OECD Economics Department Working Papers No. 787

Measuring Competition in Slovenian Industries: Estimation of Mark-ups

Margit Molnar

https://dx.doi.org/10.1787/5kmd41bjwr0q-en

OECD

Unclassified **ECO/WKP(2010)43**

Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development **17-Jun-2010**

English - Or. English

ECONOMICS DEPARTMENT

ECO/WKP(2010)43
Unclassified

Cancels & replaces the same document of 11 June 2010

MEASURING COMPETITION IN SLOVENIAN INDUSTRIES - ESTIMATION OF MARK-UPS

ECONOMICS DEPARTMENT WORKING PAPER No. 787

By Margit Molnar

JT03285799

English - Or. English

Abstract/Résumé

Measuring competition in Slovenian industries - estimation of mark-ups

Product market regulation on average is Slovenia does not appear particularly stringent, but heavy state involvement and high market concentration in several industries call for the gauging of competitive pressures in Slovenian industries. Owing to such characteristics, more sophisticated measures than the simple comparison of relative price levels is needed. Mark-ups can provide valuable information on competitive pressures in various sectors of the economy, reflecting pressures stemming from rules of conduct imposed by regulators as well as those arising from such factors as trade and FDI or increasing consumer demands in terms of price and quality. Conversely, the lack of competitive pressure may stem from heavy state involvement in the manufacturing and service sectors. This study is a first attempt to estimate mark-ups for manufacturing and service industries in Slovenia and in addition, its novelty is that it *i)* estimates mark-ups at a detailed level of sectoral disaggregation and *ii)* allows for non-constant returns to scale. The estimation is done for the period 1993-2006 and uses firm level data of the Amadeus database. In general, the estimated mark-ups are higher for services than manufacturing industries, but some manufacturing industries have high mark-ups in international comparison. This Working Paper relates to the 2009 OECD Economic Survey of Slovenia (www.oecd.org/eco/surveys/slovenia).

JEL: D4, D21, L12.
Keywords: competition; market behaviour; firm production; imperfect competition; monopoly; Slovenia.

****

Mesurer la concurrence dans les branches d'activité slovènes - estimation des marges

En moyenne, la réglementation des marchés de produits en Slovénie ne semble pas particulièrement restrictive, mais l'ampleur de l'intervention de l'État et la forte concentration du marché dans plusieurs secteurs requièrent une évaluation des pressions concurrentielles dans les branches d'activité slovènes. Compte tenu de ces caractéristiques, des mesures plus élaborées que la simple comparaison des niveaux de prix relatifs s'imposent. Les taux de marge peuvent être riches d'enseignements sur les pressions concurrentielles qui s'exercent dans divers secteurs de l'économie, reflétant les pressions qui résultent des règles de conduite imposées par les autorités de régulation, ainsi que celles qui découlent de facteurs tels les échanges et l'investissement direct étranger (IDE) ou l'augmentation des exigences des consommateurs en termes de prix et de qualité. Inversement, le manque de pressions concurrentielles peut avoir pour origine l'ampleur de l'intervention de l'État dans les industries manufacturières et les services. Cette étude est une première tentative d'estimer les marges dans les industries manufacturières et les services en Slovénie ; en outre, elle se caractérise par deux nouveautés : *i)* les marges y sont estimées à un niveau de ventilation sectorielle très poussé et *ii)* l'étude tient compte de rendements d'échelle non constants. Cette estimation est effectuée pour la période 1993-2006, à partir de données par entreprise tirées de la base de données Amadeus. En général, les marges estimées sont plus élevées pour les services que pour les industries manufacturières, mais ces dernières affichent dans certains cas des taux de marge élevés en termes de comparaison internationale. Ce document de travail se rapporte à l'Étude économique de l'OCDE sur la Slovénie de 2009 (www.oecd.org/eco/etudes/slovenie).

Classification JEL : D4, D21, L12.
Mots clés: concurrence ; comportement sur le marché ; production des entreprises ; concurrence imparfaite ; monopole : Slovénie.

TABLE OF CONTENTS

Tables

Figures

MEASURING COMPETITION IN SLOVENIAN INDUSTRIES – ESTIMATION OF MARK-UPS

by
Margit Molnar[1]

Introduction

Product market regulation on average is Slovenia does not appear particularly stringent, but heavy state involvement and high market concentration in several industries call for the gauging of competitive pressures in Slovenian industries. Owing to such characteristics, more sophisticated measures than the simple comparison of relative price levels is needed. In the literature, the most commonly used tool to assess competitive pressures in different markets is to compare mark-ups prevailing in those markets. Mark-ups can provide valuable information on competitive pressures in various sectors of the economy, reflecting pressures stemming from rules of conduct imposed by regulators as well as those arising from such factors as increasing consumer demands in terms of price and quality. Trade and FDI are also sources of such pressure. In particular, FDI can be important as very often it is the only source of competitive pressure. Conversely, the lack of competitive pressure may stem from heavy state involvement in the industrial and service sectors.

Mark-ups have some analytical advantages over approaches to assessment of competitive pressures that rely on concentration indices such as the Herfindahl-Hirsch Index. These indices may be misleading in that higher market shares are not necessarily associated with lower competitive pressure; by the same token, in fragmented markets with numerous small players there is not necessarily higher competitive pressure. Mark-ups, in turn, assess the effect of a number of sources of competitive pressure that may not be related to market structures. Mark-ups are also superior to simple price indices in terms of measuring competitive pressures as they take into account input prices.

In lack of available estimates of mark-ups for Slovenian industries, this paper proposes new estimates based on micro-data. Estimation for both manufacturing and service industries allows for testing whether mark-ups are higher in services as in other European countries. The use of micro-data allows for estimation at a detailed sectoral level so that estimates for, for instance, different professional services can be obtained separately. In contrast to industry-level estimates, service industries are more disaggregated in micro-level data. An estimation at a disaggregated level also allows for testing *i)* whether mark-ups are higher in services where customer-specific products prevail and markets are segmented such as engineering services, *ii)* whether mark-ups are lower in services that are more traded such as computer services or business consultancy, *iii)* whether mark-ups are higher in services that require more human capital input such as

1. OECD Economics Department. This Working Paper described the methodology to obtain mark-up estimates in Chapter 4 of the OECD's 2009 Survey of Slovenia which was prepared under the responsibility of the Economic and Development Review Committee. The author is grateful for the valuable comments received on earlier drafts of this text from Andrew Dean, Bob Ford, Pierre Beynet and other colleagues in the Economics Department, as well as for discussions with officials from the Slovenian government. Special thanks go to Desney Erb of the OECD Economics Department for statistical assistance.

accounting *iv)* whether mark-ups are higher in network industries owing to the large sunk and fixed costs these industries have to assume.

The paper is structured as follows: after setting the scene by a snapshot on product market regulation and competitive situations and highlighting the need to estimate mark-ups using firm-level data the estimation method is described along with the data used and finally, the estimates are compared across sectors. A summary of the findings and possible further steps conclude the paper.

A first glance at competitive pressures

Before estimating mark-ups for Slovenian industries, it may be useful to have a glance at possible competitive pressures and the lack thereof as well as some other simpler and rougher measures of competition. State ownership is still dominant in some sectors such as financial services, energy and telecommunications, which also have high market concentration. High concentration is also seen in private-ownership dominated sectors such as the retail food sector. In this section the OECD Product Market Regulation (PMR) indicators in Slovenia are compared with those in OECD countries and relative prices are also scrutinised.

Product market regulation in Slovenia

Product market regulation measured by the OECD PMR indicators (on the construction of the indicator and comparison across OECD member countries see Wölfl *et al.* [2009] and on the extension of the indicators to non-member countries Wölfl *et al.* [2010]) in Slovenia is slightly more stringent than in the average OECD member country (Figure 1) and is roughly at the same level as in France or Korea. As the figure shows, though, there are only six OECD members[2] where product market regulation in general is stronger. The aggregate product market regulation indicator, however, masks large differences in various areas of economic activity. Barriers to entrepreneurship appear low; while state control, in particular the scope of public ownership, government involvement in the infrastructure sector and direct control over businesses appear to be very high in comparison with OECD countries. In fact, among OECD members, only Poland, Italy, Norway and Turkey have a public sector of a larger scope than Slovenia does. Furthermore, only Poland and Sweden extend stronger direct control over businesses than Slovenia does.

