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This paper provides estimates of mark-ups of product prices over marginal costs for 36 manufacturing industries in 14 OECD countries over the 1970-1992 period. The estimates are based on the methodology put forward by Roeger (1995), extended to include intermediate inputs. After a discussion of analytical and data issues, the estimates are presented and shown to be smaller than those of previous studies. It is also shown that the level and dispersion of mark-ups are consistent with a priori views about characteristics of the market structure prevailing in each industry. Finally, the paper examines how mark-up estimates affect the estimated rate of growth of total factor productivity (TFP).

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Cette étude fournit des estimations sur le taux de marge des prix sur les coûts marginaux pour 36 industries manufacturières et 14 pays de l'OCDE pour la période 1970-1992. Les estimations utilisent l'approche mise au point par Roeger (1995) améliorée pour tenir compte des biens intermédiaires. L'étude commence par une discussion des problèmes méthodologiques et statistiques, et les estimations sont présentées. Dans l'ensemble, les taux de marge présentés ici sont beaucoup plus bas que ceux calculés dans d'autres études. Le niveau et la dispersion des taux de marge sont relativement cohérents avec l'idée a priori sur les caractéristiques des différentes structures de marché. En dernier lieu, il est examiné comment les estimations du taux de marge affectent la mesure de la productivité totale des facteurs (PTF).

MARK-UP RATIOS IN MANUFACTURING INDUSTRIES
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Joaquim OLIVEIRA MARTINS, Stefano SCARPETTA and Dirk PILAT[1]

1. Introduction

Product market competition is a complex and multi-dimensional process. The state of competition in a given market has many characteristics, few of which can be easily quantified and that can differ widely between industries. Competition may be affected by the number of firms in a market, the degree of concentration, the prevailing regulations, the openness of an economy to international competition, the share of goods traded, the existence of anti-competitive or collusive behaviour, government subsidies or restrictive government procurement policies, trade policy, the strictness and enforcement of competition policy, and a range of other characteristics.

As a result of these complexities, few broad and aggregate indicators can characterise the degree or intensity of competition in different markets, and no single indicator can do so. In principle, a broad range of indicators is required, each capturing one element of competition. However, even when broad measures of imperfect competition can be derived, it is necessary to interpret how much of the observed imperfections are due to genuine lack of competition, perhaps supported by policy, and how much is due to fixed or sunk costs, or to rents to innovation (and thus not necessarily a policy concern).

With these caveats in mind, this paper aims at providing evidence on one possible manifestation of imperfect competition in manufacturing, namely the mark-up of product prices over marginal costs. This indicator, the mark-up ratio, has been used frequently to gauge and interpret the state of competition. Yet, a comprehensive picture of the level and structure of mark-ups across sectors and countries was not available. This paper presents such a picture over the period 1970-92, for 36 manufacturing industries in 14 OECD countries.

The paper is organised as follows. The next section provides the theoretical background to the measurement of mark-ups, and sets out the methodological details. The method is based on recent improvements of an approach originally put forward by Hall (1986), and in particular on the methodology suggested by Roeger (1995). The third section discusses some measurement issues and provides the mark-up estimates. This section also makes a comparison with previous studies and finds that the results of the current study are more robust and intuitively more plausible than those of previous studies.

In section four, the observed level of mark-ups is related to the market structure prevailing in each industry. Some market structures may be compatible with a positive mark-up and a strong

1. The authors are indebted to Werner Roeger for very useful discussions during the preparation of this paper. We would also like to thank our colleagues for comments on earlier drafts, in particular Sven Blondal, Jørgen Elmeskov, Michael Feiner, Bob Ford, Jens Høj, Toshi Kato, Constantino Lluch and Jon Nicolaisen. Brenda Livsey-Coates and Sandra Raymond-Guilbot helped us in preparing the manuscript, and Martine Levasseur, Christophe Madaschi and Catherine Chapuis provided efficient statistical assistance. The views expressed are those of the authors, and do not necessarily reflect those of the Organisation or its Member countries.

competition process. In this case, policies should not necessarily take perfect competition as a benchmark. The paper follows a market structure taxonomy that enables the classification of sectors in terms of different types of competition. In general, there is an inherent tendency towards oligopolistic market structures in industries with high "sunk costs". In such "segmented" industries market power is more likely to emerge than in "fragmented industries" where average firm size tends to be smaller[2]. The level and dispersion of the mark-up estimates are consistent with the *a priori* views about market structure proto-types.

Section four also relates the mark-up estimates to the measurement of productivity growth. The so-called Solow residual, which is a well-known measure of total factor productivity (TFP) growth, is biased in the presence of a positive mark-up. Correcting for this bias provides an illustration of the impact of relaxing the assumption of perfect competition in assessing productivity performance. The final section draws some conclusions.

