. and Jorgenson, D. W. (1967) Tax policy and investment behavior, *American Economic Review*, **57**, 391–414.

Martins, J. O., Scarpetta, S. and Pilat, D. (1996) Mark-up ratio in manufacturing industries: estimation for 14 OECD countries, OECD, Working Papers, No 162, OECD, Paris.

Molnár, M. (2010) Measuring competition in Slovenian industries: estimation of mark-ups, OECD Economics Department, Working Papers, No. 787. doi:10.1787/5kmd41bjwr0q-en.

Rezitis, A. and Kalantzi, M. (2013) Measuring the degree of market power in the Greek manufacturing industry, *International Review of Applied Economics*, **27**, 339–59.

Roeger, W. (1995) Can imperfect competition explain the difference between primal and dual productivity measures? Estimates for U.S. manufacturing, *Journal of Political Economy*, **103**, 316–31.

Weiss, R. C. (2000) Mark-ups, industry structure and the business cycle, *Applied Economics Letters*, **7**, 189–91.