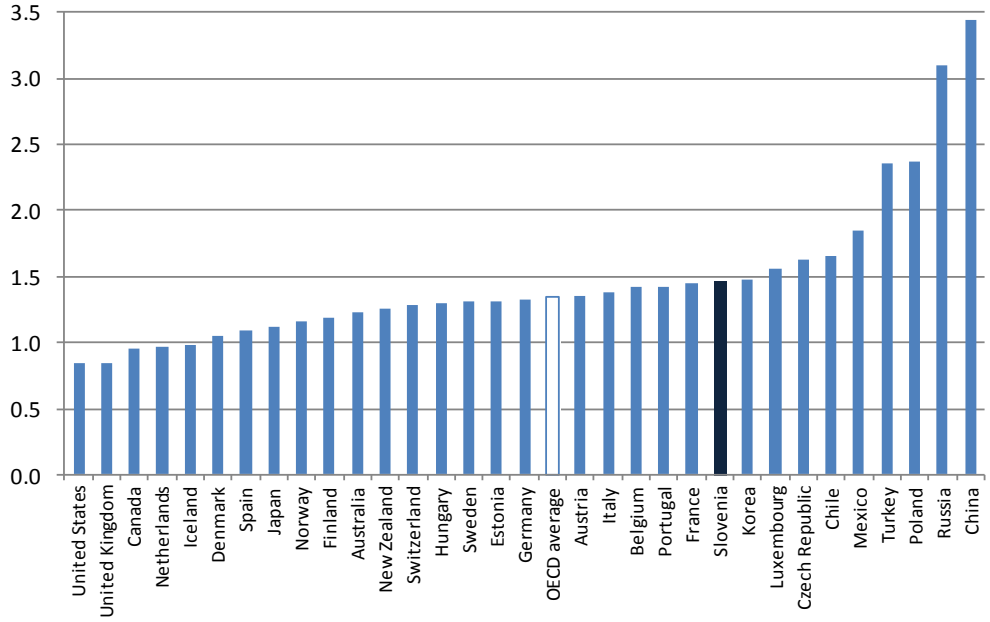
Relative prices

A rather rough, but widely used method of measuring product market competition is to compare relative price and wage levels across countries and sectors (Figure 2). The major drawback of such comparisons, however, is that final prices may not necessarily reflect the extent of competitive pressures only but other country-specific features such as tax systems, distribution systems or input prices, and gross wages include social security contributions that differ by country as well. Nevertheless, relying on these rough indicators, relative to its per-capita income, Slovenia has a low overall price level and a relatively low level of unit labour costs (Dalsgaard, 2008).

2. The indicators are not available for Greece, Ireland and for the Slovak Republic for 2008.

Figure 1. **Product market regulation is slightly more stringent in Slovenia than the OECD average**

Scale of indicators 0-6, from least, to most restrictive, 2008[1]

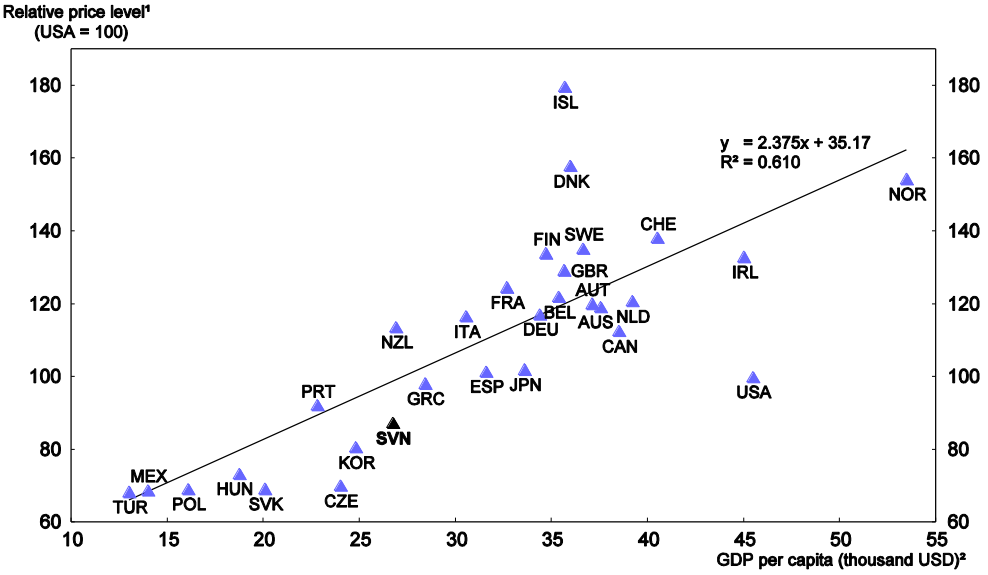


1. The OECD average is an unweighted average of PMR indicators for 27 OECD countries (all 30 members in 2008 excluding Greece, Ireland and the Slovak Republic). Non-OECD countries in 2008, such as other accession countries (Chile, Estonia and Russia) and an enhanced engagement country (China) are included for the sake of comparison.

Source: OECD (2009), *International regulation database, www.oecd.org/eco/pmr.*

Figure 2. **Relative price levels**

2007



2. Purchasing power parities divided by the exchange rate.
3. At current prices and current purchasing power parities.

Source: OECD (2009), *National Accounts of OECD countries – online database*, April.

New mark-up estimates using firm-level data

There is an abundant literature on estimating mark-ups, but most studies are constrained to manufacturing industries and use industry-level data and very few cover services industries. The use of firm-level data in the analysis that follows allows for a high-level of disaggregation of sectors and also for the exploitation of information in a manner that is not possible in the case of industry-level data. Also, using firm level data avoids measurement problems related to input and output measures at the sectoral level. At the same time, there are also drawbacks to using firm-level data, in particular the limited length of available time series. Also, due to constraints in the data drawn from the Amadeus database (the main data source for the present study), mark-ups can only be estimated for sectors where there are a sufficient number of firms. In addition, dealing with micro-data implies much higher work intensity in the estimation of mark-ups and constrains the choices of estimation methods and software used.

How are the estimates obtained?

Developments in the theoretical and empirical literature over the past decades suggest a departure from the standard assumptions of the neoclassical production theory in terms of perfect competition and constant returns to scale. This departure allows for the assumption of monopolistic firms charging mark-ups over marginal costs and opens up new avenues for the estimation of such mark-ups. Here the Roeger (1995) method is applied, which has been widely used owing to its simplicity.

Roeger (1995) explains the difference between the primal and the dual Solow residuals as a result of imperfect competition and his method has the beauty of simplicity relative to the method pioneered by Hall (1988), overcoming the need to use variables in volumes and to apply instrumental variables technique. Roeger (1995) exploits the cancelling out of the unobservable productivity term (present in both residuals) when subtracting the two Solow residuals from each other. This way, the price-cost margins can be estimated consistently by standard econometric techniques. The results obtained this way are mark-ups over average cost and not marginal cost.

The production technology is assumed to be defined by the neoclassical production function:

$$Y = AF(N, K) \qquad (1)$$

where Y is output, A is multifactor productivity growth, there are two inputs: N is labour and K is capital and $F(.)$ is a homogenous function of degree λ (the degree of returns to scale). The firm and year subscripts are subsumed for the sake of simplicity. After log-differentiation[3] and re-arranging:

$$SR_{primal} = y - \alpha_N n - \alpha_K k = (1 - B)a - B(y - k) \qquad (2)$$

where SR_{primal} is the primal Solow residual, the lower case indicates log-differentiation, α_i α_i is the revenue share of factor i and B is the Lerner index, which is closely related to the mark-up μ:

$$B = 1 - \frac{1}{\mu} \qquad (3)$$

where μ is defined as price over marginal cost.

3. Through differentiation, the growth rate of output can be related to the growth rates of inputs, *i.e.* capital, and labour.

The dual, or priced-based Solow residual is derived by using the cost-function associated with the production function in equation (1).

$$SR_{dual} = \alpha_N w + \alpha_K r - p = (1-B)a - B(p-r) \quad (4)$$

where w is the growth rate of wages, r is of the rental price of capital and p is of output. By subtracting (4) from (2) and adding an error term, B can be estimated as Roeger (1995) showed. As the unobservable productivity term, a cancels out with this subtraction, this equation is relatively easy to estimate. 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.