2. Approaches to the estimation of mark-ups

2.1 An indicator of the degree of competition

Over the past decades, a substantial body of literature has been devoted to the empirical identification of market power (e.g. Schmalensee, 1989; Bresnahan, 1989). This literature has particularly focused on the identification of monopoly pricing, i.e. whether there is evidence of pricing above marginal costs. In theory, it is possible to define the degree of monopoly power of a given producer as the mark-up of product price (P) over marginal cost (MC). This indicator, the so-called *Lerner index,* can be defined as *(P-MC)/P*. With perfect competition price equals marginal cost and the index will be equal to zero. When prices exceed marginal cost, the Lerner index becomes positive and varies between zero and unity. The greater the index, the greater the degree of monopoly power. This indicator is a static measure of *actual* conduct and may not reflect the potential for monopolistic behaviour on the part of the firm. The latter is more directly related to the type of market structure, i.e. some market structures will more than others favour the development of permanent market power.

The empirical measurement of the Lerner index and related measures is quite difficult, however, and in particular at an aggregated level, the economic literature has given little guidance on how to establish appropriate measures. Consequently, there have been few empirical studies identifying market power at the aggregate level (cf. Geroski, *et al.*, 1995) . The main problem arises from the fact that while prices can be measured, marginal costs are not directly observable. Therefore, indirect measures have to be developed. In the late eighties, a new methodology attempted to estimate the mark-up of prices over marginal costs by using the short-run fluctuations of output and production inputs by sector (Hall, 1986 and 1988, and Bills, 1987). The method proposed by Robert Hall has become popular and has been extensively applied in the empirical literature (see, for example, Shapiro 1987; Domowitz *et al.* 1988; Caballero and Lyons 1990).

2. "Segmented" industries are industries where the number of firms remains relatively stable when market size increases, and concentration therefore tends to remain relatively stable or converges towards a finite lower bound. In "fragmented" industries the number of firms typically grows in line with the size of the market (see Encaoua, 1989). For a discussion on market structure taxonomy, see Oliveira Martins (1994, 1995).

2.2 Hall's approach

Hall's approach to the estimation of mark-ups is based on ideas contained in Solow's (1957) seminal paper on productivity measurement. For a firm enjoying technical progress in the use of labour and capital, a reasonable approximation of its marginal cost can be given by the following expression:

$$MC = \frac{W \cdot \Delta L + R \cdot \Delta K}{\Delta Q - \theta Q} \tag{1}$$

where Q is real value added; *W* and *R* are the wage rate and the rental price of capital, respectively; and θ is the rate of technical progress. In the denominator, the change in output is adjusted for the amount by which output would rise if there were no increase in the production inputs. Equation (1) can be re-phrased as follows:

$$\Delta q = \frac{W \cdot L}{MC \cdot Q}\Delta l + \frac{R \cdot K}{MC \cdot Q}\Delta k + \theta \tag{2}$$

where lowercase variables indicate log-levels. Under the assumption of perfect competition, the shares of capital and labour in output valued at marginal costs measure the elasticity of output with respect to inputs. Under constant returns to scale these shares sum to one[3]. Under these assumptions, and defining the mark-up ratio as $\mu = P/MC$, equation (2) can be rearranged as follows:

$$\Delta q = \mu\alpha\Delta l - (1 - \mu\alpha) \cdot \Delta k + \theta \tag{3}$$

where $\alpha = W.L/P.Q$, i.e. the labour share in total value added. By subtracting $\alpha(\Delta l - \Delta k)$ from both sides of the equation, the so-called Solow residual (SR) can be obtained:

$$SR = \Delta q - \alpha\Delta l - (1-\alpha)\Delta k = (\mu - 1) \cdot \alpha(\Delta l - \Delta k) + \theta \tag{4}$$

This equation illustrates the key property of the Solow residual. If μ=1 (perfect competition), the SR should not be correlated with the growth rate of the capital/labour ratio[4] and is thus identical to the (unobservable) rate of technical progress (θ). This property, the so-called "invariance property" of the Solow residual (Hall, 1990), underlies the most common method of calculation of total factor productivity (TFP) growth. However, the invariance property of the Solow residual often fails to be observed. Typically, the residual tends to be higher in years of expansion than in years of recession. A possible implication of this observation is that the assumption of perfect competition is rejected by the data[5]. It also implies that the estimation of the unknown productivity term by the Solow residual is biased (see

3. Alternatively, if the capital stock is assumed to remain fixed from one year to the other, only labour input appears in the expression for marginal cost. This would allow the calculation of estimates which are independent of the method of construction selected for the capital stock series.

4. More precisely, under Solow's assumptions the following theorem should hold: *The productivity residual is uncorrelated with any variable that is uncorrelated with the rate of growth of true productivity* (Hall, 1990).