After differentiation and under the assumption of constant returns to scale (λ=1) the equation to estimate (after adding an error term) is obtained:

$$(p+y) - \alpha_N (w+n) - (1-\alpha_N)(r+k) = B[(p+y) - (k+r)] \quad (5)$$

where the first term in the left-hand side is nominal output, the second is wage cost multiplied by the estimated coefficient on labour α_N from the production function, and the third is the rental price of capital multiplied by the estimated coefficient on capital (1-α_N), all in differences. The totality of the left-hand side is the Solow residual with variables measured in nominal terms. In the right hand-side, B is the Lerner index ((Price-Average Cost)/Price) to estimate, which can be used to compute the mark-ups according to equation (3).

The equation to estimate is a simplified version of equation (5):

$$\Delta z = B\Delta x + \varepsilon \quad (6)$$

where

$$\Delta z = (p+y) - \alpha_N (w+n) - (1-\alpha_N)(r+k) \quad (7)$$

$$\Delta x = (p+y) - (k+r) \quad (8)$$

and ε is the error term.

Oliveira Martins *et al.* (1996) show that the equation to estimate the mark-up can also be derived from the direct definition of the mark-up over average cost:

$$\frac{P}{AC} = \frac{P*Y}{(W*N + R*K)} = \frac{\mu}{\lambda} \quad (9)$$

where AC is average cost, P, W, and R are the prices of output, labour and capital, respectively, whereas λ is an index of returns to scale (*i.e.* average costs over marginal costs) and μ is the mark-up.

By differentiating, dividing by P*Y and rearranging:

$$\Delta z = [\lambda(B-1)+1]\Delta x + \varepsilon \qquad (10)$$

where Δz and Δx are defined as earlier. Oliveira Martins et al. (1996) demonstrate that Roger's equation provides an unbiased estimate of the Lerner index B only in the case of constant returns to scale (λ=1). Indeed, in the presence of increasing returns to scale, the mark-up estimation would be downward biased (marginal cost<average cost) and the reverse holds in case of decreasing returns to scale (marginal cost>average cost).

Following Dobrinsky *et al.* (2004), to estimate the mark-ups under non-constant returns to scale, the returns to scale index, λ was estimated from the production function, and the new mark-up computed from the Lerner index obtained in the case of constant returns to scale is:

$$B' = 1 - \frac{\lambda}{\mu} \qquad (11)$$

Data

Most of the data are obtained from a subset of the Amadeus database comprising over 5400 Slovenian companies. The dataset contains firms' balance sheets and profit and loss accounts and information on stocks, shareholders, subsidiaries and activities. Company-specific nominal data needed for the estimation of the production function and the mark-ups are directly obtained from the Amadeus database. For the output variable, operating revenue is used as value-added can only be interpreted as an output measure under perfect competition (Basu and Fernald, 1997) and there are more observations for operating revenue than for sales. Moreover, defining the mark-up over value added can introduce an upward bias in estimation (Norrbin 1993). For labour, the number of employees is used and for capital, fixed assets. For Slovenia, unlike for other EU countries in the Amadeus database, no material cost data are available. For wages, there is a straightforward variable to use. The rental price of capital is calculated from the following equation:

$$R = ((i - \pi_e) + \delta)\, pk \qquad (12)$$

where i is the long term interest rate, π_e is expected inflation and δ is the depreciation ratio and pk is the fixed asset investment deflator. For the calculation of the rental price of capital, the yield on benchmark government 10 year bonds are used from the Statistic Office of the Republic of Slovenia SI-Stat database; expected inflation is proxied by the Hodrick-Prescott-filtered GDP deflator, which is also extracted from the Statistic Office of the Republic of Slovenia SI-Stat database. The depreciation ratio is company-specific and is calculated from the depreciation costs available in the Amadeus database. For the fixed-asset investment deflator, sector-specific deflators are used from the OECD STAN database.

The Amadeus database classifies firms into 4-digit and 2-digit NACE categories. Due to the limited number of companies in several countries at the 4-digit level, the industries were reclassified into a mix of 2- and 4-digit NACE categories, avoiding overlap. A particular feature of this work is the disaggregation of the business service category into its sub-components. Indeed, while computer and related activities, research and development, legal, accounting, advertising, engineering and architecture services present certain common features (they are small in size and knowledge- and reputation-based activities), they cannot be treated as a homogenous group given that the degree of market segmentation for these services and their interface with technology, *inter alia*, differs largely. As a result, mark-ups were estimated for 37 sectors, from which are 20 manufacturing including food and beverages; textiles; apparel; leather;

wood; pulp and paper; printing and publishing; chemicals; rubber; other minerals; basic metals; fabricated materials; machinery; office machinery; electronic machinery; radio equipment; medical equipment; cars; other transport vehicles and furniture and for 17 service industries including construction; car sale and gasoline retail; wholesale trade; retail trade; hotels and restaurants; land transport; other transport activities; real estate; computer and related activities; research and development; other business services; accounting services; market research; business management; management of holding companies; engineering and architecture services and other services.

Choices of estimation and specification techniques

Mark-ups are estimated using the ordinary least squares (OLS) method with fixed effects to obtain the input coefficients. The factor shares were also computed as in Görg and Warzynski (2003), but very likely owing to measurement errors, the estimates were implausibly large, therefore are not reported in this paper. The OLS fixed-effects method assumes that productivity that influences firms' choice is a time-invariant firm-specific attribute and corrects for it by including firm fixed effects.[4] It should be noted, that the estimated elasticities are equivalent to factor shares only in the case of constant returns to scale (see Annex A1), thus in the case of non-constant returns to scale, this can be a source of bias. The OLS fixed effects method can produce sector estimates, while computed factor shares are obtained at the firm level. In the second step, Lerner indices were jointly estimated for all sectors. The Lerner indices were estimated by OLS with fixed effects and year dummies. The mark-ups were then retrieved from equation (3) and the corresponding standard errors were computed by the delta method as in Görg and Warzynski (2003).

Two specifications were applied: *i)* assuming constant returns to scale (to obtain the Lerner index, *B*) and *ii)* relaxing the constraint of constant returns to scale (to test for the validity of the assumption of constant returns to scale). The validity of the assumption of constant returns was checked by econometric tests and where constant returns were rejected, this constraint was relaxed and the return to scale index was introduced to correct for the estimation bias.

Relaxing the assumption of constant returns to scale

Constant returns to scale may not hold for all industries, hence its validity needs to be tested. The hypothesis of constant returns to scale was rejected for several groups; therefore the mark-ups were re-estimated under the relaxation of the assumption of constant returns as in Dobrinsky *et al.* (2004). More specifically, the returns to scale index was first derived as a function of the estimated input coefficients, then the mark-up estimates obtained from equation (6) were adjusted according to equation (11). The standard errors for the mark-ups under non-constant returns to scale were obtained using the delta method.

Equation (7) implies that all firms in the same NACE-2- and NACE-4-digit industries have the same returns to scale index and hence the same production technologies. This would be quite a plausible assumption under perfect markets where all firms have the same production efficiency as less efficient firms are driven out of the market by competition. In imperfect markets, however, production technologies may differ and hence there may be varying returns to scale indices across firms in the same industry. As the magnitude of the returns to scale index is an empirical issue, and the empirical literature suggests that firms of similar sizes may have similar magnitudes of the index (Dobrinsky *et al.* 2004), the inclusion of only large firms in the sample may justify this assumption.

4. Superior techniques such as the Levinsohn-Petrin method could also be employed to estimate the input coefficients of the production function. In that case, however, the estimation would need to proceed by sector, as the estimation procedure does not allow for estimating sector specific coefficients for pooled data.

How large are the estimates and how do they compare across sectors?

There are no priors as to the magnitudes of mark-ups except that they are expected to be larger than 1. This is due to the fact that the demand curve faced by a monopolist is downward sloping and the elasticity of demand for a downward-sloping demand curve is negative. The mark-up and the elasticity of demand η are related the following way:

$$\mu = \frac{1}{1+\frac{1}{\eta}} \qquad (13)$$

The mark-ups thus are calculated from equation 11 and the standard errors are obtained through the delta method. Although originally there were firms in 51 sectors, owing to the small number of firms in some sectors, too short time series for the variables and data quality (see Annex A2 for data cleaning issues), mark-ups for 37 sectors were obtained, including 20 manufacturing and 17 service industries. From the 5 412 firms present in the Amadeus database, only 3 446 were used for the estimation of mark-ups as many firms did not have the full set of variables necessary for the estimation available. In some sectors, such as gas, electricity and hot water; financial intermediation and legal services, there were too few firms in the database to obtain estimates for the Lerner indices (Table 1). In other industries, the variables necessary for the estimation of Lerner indices were not readily available. For instance, no deflator for fixed assets investments is available separately for post and telecommunications industries.[5] Most estimates of the Lerner index, where available, are highly significant except tobacco manufacturing, air transport and market research, where the small sample size may have an influence on the level of significance.

Once the Lerner indices are obtained, the hypothesis of constant returns to scale of the production function was tested (Table 2). Among manufacturing industries, half exhibit constant returns to scale (the hypothesis of constant returns could not be rejected at the 1% level of significance), while among services more than half. This is slightly different from the results for service industries in OECD countries as in Molnar and Bottini (2010), moreover, at a higher level of tolerance with regard to the level of significance, even more service industries would show constant returns to scale. Those industries, for which the hypothesis of constant returns to scale was rejected, largely exhibit decreasing returns to scale, similarly to OECD countries. The only industry with increasing returns to scale is real estate. Nishimura *et al.* (1999) show that the uniformity of returns to scale across a certain industry is a very strong assumption as there is a large diversity among firms in terms of scale, production technology and profitability. This implies that estimation of mark-ups should be done at the firm level, allowing firm-specific market and technological conditions. Given data constraints, however, very few studies, including that by Nishimura *et al.* (1999) estimate mark-ups at the firm level.

On average, mark-ups in Slovenian industries do not appear particularly high in comparison with OECD countries,[6] but the average masks large differences across sectors. The lack of competitive pressure allows for high mark-ups in a number of sectors (Table 3 and Figure 3, panel A). Mark-ups are probably the best available measure of competition and high mark-ups are an indication of weak competitive pressure stemming from *inter alia* a combination of excessive product market regulation, or the lack of regulation in case of dominant players, or the lack of competition from foreign exporters or investors.

5. Given the very different capital-intensity and type of capital for post and courier services compared to telecommunications, it was preferred to drop these industries from the sample rather than estimating the Lerner indices with the available common deflator for fixed asset investment.

6. Any cross-country comparison should be done with care as for Slovenia only a 2-input (labour and capital) production functions could be estimated, while for OECD members also materials were included among the inputs. This leads to measurement errors in labour and capital revenue shares when assuming constant returns to scale. As Christopoulou and Vermeulen (2008) showed, measurement errors in labour only lead to inefficient estimates, but those in capital result in upward bias in the estimated mark-ups.

Table 1. **Statistics for the regression estimating the Lerner indices**

NACE	Sectors	Coefficient	Standard erro	t-value	p-value	[95% conf.	interval]
1500	Food and beverages	0.76***	0.03	28.52	0	0.71	0.82
1600	Tobacco	0.16	0.31	0.52	0.602	-0.45	0.78
1700	Textiles	0.67***	0.02	34.58	0	0.63	0.71
1800	Garments	0.41***	0.05	8.81	0	0.32	0.50
1900	Leather	0.45***	0.06	7.89	0	0.34	0.56
2000	Wood	0.43***	0.03	12.77	0	0.37	0.50
2100	Pulp and paper	0.30***	0.05	6.57	0	0.21	0.40
2200	Printing and publishing	0.52***	0.03	19.4	0	0.47	0.58
2300	Coke	(dropped)					
2400	Chemicals	0.35***	0.04	9.86	0	0.28	0.41
2500	Rubber and plastics	0.37***	0.02	15.38	0	0.33	0.42
2600	Other non-metallic minerals	0.55***	0.02	22.42	0	0.50	0.60
2700	Basic metals	0.43***	0.04	10.3	0	0.35	0.52
2800	Fabricated metal products	0.40***	0.02	26.02	0	0.37	0.43
2900	Machinery	0.52***	0.02	21.87	0	0.47	0.56
3000	Office machines and computers	0.42***	0.09	4.69	0	0.24	0.59
3100	Electrical machinery	0.70***	0.03	21.2	0	0.64	0.77
3200	Radio and television	0.32***	0.04	8.18	0	0.24	0.40
3300	Medical and optical instruments	0.70***	0.04	17.46	0	0.62	0.78
3400	Motor vehicles	0.61***	0.03	21.93	0	0.55	0.66
3500	Other transport equipment	0.28***	0.09	3.21	0.001	0.11	0.45
3600	Furniture and n.e.c.	0.46***	0.03	15.83	0	0.40	0.51
3700	Recycling	0.91***	0.07	13	0	0.77	1.05
4000	Electricity, gas, steam and hot water	(dropped)					
4100	Collection, purification and distribution of water	0.67***	0.10	6.84	0	0.48	0.86
4500	Construction	0.62***	0.02	40.14	0	0.59	0.65
5000	Sale, maintenance, etc.	0.51***	0.02	27.67	0	0.48	0.55
5100	Wholesale trade, etc.	0.55***	0.01	77.55	0	0.53	0.56
5200	Retail trade	0.47***	0.01	32.2	0	0.44	0.50
5500	Hotels and restaurants	0.69***	0.07	9.65	0	0.55	0.82
6000	Land transport	0.71***	0.02	31.17	0	0.67	0.75
6100	Water transport	0.44***	0.12	3.54	0	0.20	0.68
6200	Air transport	0.35	0.45	0.79	0.43	-0.53	1.24
6300	Supporting, etc.	0.67***	0.02	29.74	0	0.63	0.72
6500	Financial intermediation	(dropped)					
6700	Auxiliary activities to financial intermediation	1.22***	0.18	6.75	0	0.87	1.58
7000	Real estate	0.70***	0.02	28.25	0	0.65	0.75
7100	Renting of machinery and equipment	0.90***	0.10	9.47	0	0.72	1.09
7200	Computer activities	0.50***	0.03	14.54	0	0.44	0.57
7300	Research and development	0.74***	0.13	5.62	0	0.48	0.99
7400	Other business activ.	0.59***	0.04	13.41	0	0.50	0.68
8000	Education	(dropped)					
6410	Post and courier activities	(dropped)					
6420	Telecommunications	(dropped)					
7411	Legal services	(dropped)					
7412	Accounting, etc.	0.49***	0.06	8.4	0	0.38	0.61
7413	Market research, etc.	0.07	0.13	0.57	0.567	-0.18	0.33
7414	Business and management consultancy	0.65***	0.03	20.48	0	0.59	0.71
7415	Management activities of holding companies	0.75***	0.05	14.67	0	0.65	0.85
7420	Architectural and engineering activities	0.62***	0.02	37.15	0	0.59	0.65
7599	Other services	0.51***	0.03	14.68	0	0.44	0.57
dummy_1994		(dropped)					
dummy_1995		(dropped)					
dummy_1996		(dropped)					
dummy_1997		(dropped)					
dummy_1998		(dropped)					
dummy_1999		-0.01	0.01	-0.87	0.385	-0.02	0.01
dummy_2000		0.10***	0.01	13.6	0	0.08	0.11
dummy_2001		0.03***	0.01	4.52	0	0.02	0.05
dummy_2002		0.02***	0.01	3.06	0.002	0.01	0.04
dummy_2003		-0.02***	0.01	-2.92	0.003	-0.03	-0.01
dummy_2004		0.01	0.01	1.57	0.116	0.00	0.03
dummy_2005		0.00	0.01	0.42	0.672	-0.01	0.02
dummy_2006		(dropped)					
Constant		-0.03***	0.01	-6.67	0	-0.05	-0.02
No. of observations		19531					
No. of firms		3446					
R-squared		0.5654					
F-test all u_i=0		1.12					
p-value		0					

Note: ** and *** indicate statistical significance at the 5% and 1% level, respectively. The Lerner indices were estimated by ordinary least squares with firm and year fixed effects.

Source: Author's estimation.