5. Other possible causes for the procyclicality in the productivity residual have recently been discussed in the literature. For example, Burnside, Eichenbaum, and Rebelo (1995) argue that capital stocks are a poor measure of the actual capital services provided. Basu and Fernald (1995) suggests that the aggregate (economy-wide or sectoral) procyclicality of the residual may be due to aggregation effects.

section 4.2 below). Along these lines, Hall's approach attempts to estimate the mark-up ratio from equation (3), assuming that the rate of technological progress can be described as a random deviation from an underlying constant rate:

$$\theta_t = \theta + u_t \tag{5}$$

By re-arranging (3) and assuming that the mark-ups are constant through time, the equation to be estimated is the following:

$$\Delta(q_t - k_t) = (\mu\alpha_t)\cdot\Delta(l_t - k_t) + \theta + u_t \tag{6}$$

The (observed) labour share in total revenue is used as a benchmark for the coefficient associated with the growth of the labour/capital ratio. In principle, this would enable the identification of the value of the mark-up coefficient. However, as pointed out by Hall, equation (6) cannot be estimated directly. Indeed, under imperfect competition the labour/capital ratio is correlated with the productivity term (and consequently with the error term) and the ordinary least square (OLS) estimates will not be consistent. The usual way to correct this is to replace the labour/capital ratio by a set of instrumental variables, i.e. variables which are correlated with the growth of the labour/capital ratio, and at the same time are not correlated with the productivity shocks. For the case of the United States, Hall proposed a number of instruments, including overall real GDP[6], military spending, the oil price and the political party of the president.

However, some of these instruments have been criticised as being rather implausible. Moreover, the problem with the instrumental variable approach is that, in small samples, the relative merits of this procedure over the simple OLS estimate are not clear-cut. For example, a very small correlation between the instruments and productivity growth may prove much more problematic than the biases emerging from the OLS procedure (see Caballero and Lyons, 1989).

2.3 Roeger's approach and the adjustment for intermediate inputs

Roeger (1995) proposed a different way of computing mark-ups which overcomes the identification problems arising from the correlation between the explanatory variable and the error term. In order to see how this alternative method can be derived, it is convenient to make the relation between the Solow residual and the Lerner index (*B*) more explicit. By definition:

$$B = \frac{P - MC}{P} = 1 - \frac{1}{\mu} \quad or \quad \mu = \frac{1}{1 - B} \tag{7}$$

by incorporating (7) into equation (4) and re-arranging, a new expression for the Solow residual can be obtained:

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6. See Blanchard's (1986) comments on Hall's paper for a discussion of the plausibility and the implications of assuming sectoral productivity shocks orthogonal to the business cycle. A correlation between productivity shocks and the business cycle may explain why the estimated elasticity of output to labour is much higher than the labour share. This is the basic assumption underlying the so-called Real Business Cycle (RBC) theory. Hall's approach offers an alternative route of explanation based on the existence of positive mark-ups. Noteworthy, under constant returns to scale, both approaches clear up the usual "puzzle" of very low or even negative estimates of the elasticity of output to capital. Also, Hall's approach leads to a close association between mark-ups and current input shares.

$$SR = \Delta q - \alpha\Delta l - (1-\alpha)\Delta k = B\cdot(\Delta q - \Delta k) + (1-B)\cdot\theta \tag{8}$$

This equation is another way of stating that, under perfect competition (*B=0*), the Solow residual is identical to the rate of technical progress. Roeger showed that an equivalent expression can be derived for the dual productivity measure, i.e. a price-based Solow residual (SRP), as follows:

$$SRP = \alpha\cdot\Delta w + (1-\alpha)\cdot\Delta r - \Delta p = -B\cdot(\Delta p - \Delta r) + (1-B)\cdot\theta \tag{9}$$

By subtracting (9) from (8) and adding an error term, a suitable expression for the estimation of *B* can be obtained:

$$\Delta y_t = B\cdot\Delta x_t + \varepsilon_t \tag{10}$$

where:

$$\Delta y = (\Delta q + \Delta p) - \alpha\cdot(\Delta l + \Delta w) - (1-\alpha)\cdot(\Delta k + \Delta r)$$
$$\Delta x = (\Delta q + \Delta p) - (\Delta k + \Delta r)$$

The dependent variable (Δy) can be interpreted as the nominal Solow residual and the explanatory variable is the growth rate of the nominal output/capital ratio. The appealing feature of equation (10) is that the productivity term vanishes and a direct estimation of *B* can be carried out by the usual econometric techniques. Another advantage of this method is that the price and volume variables can be grouped together and only nominal variables appear in the equation. This helps to overcome some availability problems associated with price data.

Along these lines, a straightforward extension of equation (10) makes it possible to incorporate intermediate inputs and define the mark-up ratios over gross output instead of value added. This correction is rather crucial as defining the mark-up over value added induces a clear upward bias in the estimation (see Norrbin, 1993 and Basu, 1995). Accordingly, if the intermediate inputs are taken into account, the dependent and explanatory variables of equation (10) become:

$$\begin{aligned} \Delta y &= (\Delta q^o + \Delta p^o) - \alpha\cdot(\Delta l + \Delta w) - \beta\cdot(\Delta m + \Delta p_m) - (1-\alpha-\beta)\cdot(\Delta k + \Delta r) \\ \Delta x &= (\Delta q^o + \Delta p^o) - (\Delta k + \Delta r) \end{aligned} \tag{11}$$

where q^o and p^o correspond to gross output and its respective price, and *m* and p_m to intermediate inputs and their prices. As noted above, only the nominal values are required to carry out this calculation. However, the treatment of capital costs requires a separate computation of the volume and rental price of capital as described below.