Table 2. **Testing the hypothesis of constant returns to scale (F-test)**

NACE	Sectors	Returns to scale	Test statistic	p-value
1500	Food and beverages	0.91	1.98	0.16
1700	Textiles	0.52	45.02	0.00
1800	Garments	0.65	22.65	0.00
1900	Leather	0.80	2.43	0.12
2000	Wood	0.81	4.32	0.04
2100	Pulp and paper	0.94	0.26	0.61
2200	Printing and publishing	0.69	22.15	0.00
2400	Chemicals	0.63	13.99	0.00
2500	Rubber and plastics	0.88	6.64	0.01
2600	Other non-metallic minerals	1.07	0.72	0.40
2700	Basic metals	0.94	0.45	0.50
2800	Fabricated metal products	0.71	68.99	0.00
2900	Machinery	0.69	54.82	0.00
3000	Office machines and computers	1.08	0.20	0.66
3100	Electrical machinery	0.83	8.77	0.00
3200	Radio and television	1.12	1.50	0.22
3300	Medical and optical instruments	0.75	7.50	0.01
3400	Motor vehicles	0.64	24.45	0.00
3500	Other transport equipment	0.55	4.07	0.04
3600	Furniture and n.e.c.	0.67	37.36	0.00
4500	Construction	0.74	39.10	0.00
5000	Sale, maintenance, etc.	0.66	40.98	0.00
5100	Wholesale trade, etc.	0.77	211.71	0.00
5200	Retail trade	0.90	8.41	0.00
5500	Hotels and restaurants	0.72	3.76	0.05
6000	Land transport	0.98	0.08	0.77
6300	Supporting, etc.	1.02	0.02	0.88
7000	Real estate	1.44	7.31	0.01
7200	Computer activities	0.87	3.38	0.07
7300	Research and development	0.53	3.22	0.07
7400	Other business activ.	0.86	2.29	0.13
7412	Accounting, etc.	1.43	3.36	0.07
7413	Market research, etc.	1.00	0.00	1.00
7414	Bus. and man. consultancy activ.	0.73	7.36	0.01
7415	Man. activ. of holding companies	0.80	3.46	0.06
7420	Architectural, etc	0.88	4.61	0.03
7599	Other	1.12	0.89	0.34

Note: Values for the returns to scale index, F-statistics for checking the hypothesis of constant returns to scale, i.e. whether the returns to scale index is significantly different from 1 and the power of the test statistic expressed as a p-value.

Source: Author's estimation.

The estimated mark-ups confirm large heterogeneity across sectors (Table 3 and Figure 3, panel A). This is not surprising given that sector-specific characteristics affect the mark-ups companies can charge over average costs and that the forces driving competition – and hence reducing mark-ups – vary across sectors. Notwithstanding this heterogeneity in the estimated mark-ups, some general trends can be identified. It should be noted that any cross-sectoral comparison should be done with care as mark-ups may be subject to sector-specific measurement errors or other sector specificities (such as varying risk *premia* included in the cost of capital), which are only partly accounted for in the fixed-effect specification. With this caveat in mind, the highest mark-ups are observed in real estate (Table 3 and Figure 3), which is characterised by high level of asymmetric information between suppliers and customers giving rise to

pricing powers by suppliers. Indeed, owing to the high degree of information asymmetry, the price of a service is not serving as a device to infer the quality of the service and consumers need more information to make a decision. In this case, regulation may reduce the information asymmetry and the consequent transaction costs and enhance transactions (Molnár *et al*., 2008). In addition to such economic reasons, there is a possibility of upward bias induced by measurement errors of capital (as pointed out in Christopoulou and Vermeulen [2008]), which, given higher capital intensity of this sector, may be higher. Measurement error of capital, however, should not be as large as in the case of industry-level data, which owner-occupied housing, a component highly susceptible to measurement error.

Table 3. **Mark-up estimates for Slovenian industries**

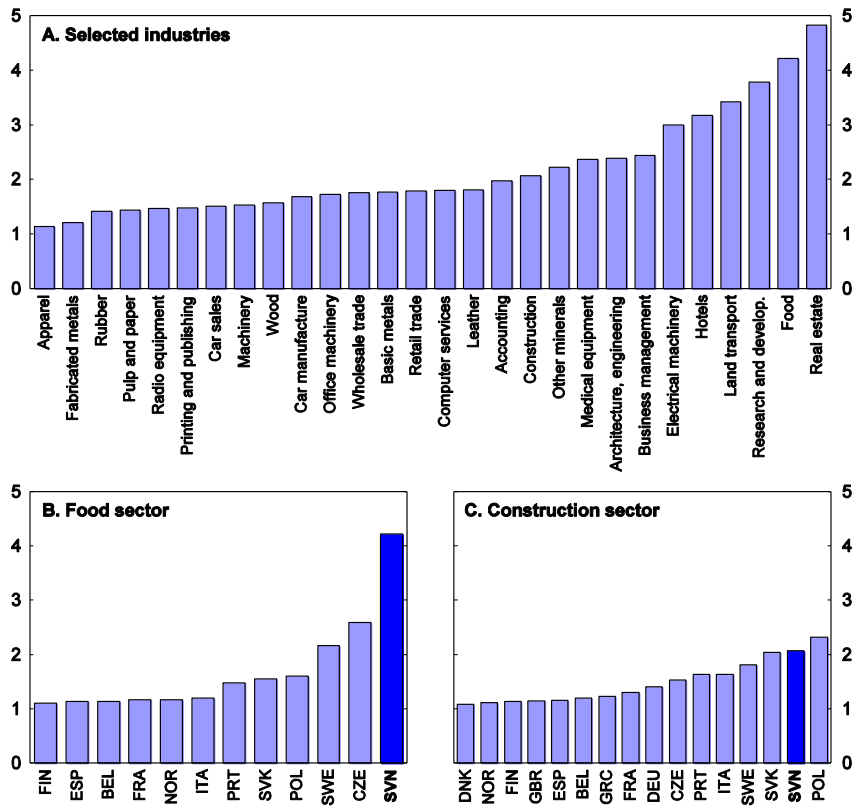
		Ordinary least squares				
NACE	Sectors	Fixed effect with year dummies	Standard error	t-value	P>|t|	CRS
1500	Food and beverages	4.22***	0.48	8.86	0	1
1700	Textiles	0.96***	0.03	31.83	0	0
1800	Garments	1.13***	0.08	14.27	0	0
1900	Leather	1.81***	0.18	9.78	0	1
2000	Wood	1.57***	0.09	17.47	0	1
2100	Pulp and paper	1.44***	0.10	15.02	0	1
2200	Printing and publishing	1.48***	0.07	19.74	0	0
2400	Chemicals	0.93***	0.04	21.91	0	0
2500	Rubber and plastics	1.41***	0.05	29.26	0	1
2600	Other non-metallic minerals	2.21***	0.12	18.46	0	1
2700	Basic metals	1.76***	0.13	13.47	0	1
2800	Fabricated metal products	1.21***	0.03	43.75	0	0
2900	Machinery	1.53***	0.07	21.82	0	0
3000	Office machines and computers	1.72***	0.26	6.51	0	1
3100	Electrical machinery	3.00***	0.31	9.57	0	0
3200	Radio and television	1.47***	0.08	17.44	0	1
3300	Medical and optical instruments	2.36***	0.26	9.06	0	0
3400	Motor vehicles	1.68***	0.11	15.58	0	0
3500	Other transport equipment	0.95***	0.13	7.52	0	1
3600	Furniture and n.e.c.	1.59***	0.09	16.90	0	0
4500	Construction	2.07***	0.08	26.42	0	0
5000	Sale, maintenance, etc.	1.51***	0.06	27.14	0	0
5100	Wholesale trade, etc.	1.76***	0.02	70.97	0	0
5200	Retail trade	1.79***	0.05	39.55	0	0
5500	Hotels and restaurants	3.18***	0.72	4.44	0	1
6000	Land transport	3.42***	0.24	14.44	0	1
6300	Supporting, etc.	3.07***	0.21	14.37	0	1
7000	Real estate	4.82***	0.35	13.82	0	0
7200	Computer activities	1.79***	0.11	15.96	0	1
7300	Research and development	3.78**	1.87	2.02	0.01	1
7400	Other business activ.	2.45***	0.26	9.28	0	1
7412	Accounting, etc.	1.97***	0.23	8.67	0	1
7413	Market research, etc.	1.08***	0.15	7.10	0	1
7414	Bus. and man. consultancy activ.	2.44***	0.23	10.76	0	0
7415	Man. activ. of holding companies	4.02***	0.83	4.85	0	1
7420	Architectural, etc	2.39***	0.09	25.22	0	1
7599	Other	2.02***	0.14	14.36	0	1

Note: ** and *** indicate statistical significance at the 5% and 1% level, respectively. Mark-ups were estimated by ordinary least squares with firm and year fixed effects. Standard errors were computed by the delta method. CRS indicates whether there are constant returns to scale in the sector (1=yes, 0=no) based on the test results. Non-constant returns to scale is indicated if the hypothesis of constant returns was rejected at the 1% level.

Source: Author's estimation.