2.4 An interpretation and possible bias of Roeger's equation

Equation (10) is striking by its simplicity but its intuitive meaning is not immediately clear. In fact, the Roeger equation can also be derived from the definition of an "average" mark-up (μ^a),[7] i.e. the ratio between prices and average costs (AC)[8]:

7. Kalecki (1940) developed a theory of imperfect competition where firms set the product price as a mark-up over average variable costs. This has become a standard assumption in many macro-economic models.

$$\mu^a = \frac{P}{(W \cdot L \ + \ R \cdot K)/Q} = \frac{\mu}{\lambda} \tag{12}$$

which by definition is equal to the mark-up over marginal costs divided by an index of returns to scale ($\lambda = AC/MC$). Under the assumption that this average mark-up is constant, re-arranging, taking the total differential and changing equation (12) into a growth rate form, the following relation can be derived:

$$\Delta(p+q) \ = \frac{\mu}{\lambda}\left(\frac{W \cdot L}{P \cdot Q}\Delta(w+l) \ + \ \frac{R \cdot K}{P \cdot Q}\Delta(r+k)\right) \tag{13}$$

which can also be expressed as:

$$\Delta(p+q) \ = \ \frac{\mu}{\lambda}\alpha \cdot \Delta(w+l) \ + \ \left(1-\frac{\mu}{\lambda}\alpha\right) \cdot \Delta(r+k) \tag{14}$$

where $\alpha = W.L/P.Q$. It can be noted that this equation is equivalent to equation (3) defined in nominal values but without the productivity term. Finally, by noting that $\mu = 1/(1-B)$ and adding an error term, the Roeger equation can be obtained:

$$\Delta y_t \ = \ [\lambda \cdot (B-1)+1] \cdot \Delta x_t \ + \ \varepsilon_t \tag{15}$$

where Δx and Δy are defined as previously. Therefore, under the assumption of constant returns to scale ($\lambda=1$), Roeger's equation provides an unbiased estimate of the Lerner index *B*. Noteworthy, the presence of increasing returns to scale induces a downward bias in the estimation of the mark-up[9]. This remark enables to address, at least partially, the criticism put forward by Burnside, Eichenbaum and Rebelo (1995). They argued that capital stocks are a poor measure of capital services and replaced them by a measure of electricity consumption. Using this proxy they found no evidence of increasing returns to scale, both at the economy-wide level and for the manufacturing sector. The estimates presented in this paper cannot be criticised on these grounds, precisely because they only take into account that part of the mark-up corresponding to the difference between price and average costs, i.e. the mark-up net of the influence of increasing returns to scale.

The presence of sunk costs is also likely to generate a downward bias in equation (10). Indeed, if a fraction of the capital stock is sunk, this has to be subtracted from the total capital stock leading to a lower marginal cost and a higher mark-up. The same reasoning can be applied to downward rigidities of the capital stock or labour hoarding. When the capital stock or the labour force cannot be adjusted downward during recessionary periods the marginal costs would be higher than under a situation of perfectly flexible production inputs. Correcting for these biases would imply higher mark-ups than those following from equation (10).

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8. Thanks are due to Sven Blondal to leading us to this insight.

9. For example, if the "true" *B* coefficient is 0.25 and λ is equal to 1.2, the mark-up estimated by means of the Roeger equation (i.e. assuming $\lambda=1$) will be 1.10 instead of 1.33. Conversely, the presence of decreasing returns to scale induces an upward bias in the estimation of the mark-up.

To sum up, Roeger's approach can be directly related to the definition of an average mark-up. Moreover, the mark-up estimates are likely to represent a lower bound for industries operating under increasing returns to scale, large sunk costs or strong adjustment rigidities over the business cycle.

3. Mark-up estimates

3.1 Data issues

The main data source used in this study is the OECD-STAN data base. STAN covers 19 OECD Member countries and 36 manufacturing sectors (at the 3-4 ISIC digit-level) for the period 1970-1992 (see OECD, 1995)[10]. STAN provides data on the following variables: production, value added in current and constant prices, gross fixed capital formation, employment (number of persons engaged), labour compensation, exports and imports.

The mark-up estimation takes account of labour, capital and intermediate inputs as production factors. The series for gross output, employment, wage compensation and intermediate inputs (gross output minus value added) were taken from the STAN database. Preliminary estimates of gross capital stock by industry were provided by the EAS Division of OECD's Directorate of Science, Technology and Industry[11]. Concerning the rental price of capital, no sector-specific information was available enabling the implementation of the Hall and Jorgenson (1967) method. However, inspired by their methodology, a simplified rental price of capital (*R*) was defined as follows[12]:

$$R = ((i - \pi_e) + \delta).\, p_k \tag{16}$$

where *i* is the representative long-run nominal interest rate and π_e is the expected inflation rate[13]. The difference between these two terms represents the expected real cost of funds for the firm. The δ

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10. For five OECD countries (Austria, Mexico, New Zealand, Portugal and Spain) covered by STAN, the available data were insufficient to estimate mark-ups at a meaningful level of detail.