While mark-ups tend to be higher everywhere in highly-regulated and less tradable services industries, in Slovenia, high mark-ups are observed even in some manufacturing industries, in particular food and beverages. Mark-ups in this sector are substantially higher in Slovenia than in other transition economies (Figure 3, Panel B), where mark-ups tend to be high in general. Vertical integration of retailers and food processors allows for high mark-ups that can be passed on to consumers in the form of higher prices owing to high concentration in the retail food sector (75-85% of market share by the three largest players if including franchises) and to occasional symptoms of collusive behaviour among players (OECD, 2009).[7] Another possible explanation for the high mark-ups in the food and beverages sector may be the very high specialisation in high-value-added sub-segments such as fruits and vegetables, which allows for charging higher mark-ups. Only Poland, Hungary and Bulgaria are more specialised in this sub-sector relative to the EU-27 than Slovenia is. In addition, part-time employment in this sector is higher in Slovenia[8] (along with the Czech Republic and Germany) than in the non-financial business economy, which may result in an overestimation of the share of labour, thereby inducing an upward bias in the explanatory variable for the mark-up (more exactly for the Lerner index) estimation. As Christopoulou and Vermeulen (2008) showed, however, this may only lead to inefficient albeit not biased estimate.

Figure 3. **Estimated mark-ups in selected sectors**[1]



1. Mark-ups are estimated using firm-level data over 1993-2006 and are expressed as a ratio over average cost.

Source: Molnar, M. (2009), "Measuring Competition in Slovenian Industries – Estimation of Mark-ups", *OECD Economics Department Working Paper*, forthcoming and Molnar, M. and N. Bottini (2008), "How Large are Competitive Pressures in Services Markets? – Estimation of Mark-ups for Selected OECD Countries", paper presented at the OECD Technical Workshop on Trade Barrier Assessment Methodology, 12 December.

7. Not surprisingly, mark-ups in retail and wholesale trade are also higher than in most OECD countries.

8. European Commission: *European Business Facts and Figures: Food, beverages and tobacco*, January, 2008.

Mark-ups are also high in some tradable services industries, such as construction (Figure 3, Panel C), which registers one of the lowest mark-ups among services in OECD countries, but not in Slovenia. High concentration in the construction sector and the growth of construction output outpacing that of GDP in the past years have allowed construction firms to charge high mark-ups.

Mark-ups are also relatively high in professional services, where human capital is a major input, reputation is a key asset and most products are customer-specific, hence markets are segmented. In segmented markets, suppliers have a certain degree of monopoly due to switching costs that are manifest in discretionary price settings. Mark-ups in architectural and engineering activities are high, but not in comparison with Central European OECD members (as in Molnár and Bottini [2010]). Mark-ups estimated for accounting services also appear relatively high, reflecting relatively low tradability of accounting services. Owing to local qualification and licensing requirements and the differences in accounting standards across countries, very often the large international accounting firms formed partnerships with local firms to overcome the effects of such national regulations (WTO, 1998a). Professional services are inherently competitive services and the exceptionally high mark-ups in this sector may indicate inadequate competitive pressure. Unnecessary regulation and the recognition of qualifications may give a particular boost to firms' pricing power in this sector.

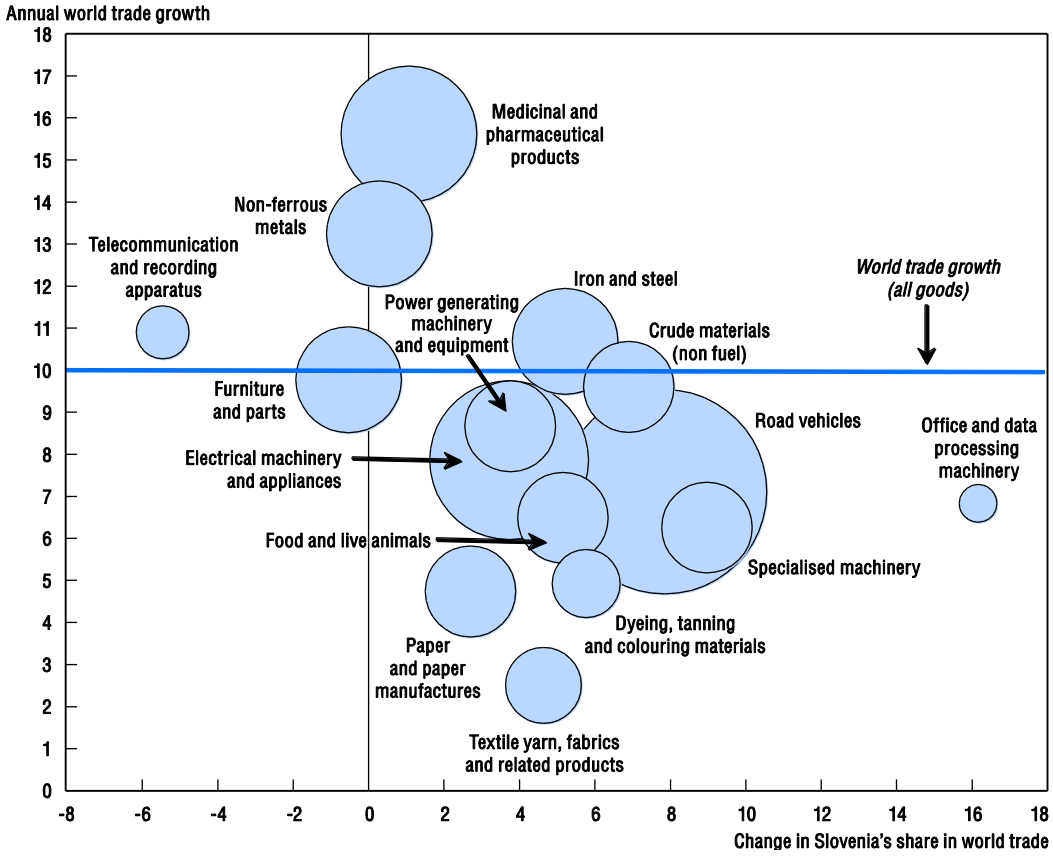
Network industries, in general, exhibit higher mark-ups than inherently competitive non-network services owing to the large sunk and fixed costs these industries have to assume. Networks can also deliver valuable network externalities. Such features of network industries may inhibit the development of competitive markets. Given the small number of firms in the dataset in most network industries, mark-ups were estimated for only land transport and they show little competitive pressure in this market in contrast to OECD countries. Mark-ups are low in highly traded services such as computer services as well as trade-related activities, implying large competitive pressure in these industries.

In lack of other mark-up estimates, comparison is not possible but some caveats need to be kept in mind. First of all, the overrepresentation of large firms in the Amadeus introduces sample selection bias and given the nature of different industries, this bias differs by industry. Furthermore, the different relative importance of large firms and different coverages of the Amadeus database across countries imply limited comparability. The estimated mark-ups tend to be bigger in countries where the extent of overrepresentation of large firms is larger. As in other Central European countries, this causes and upward bias in Slovenia as well. Measurement errors are another source of bias. In particular measurement errors in capital, as pointed out by Christopoulou and Vermeulen (2008) always lead to an upward bias. A further source of bias is related to the way the factor shares are derived, which also tends to bias the estimates upwards in general as in the case of non-constant returns to scale, decreasing and not increasing returns are observed. Thus the adjustment for non-constant returns to scale introduces an upward bias, which seems to be higher in some industries.

High mark-ups may be supported by the domestic market in lack of competition, but may have an adverse impact on export performance. In some of the sectors, where Slovenia is gaining market share, in particular in the most successful industry, medicine and pharmaceuticals, mark-ups are very low (Table 3 and Figure 4). Although there is no clear correlation between the level of mark-ups and export performance, exporting itself may be a source of competitive pressure. In some high mark-up sectors such as food products and electrical machinery, Slovenia has lost market share over 1997-2007.

Figure 4. **Slovenia's export performance in selected commodities**

Per cent, 1997-2007



1. Commodities based on SITC Rev.3 classification; those shown represent 64% of total exports in 2007. The size of the bubble indicates the share of the sector in total exports in 2007.

Source: OECD (2009), *International Trade by Commodity Statistics*, ITCS online database, January.

Product market competition: room for reducing mark-ups in some sectors

This paper is a first attempt to gauge competitive pressures in Slovenian industries. In general, the estimated mark-ups were high for industries where high degree of information asymmetry prevails and products are customer specific such as real estate, but surprisingly, they were also high in some industries, such as food and beverages, which exhibit low mark-ups in other countries. Mark-ups also appeared high in transport, catering and professional services, while mark-ups tended to be substantially lower for most manufacturing industries and traded services and industries that produce more standardised products such as construction, computer services and retail and wholesale trade. Some industries exhibit non-constant returns to scale, hence the relaxation of the constant returns to scale assumption was necessary. The study highlighted some sources of potential bias related to sample selection, measurement error and production technology (returns to scale).

High mark-ups in some sectors call for a reduction of state control, in particular state ownership, including through privatisation with a clear strategy and calendar. This would open up opportunities to foreign direct investment, which is lagging behind other regional peers and which could help exerting competitive pressure in product and service markets. Trade can also be a source of competitive pressure in product and service markets. Import competition may in particular play a role in squeezing margins in

industries that produce tradable goods and similarly, competing in export markets may also impose a certain degree of pressure on margins. Direct involvement of the government in businesses may also hamper competition, hence ways to improve the governance of state enterprises should be explored. A more independent Competition Protection Office could also play a more pro-active role in boosting competition.

The methodology applied could also be further refined, for example, by using the Levinsohn-Petrin method to obtain the input coefficients of the production function. Some of the measurement errors could also be reduced. In addition, in future analyses, competitive pressures stemming from regulation could be delineated from other pressures stemming from other sources using the newly estimated mark-ups.

Bibliography

Basanetti, A., R. Torrini and F. Zollino (2008), "Changing institutions and productivity across Europe"; Paper presented at the final conference of the EU KLEMS project on "Productivity in the European Union: A Comparative Industry Approach, University of Groningen (the Netherlands), June 2008.

Basu, S. (1995), "Intermediate Goods and Business Cycles: Implications for Productivity and Welfare", *American Economic Review 85.*

Basu, S. and J. Fernald (1997), "Returns to scale in US production: Estimates and implications", *Journal of Political Economy 105.*

Bouis, R. and C. Klein (2009), "La concurrence favorise-t-elle les gains de productivité ? Une analyse sectorielle dans les pays d l'OCDE", *Économie et Statistique No. 419-420.*

Christopoulou, R. and P. Vermeulen (2008), "Mark-ups in the euro area and the US over the period 1981-2004 – A comparison of 50 sectors", *European Central Bank Working Paper Series No. 856.*

Dalsgaard, T. (2008), "Product market competition in Slovenia: Stylised facts and policy challenges", paper presented at the Bank of Slovenia Research Seminar on Contemporary Macroeconomic Issues: Challenges and Policies, Ljubljana, 23 April.

Dobrinsky, R., G. Körösi, N. Markov and L. Halpern (2004), "Firms' price mark-ups and returns to scale in imperfect markets: Bulgaria and Hungary", *William Davidson Institute Working Paper No. 710.*

Görg, H. and F. Warzynski (2003), "Price cost margins and exporting behaviour: Evidence from firm-level data" *LICOS – Centre for Institutions and Economic Performance, K.U.Leuven Discussion Paper* No. 13303.

Hall, R. E. (1988) "The relation between price and marginal cost in U.S. industry", *Journal of Political Economy 96-5.*

Høj, J., M. Jimenez, M. Maher, G. Nicoletti and M. Wise (2007), "Product market competition in the OECD countries: Taking stock and moving forward", *OECD Economics Department Working Papers No. 575.*

Hook, A. (2007), "Sectoral Study on the Impact of Domestic Regulation on Trade in Legal Services", paper prepared for the Sixth Services Expert Meeting, OECD, Paris, 16-17 February.

Kox, H.L.M. (2002), *Growth challenges for the Dutch business services industry: International comparison and policy issues*, CPB Netherlands Bureau for Economic Policy Analysis, The Hague.

Molnár, M. and N. Bottini (2010), "How large are competitive pressures in services markets? – Estimation of mark-ups for selected OECD countries", *OECD Economic Studies, forthcoming.*

Molnár, M., K. Tanaka and M. Van Duijn (2008), "Direct or indirect channels for regulation to affect trade in services – The case of business services, construction and telecommunications" paper presented at the "OECD Technical Workshop on Trade Barrier Assessment Methodology – Towards a Services Trade Restrictiveness Index", Paris, December 12, 2008. Available at www.oecd.org/trade/stri08.

Nishimura, K., Y. Ohkusa and K. Ariga (1999), "Estimating the mark-up over marginal cost: a panel analysis of Japanese firms 1971-1994", *International Journal of Industrial Organisation 17.*

Norrbin, S.C. (1993), "The relation between price and marginal cost in US industry: a contradiction", *Journal of Political Economy 101-6.*

OECD (2009) *OECD Economic Surveys: Slovenia*, OECD Paris.

Oliveira Martins, J., S. Scarpetta and D. Pilat (1996), "Mark-up ratios in manufacturing industries: Estimates for 14 OECD countries", *OECD Economics Department Working Papers No. 162.*

Roeger, W. (1995), "Can imperfect competition explain the differences between primal and dual productivity measures? Estimates for U.S. manufacturing", *The Journal of Political Economy Vol. 103-2.*

Van Biesebroeck, J. (2007), "Robustness of productivity estimates", *The Journal of Industrial Economics 55-3.*

Wölfl, A., I. Wanner, T. Kozluk and G. Nicoletti (2009), "Ten years of product market reform in OECD countries – insights from a revised PMR indicator", *OECD Economics Department Working Papers No. 695.*

Wölfl, A., G.Nicoletti, O.Röhn, and I.Wanner (2010), "Product market regulation: Extending the analysis to candidate countries for accession, enhanced engagement countries and other non-OECD countries", *OECD Economics Department Working Papers, forthcoming.*

WTO (1998a), "Accountancy services", WTO Secretariat's papers on services No. S/C/W73.

WTO (1998b), "Legal services", WTO Secretariat's papers on services No. S/C/W43.

WTO (1998c), "Distribution services", WTO Secretariat's papers on services No. S/C/W37.

Annex A1

Derivation of primal and dual Solow residuals

The primal Solow residual

The production technology is assumed to be defined by the neoclassical production function:

$$Y = AF(N, K) \qquad \text{(A1.1)}$$

where *Y* is output, *A* is multifactor productivity growth, there are two inputs: *N* is labour and *K* is capital and *F(.)* is a homogenous function of degree lambda (the degree of returns to scale). The firm and year subscripts are subsumed for the sake of simplicity. After log-differentiation:[1]

$$y = \varepsilon_N n + \varepsilon_K k + a \qquad \text{(A1.2)}$$

where the lower case indicates log-differentiation and ε_i (*i*=*N*, *K*) is the elasticity of output with respect to input *i* equalling factor *i*'s share of total cost. For labour, for instance:

$$\varepsilon_N = \frac{WN}{C_m Y} \qquad \text{(A1.3)}$$

where W is the price of labour and C_m $C_m$is marginal cost. Labour's share of total revenue, in turn is:

$$\alpha_N = \frac{WN}{PY} \qquad \text{(A1.4)}$$

where *P* is the price of output. Under perfect competition, price equals marginal cost and hence equations A1.3 and A1.4 are identical. Imperfect competition, in contrast, implies that firms charge a mark-up µover marginal cost:

$$\mu = \frac{P}{C_m} \qquad \text{(A1.5)}$$

and thus

$$\varepsilon_N = \mu\alpha_N \qquad \text{(A1.6)}$$

1. Through differentiation, the growth rate of output can be related to the growth rates of inputs, *i.e.* capital, and labour.