11. These estimates use the available data on capital stocks and capital formation from OECD’s ISDB database (Meyer zu Slochtern and Meyer zu Slochtern, 1994) and the detailed material on capital formation from STAN to derive capital stock series at the level of detail of the STAN database.

12. The formula for the rental price of capital is (Hall, 1990):

$$R = (\rho + \delta)\frac{1 - k - \tau d}{1 - \tau}\, p_k$$

where ρ is the firm's real cost of funds, δ the economic rate of depreciation, k the effective rate of the investment tax credit, *d* the present discounted value of tax deductions for depreciation, τ the tax rate on capital and p_k the deflator for fixed business investment. The terms related to investment taxes, capital taxes and deductions for depreciation enter in a log-additive way in the equation and do not have a strong variability through time. Therefore, while they are important to compute the level of capital costs, these terms are not expected to have a strong influence on the growth rates of the rental price of capital.

13. Nominal long-term interest rates are yields on benchmark public sector bonds of around 10 years maturity. Inflation expectations are generated using the low-frequency component of the annual percentage change in the GDP deflator using a Hodrick-Prescott filter. In the filtering process, a lambda value of 1600 was used. The nominal long-term interest rates and GDP deflators are both derived from the OECD Analytical Database (OECD-ADB).

coefficient can be interpreted here as the discard rate corresponding to the gross capital stock[14]. In accordance with the capital stock series, this coefficient was set at 5 per cent across all sectors which is equivalent to an average service life of 20 years. The final term p_k represents the economy-wide deflator for fixed business investment, and was derived from OECD's ADB database.

The mark-up estimation discussed above is based on nominal output data, which often include net indirect taxes (i.e. indirect taxes minus subsidies). The inclusion of net indirect taxes would generally produce an upward bias to the mark-up estimates and for this reason previous studies used nominal output at factor costs. When prices include indirect taxes, it is necessary to take into account that part of the value of output will go to the tax authorities[15]. Consequently, if the net indirect tax rate is constant, an estimate for the true mark-up, can be obtained by dividing the estimated mark-up (μ^e) by the net indirect tax rate ($1+\tau$):

$$\mu = \mu^e / (1 + \tau) \qquad (17)$$

The tax data were derived from national sources, including detailed national accounts, input-output tables and manufacturing census data. Such detail was particularly required for the estimation of mark-ups for food, beverages and tobacco and for the chemical sector, where high indirect tax rates are particularly prevalent. The former reflects high excise taxes on alcohol and tobacco; the latter high taxes on petrol and energy. This pattern implies that the mark-up estimation for these sectors is particularly affected by an adjustment for indirect taxes. The corrected mark-ups are generally lower than the unadjusted mark-ups, except where the net indirect tax rate for manufacturing is negative (i.e. where subsidies exceed indirect taxes). Moreover, the value added tax rates have to be adjusted for the fact that the mark-up is calculated over gross output. The adjustment can be done simply by multiplying the tax rate by the ratio of value added over gross output for each industry. Both the detailed tax rates by industry and country and the value added/gross output adjustment factors are provided in the annex.

3.2 Results

Equation (10) was used to estimate mark-ups for the 14 OECD countries for which sufficient data were available and for the 36 manufacturing sectors available from OECD's STAN database[16]. The mark-up are obtained as $1/(1-B)$, where B is the coefficient of the Roeger equation. All the steps of the estimation procedure are provided in annex tables A1-A14. A synthetic view of the estimates is provided

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14. There is a trade-off between the use of gross or net capital stocks. The former only takes into account physical scrapping whereas the latter also accounts for economic depreciation. In general, the gross capital stock is more appropriate for the estimation of a production function, whereas the net capital is close to the definition of production costs. From the point of view of the methodology used in this study, only the nominal variables are relevant, in consequence, the crucial point is to define the δ coefficient in a consistent way with the available capital stock series.

15. For Canada, Denmark and the United Kingdom, sectoral value added is already at factor cost, i.e. net of all indirect taxes and subsidies. In the other countries covered by STAN, sectoral value added includes specific indirect taxes and subsidies, but excludes value added taxes and import duties ("producer value"). This implies that the bulk of all indirect taxes will show up in sectoral value added in countries where such taxes are levied directly on goods (e.g. the United States, Japan, and Australia), whereas they will not be reflected in sectoral value added where indirect taxes are primarily levied on value added.

16. Although the STAN database is not as detailed as the country-specific information used by Roeger to calculate the mark-ups for the U.S., the replication of Roeger's (1995) estimates (based on value-added) with our data set produced quite similar results.

in Figure 1 which shows the maximum, minimum and average mark-up in each country for the sub-periods 1970-80 and 1980-92[17]. The average mark-up ratios range from 1.13 in Belgium and Finland over the 1970s, to 1.26 for Japan over the period 1980-92 and for the Netherlands over the period as a whole. This range seems more plausible than the very high mark-ups obtained in previous studies (see section 3.3 below). In the 1970s, the mark-up ratios are highest for Japan, the Netherlands, Norway and Canada, while they are relatively low for Belgium, Denmark, Finland and the United Kingdom. For the 1980s, the highest mark-ups are observed for Finland, Japan, Germany and the Netherlands, whereas the lowest mark-ups are estimated for Denmark, the United States and the United Kingdom. However, there is no systematic pattern of change of the mark-up between the two periods. At first sight, the averages and the high dispersion of the mark-ups suggest that strong country-specific factors are at work.

The detailed sectoral results for the period 1970-92 are given in Tables 1 (G-7 countries) and 2 (small countries). The tables only show cases where the estimate of *B* is significantly different from zero. There is more regularity in the sectoral patterns than in the overall results. Indeed, relatively high mark-ups (often over 40 per cent) can be observed in several countries in industries such as radio,TV and communication equipment, beverages, tobacco products, railroad equipment, drugs and medicines and in office and computing machinery. On the other hand, mark-ups are relatively low in all countries in textiles, clothing, leather, footwear, food products, printing and publishing, machinery and equipment, electric machinery and motor vehicles.

The above estimates were carried out under the assumption of constant sectoral mark-ups over more than twenty-years (1970-92). Given the economic turbulence and the many structural changes that have occurred across the OECD area over this period, it is of interest to analyse whether there have been any changes in the pattern of sectoral mark-ups. The mark-ups for the period 1980-92 are shown in Tables 3 and 4. It appears that the incidence of high mark-ups (over 40 per cent) has gone down in all countries since the 1970s, with the exception of Finland and Japan[18]. Notwithstanding, the pattern of mark-ups across industries has not changed much from the 1970s to the 1980s. In both periods, the main incidence of high mark-ups is in tobacco products, industrial chemicals, radio, TV and communication equipment, drugs and medicines and computer equipment. However, even for these industries, the high mark-ups cannot be taken unconditionally as rents stemming from market power. For innovative industries, for instance, such unmeasured costs may include R&D expenditures and costs of increasing the skill level of the workforce.

3.3 Comparison with previous studies

Our estimates of mark-ups range, with some exceptions, from zero to 30 per cent. These values are substantially lower, and intuitively more plausible, than the results of previous studies. They are also more in line with the usually observed profit rates. For comparative purposes, estimates of mark-ups for the United States taken from Hall (1990) and Roeger (1995) are provided in Table 5. Although the time periods used differ between the present study and both Hall and Roeger's estimates, the level of mark-ups provides interesting insights in the differences between approaches.

In the results reported by Hall (1990) there are a significant number of sectors (7 out of 21) where the standard errors are quite large or the estimated mark-up ratio is less than one. Over the remaining industries there are two cases where competition cannot be rejected, i.e. the estimated mark-ups

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17. The average mark-up is a weighted average of the sectoral mark-ups, using gross output as sector weights.

18. The mark-ups by industry for the 1970s are available in annex tables A15 and A16. However, the sectoral detail for the 1970s is less than for the 1980s, partly due to the poorer quality of the basic data.

are not significantly above one, whereas in the other cases the mark-up is significantly higher than one. The size of the mark-up ratios estimated by Hall is substantially higher than those calculated by Roeger. Many of Hall's significant mark-up ratios are close to, or over, 100 per cent. This appears not very plausible for manufacturing industries, as these tend to be highly exposed to international competition and high mark-ups would be contested.

Our estimates of mark-ups are also substantially lower than those derived by Roeger (1995). For example, the mark-up ratio estimated by Hall and Roeger for the textile sector were 2.58 and 1.34, respectively, whereas our estimates indicate a mark-up ratio of 1.08, quite close to the competitive level. Roeger's estimates of mark-up ratios for manufacturing sectors range from 1.15 to 2.75, with most sectors having 30-60 per cent mark-ups over marginal costs. Our estimates are in many cases below or close to 10 per cent, while high mark-ups (over 40 per cent) are only observed in a few sectors. In broad terms, the difference between Roeger's results and the results presented here is primarily 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.

4. Interpretation of the Results

4.1 Mark-ups and market structure

The industrial organisation literature typically associates the degree of market power with a number of structural variables (establishment size, concentration, degree of vertical integration, etc.). A starting point is the observation that differences in market power across manufacturing industries must in part be due to differences in entry conditions into each industry. Traditionally, entry conditions and the resulting market structures have been related to technological conditions, such as economies of scale and scope (see e.g. Panzar, 1989). Firms may also be able to influence the demand for their products under a regime of monopolistic competition (Dixit and Stiglitz, 1977), where limited market power can arise from the combination of returns to scale and horizontal product differentiation. Nevertheless, the entry of new firms can be expected to bring prices down to average costs over the long run. More recent research has focused on so-called "vertical" product differentiation, where firms are able to influence the perceived quality of their products. Firms that engage in such product differentiation strategies may be able to influence entry conditions in the market[19]. Generally, this influence is related to endogenous sunk costs associated with advertising or R&D expenditures[20].