Cost and revenue shares for capital can be derived similarly to those for labour. In the case of constant returns to scale:

$$\Sigma_{i=N,K}\varepsilon_i = 1 \quad \text{(A1.7)}$$

Substituting A1.7 and A1.6, adding *y* and subtracting *k* from both sides of equation A1.2 and rearranging results in the primal Solow residual:

$$SR_{primal} = y - \alpha_N n - \alpha_K k = (1-B)a - B(y-k) \quad \text{(A1.8)}$$

where *B* is the Lerner index closely related to the mark up μ:

$$B = 1 - \frac{1}{\mu} \quad \text{(A1.9)}$$

The dual Solow residual

The cost function corresponding to the production function in A1.1 is (subscripts subsumed)

$$C(W,R,Y,A) = \frac{G(W,R)Y}{A} \quad \text{(A1.10)}$$

while the marginal cost function is

$$Q = \frac{G(W,R)}{A} \quad \text{(A1.11)}$$

Log-differentiation of (A1.11), making use of Shephard's lemma gives:

$$q = \varepsilon_N w + \varepsilon_K r + a \quad \text{(A1.12)}$$

Constant mark-ups imply

$$p = q \quad \text{(A1.13)}$$

Using A1.13, A1.6 and A1.7 to substitute into A1.12, adding *r* and subtracting *p* from both sides and rearranging gives the dual Solow residual:

$$SR_{dual} = \alpha_N w + \alpha_K r - p = (1-B)a - B(p-r) \quad \text{(A1.14)}$$

Annex A2

Data sources and description of the sample

The Amadeus database used for the analyses contains over 5000 Slovenian firms and over 71 000 observations for 14 years (Table A2.1), but given the unbalanced nature of the data and missing observations for some variables, only a smaller subset was suitable for the estimation of mark-ups. While the number of firms in the database is over 71 000, the number of employees was only available for 20 000 firms, thereby reducing the useable sample significantly. For most firms, the observations available are concentrated over the years of 1995-2005. To improve the quality of the data, several filtering rules were applied. At the first stage, when the input coefficients were estimated for the production function, the observations where some of the data necessary for the estimation were missing (operating revenues, labour and fixed assets) were deleted. At the second stage only those observations were retained for which the estimated input coefficients were of a plausible size, *i.e.* each were in the range of [0,1] and if they were significant. As a result, 19 531 observations were retained.

Table A2.1. **Number of observations for selected variables in the dataset**

NACE	Sector	Firms	Operating revenue	Employees	Fixed assets	Wages	Rental price of capital
15	Food and beverages	1974	763	628	864	729	1833
16	Tobacco	14	8	8	10	8	13
17	Textiles	1078	504	482	579	492	1001
18	Garments	840	343	333	382	330	780
19	Leather	364	174	167	199	162	338
20	Wood	1274	417	350	490	396	1183
21	Pulp and paper	560	228	211	258	221	520
22	Printing and publishing	1372	549	457	643	537	1274
23	Coke	42	18	17	19	18	39
24	Chemicals	966	485	435	555	460	897
25	Rubber and plastics	1862	814	688	900	767	1729
26	Other non-metallic minerals	910	416	377	478	405	845
27	Basic metals	476	225	186	249	218	442
28	Fabricated metal products	3836	1578	1303	1807	1528	3562
29	Machinery	2450	1097	946	1297	1073	2275
30	Office machines and computers	280	118	88	135	117	260
31	Electrical machinery	1120	542	453	634	535	1040
32	Radio and television	560	278	233	329	275	520
33	Medical and optical instruments	770	335	275	408	330	715
34	Motor vehicles	504	218	180	253	213	468
35	Other transport equipment	196	81	69	87	78	182
36	Furniture and n.e.c.	1792	688	620	800	663	1664
37	Recycling	140	64	51	77	64	130
40	Electricity, gas, steam and hot water	364	71	67	81	69	338
41	Collection, purification and distribution of water	322	20	14	20	19	299
45	Construction	4998	1437	1114	1646	1382	4641
50	Sale, maintenance, etc.	3304	772	627	905	741	3068
51	Wholesale trade, etc.	17542	7078	5722	8248	6837	16289
52	Retail trade	4284	1470	1243	1709	1428	3978
55	Hotels and restaurants	1008	145	137	175	144	936
60	Land transport	2142	624	470	723	616	1989
61	Water transport	42	21	18	24	21	39
62	Air transport	42	17	11	20	12	39
63	Supporting, etc.	1652	352	268	442	343	1534
65	Financial intermediation	490	79	56	95	73	455
67	Auxiliary activities to financial intermediation	350	14	8	16	14	325
70	Real estate	742	124	88	149	108	689
71	Renting of machinery and equipment	98	33	30	37	31	91
72	Computer activities	1218	406	303	472	400	1131
73	Research and development	294	49	41	58	49	273
74	Other business activ.	1470	330	243	389	310	1365
80	Education	224	39	30	45	34	208
6410	Post and courier activities	28	13	7	14	13	0
6420	Telecommunications	392	153	112	171	144	0
7411	Legal services	42	0	1	0	0	39
7412	Accounting, etc.	182	22	17	27	22	169
7413	Market research, etc.	140	36	18	38	36	130
7414	Business and management consultancy	1190	187	148	225	165	1105
7415	Management activities of holding companies	588	113	90	129	90	546
7420	Architectural and engineering activities	3052	820	638	983	802	2834
7599	Other services	1456	272	206	305	239	1352
.	Total	71036	24640	20284	28599	23761	65572

Source: Amadeus dataset for the number of firms and the number of observations for the variables of operating revenues, employees, fixed assets and wages and author's calculation for the rental price of capital.

WORKING PAPERS

The full series of Economics Department Working Papers can be consulted at www.oecd.org/eco/workingpapers/

786. *Enhancing financial stability through better regulation in Hungary*
(June 2010) by Margit Molnar

785. *Chile: Boosting productivity growth by strengthening competition, entrepreneurship and innovation*
(June 2010) by Cyrille Schwellnus

784. *Chile: Climbing on giants' shoulders: better schools for all Chilean children*
(June 2010) by Nicola Brandt

783. *Israel: Monetary and fiscal policy*
(June 2010) by Charlotte Moeser

782. *Policy options for reducing poverty and raising employment rates in Israel*
(June 2010) by Philip Hemmings

781. *Israeli education policy: How to move ahead in reform*
(June 2010) by Philip Hemmings

780. *Germany's growth potential, structural reforms and global imbalances*
(June 2010) by Isabell Koske and Andreas Wörgötter

779. *Energy policy and the transition to a low-carbon economy*
(June 2010) by Jeremy Lawson

778. *Making the Luxembourg labour market work better*
(June 2010) by Jeremy Lawson

777. *Coping with the job crisis and preparing for ageing: the case of Finland*
(June 2010) by Henrik Braconier

776. *The political economy of fiscal consolidation*
(June 2010) by Robert Price

775. *Structural and cyclical factors behind current-account balances*
(May 2010) by Calista Cheung, Davide Furceri and Elena Rusticelli

774. *A framework for assessing green growth policies*
(May 2010) by Alain de Serres, Fabrice Murtin and Giusepppe Nicoletti

773. *Modeling institutions, start-ups and productivity during the transition*
(May 2010) by Zuzana Brixiova and Balázs Égert

772. *Can emerging asset price bubbles be detected?*
(June 2010) by Jesús Crespo Cuaresma

771. *The nature of financial and real business cycles*
(2010) by Balázs Égert

770. *The effects of fiscal policy on output: A DSGE analysis*
(May 2010) by Davide Furceri and Annabelle Mourougane

769. *Health care systems: efficiency and institutions*
(May 2010) by Isabelle Joumard, Christophe André and Chantal Nicq

768. *The OECD's new global model*
(May 2010) by Karine Hervé, Nigel Pain, Pete Richardson, Franck Sédillot and Pierre-Olivier Beffy

767. *Assessing the impact of the financial crisis on structural unemployment in OECD countries*
(May 2010) by Stéphanie Guichard and Elena Rusticelli

766. *After the crisis: bringing German public finances back to a sustainable path*
(April 2010) by Isabell Koske

765. *Optimal monetary and fiscal stabilisation policies*
(May 2010) by Klaus Adam

764. *Asset prices and real economic activity*
(May 2010) by E. Philip Davis

763. *Fiscal policy reaction to the cycle in the OECD: Pro- or counter-cyclical?*
(May 2010) by Balázs Égert

762. *New evidence on the private savings offset and Ricardian equivalence*
(May 2010) by Oliver Röhn

761. *Monetary policy reaction functions in the OECD*
(May 2010) by Douglas Sutherland

760. *Counter-cyclical economic policy*
(May 2010) by Douglas Sutherland, Peter Hoeller, Balázs Égert and Oliver Röhn

759. *Exports and property prices in France: are they connected?*
(April 2010) by Balázs Égert and Rafał Kierzenkowski

758. *Further Advancing Pro-Growth Tax and Benefit Reform in the Czech Republic*
(April 2010) by Zdeněk Hrdlička, Margaret Morgan, David Prušvic, William Tompson and Laura Vartia.

757. *Advancing structural reforms in OECD countries: Lessons from twenty case studies*
(April 2010) by William Tompson and Thai-Thanh Dang

756. *Labour markets and the crisis*
(April 2010)

755. *Long-term growth and policy challenges in the large emerging economies*
(March 2010) by Paul Conway, Sean Dougherty and Artur Radziwill

754. *Explaining household saving rates in G7 countries: implications for Germany*
(February 2010) by Felix Hüfner and Isabell Koske