A crucial point in the recent literature on industrial organisation is the insight that the relation between market structure variables and, say, profitability cannot be captured by estimating the usual linear (or log-linear) relationship. Instead, this relation can be complex and non-monotonic[21]. For example, Sutton (1991, 1995) put forward a framework involving the estimation of "bounds" for the size distribution of firms which leads to the identification of different types of market structures instead of a

19. A survey of this lliterature can be found in Encaoua (1989) and Beath and Katsoulacos (1991).

20. Shaked and Sutton (1983) argue that firms in industries with differentiated products tend to increase the level of sunk costs by making strategic investments in advertising or R&D. Similarly, Leahy and Neary (1995) show that R&D joint ventures may imply a form of collusion -- by lowering sunk costs for the collaborators -- in markets with product differentiation.

21. See for example, the attempt reported in Blanchard (1986, p.326) to estimate a cross-industry relation between the level of Hall's mark-ups and concentration ratios.

continuum of situations from competition to monopoly. In other words, it matters in the first place to identify the *type* rather than the *intensity* of competition.

To identify the type of competition and ultimately relate it to the mark-up estimates, a market structure taxonomy was established. The basic principles are the following. The 36 manufacturing industries for which mark-up estimates were calculated, were classified according to two indicators. The first indicator -- *relative establishment size* -- is a proxy for the existence of size advantages, such as scale economies at the firm level. Sectors with small average establishments size are termed "fragmented" industries. In these industries, the number of firms typically grows in line with the size of the market. Sectors characterised by the existence large establishments, covering a large proportion of employment and output, were termed "segmented". In these sectors, concentration remains relatively stable or converges towards a finite lower bound. The second indicator, *R&D intensity*, can be taken as a proxy for product differentiation, although the available data do not allow for a distinction between product and process innovation. It can also be a proxy for an industry's degree of innovation, although a distinction needs to be made between R&D and innovation. While this is somewhat ambiguous, it allows for combining in one indicator two of the main elements stressed in the literature.

The combination of these two indicators provides the breakdown shown in Table 6. First, the sectors were ranked by firm size in order to make a distinction between fragmented and segmented industries. Within each of these two groups, industries were subsequently ranked according to R&D intensity by establishment[22]. The border lines between the four groups are approximate. For the establishment size indicator they roughly correspond to a threshold around the average for total manufacturing. For R&D intensity, there is an observable jump in the value of the indicator between low and high differentiation groups. It turns out that this market structure taxonomy can also be related to more direct indicators of sunk costs and product innovation and to qualitative information about the different industries (see Oliveira Martins, 1995). While being a simplifying device, this classification provides some explanation for the observed mark-ups. Figure 2 presents average mark-ups for broad groups of fragmented and segmented industries. It appears that mark-ups tend to be substantially lower in fragmented industries than in segmented industries, confirming that these industries may indeed be closer to a state of perfect competition. There are, however, substantial differences between countries.

Within fragmented and segmented industries, the distinction between differentiated and non-differentiated industries also appears to contribute somewhat to the explanation of mark-ups (Figure 3). Average mark-ups are lowest in fragmented, non-differentiated industries, which confirms that these industries may indeed have the least potential to exercise market power. Mark-ups are higher in fragmented, differentiated industries, which may partly be taken as a sign of innovation rents. However, the variation across countries suggests that other variables contribute to the explanation of mark-ups. Mark-up levels are substantially higher in segmented industries, which could be taken as a sign of market power in industries with a low degree of product differentiation, although it may well be an indication of innovation rents in industries with high product differentiation. Mark-ups are particularly high in segmented, differentiated industries, where the market structure is expected to have many oligopolistic features. Again, the variation across countries is quite large, which may partly be due to the impact of specific policies. Such policies may create entry barriers in a particular country or industry, thus re-inforcing market power and contributing to mark-ups.

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22. The ranking according to R&D intensity is primarily based on the R&D intensity by establishment. The rankings according to R&D intensity per unit of output and cumulated R&D expenditures (R&D stocks) per unit of output were quite similar, with two exceptions, namely the tobacco industry and petroleum refineries. These industries were therefore classified as segmented, low-differentiated industries.

4.2 Implication of mark-ups for productivity measurement

A question of interest is whether, and if so, how, differences in mark-up ratios relate to differences in economic performance. Large and sustained differences between prices and marginal costs, if due to market power, are associated with a level of economic activity that is lower than the one reachable in situations of no market power. As a first step towards addressing this question, the mark-up estimates can be used to relate measures of imperfect competition to the measurement of the growth in total factor productivity (TFP). With perfect competition and constant returns to scale, the observed Solow residual can be viewed as a good estimate of TFP growth. This is no longer the case under imperfect competition (equation 4)[23]. With the estimated mark-ups and the observed growth rates of labour and capital, the Solow residual is typically below the estimated growth in TFP for the period 1970-92. This can be seen in the results for total manufacturing presented in Table 7. In general, the difference between the Solow residual and TFP growth is relatively small (in average 0.5 per cent on a annual basis), but somewhat larger in Canada, the Netherlands and Norway. Due to falling employment in manufacturing, TFP growth in a number of countries exceeded output growth.

5. Concluding Remarks

This paper aimed at estimating mark-ups of prices over marginal costs for 36 manufacturing industries in 14 OECD countries. The main results of the paper are the following:

- In general, the estimated mark-ups are positive and statistically significant in all of the countries considered, and in almost all manufacturing industries. This may imply that departures from perfect competition are prevalent in the manufacturing sector.

- The estimated mark-ups are substantially lower, and more in line with observed profit rates, than those presented in previous studies. With some exceptions, their level ranges from zero to 30 per cent.

- The level of mark-ups appears related to the market structure of a particular industry. They are substantially lower in fragmented industries than in segmented industries. In particular, high mark-ups were estimated for radio, TV and communication equipment, drugs and medicines and computer equipment, suggesting that some of the variation in mark-ups may be due to innovation rents.

- There is a considerable variation of mark-ups across countries and across industries. Some of this variation may be due to the impact of specific policies.

There are several areas where the estimation and interpretation of mark-up ratios could be improved. *First*, it would be important to decompose the mark-up in a part due to structural characteristics of an industry (and therefore perhaps not susceptible for policy change), innovation rents (and therefore not a particular concern for policy makers) and a part that is related to entry barriers and particular policies. *Second*, the analysis could be extended to service sectors. It is likely that the degree of competition in many services is considerably lower than in manufacturing. *Third*, in the presence of imperfections in the labour market, the estimated mark-up is not a fully appropriate measure of total product market rents. *Fourth*, the mark-up estimate might be corrected for the potential downward bias induced by increasing returns, sunk costs or adjustment rigidities. Finally, it would be interesting to

23. The Solow residual remains, however, an interesting welfare indicator (see, Basu and Fernald, 1995).

disentangle the components of the total mark-up due to these factors, from the pure profits resulting from the difference between prices and average costs.

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Table 1. **Estimated sectoral mark-ups for G-7 countries: Roeger's method (1)**
(period 1970-92)

Sector (by market structure type and ISIC classification	United States	Japan	Germany	France	Italy	United Kingdom	Canada
Food products	1.05	1.32	1.12	1.11	.	1.20	1.09
Textiles	1.08	1.19	1.15	1.10	1.16	1.03	1.20
Wearing apparel	1.10	.	1.11	1.15	1.14	1.03	1.10
Leather products	1.08	.	1.18	1.11	1.14	1.06	1.11
Footwear	1.08	.	.	1.13	1.13	1.04	1.07
Wood products	1.22	.	1.20	1.15	1.17	1.18	1.28
Furniture	1.06	1.25	1.15	1.21	1.21	1.19	1.16
Printing & Publishing	1.19	1.10	1.09	1.24	1.18	1.09	1.21
Plastic products	1.07	1.15	.	.	1.08	.	1.17
Non-metal mineral products	1.18	1.26	1.26	1.24	1.30	1.15	1.32
Metal products	1.09	1.11	1.20	1.18	1.39	1.03	1.16
Chemical products	1.26	1.26	1.24	1.19	.	1.08	1.20
Machinery & equipment	1.06	1.09	1.06	1.12	1.19	.	1.15
Motorcycles & bicycles	1.13	.	.	.	.	.	.
Professional goods	1.09	1.22	1.67	.	1.21	1.16	.
Other manufacturing	1.08	1.38	1.30	.	1.09	.	1.11
Beverages	.	1.26	1.33	1.68	.	1.54	1.30
Paper products & pulp	1.13	1.20	1.29	1.13	1.15	1.05	1.39
Petroleum & coal products	1.11	1.10	1.09	.	.	1.06	1.31
Rubber products	.	1.15	.	1.20	1.10	.	1.12
Pottery & china	1.09	1.22	.	1.29	1.30	.	1.40
Glass products	1.17	1.41	1.23	1.22	1.30	1.06	1.31
Iron & steel	1.10	1.19	1.14	1.16	1.17	.	1.25
Non-ferrous metals	1.14	1.26	.	1.26	1.15	1.05	1.14
Shipbuilding & repair	.	1.27	.	.	.	.	1.16
Other transport equipment	.	.	.	.	1.05	.	.
Tobacco products	1.56	.	1.52	3.12	.	1.56	1.19
Petroleum refineries	1.03	1.04	.	1.19	.	1.07	.
Industrial chemicals	1.18	1.23	.	1.21	1.16	1.06	1.40
Drugs & medicines	1.44	1.54	1.45	1.04	.	1.16	1.25
Office & computing machinery	1.54	1.24	1.58	1.17	1.67	1.47	.
Radio, TV & comm. equipment	1.40	1.13	1.34	1.11	1.19	1.25	1.31
Electrical apparatus	.	1.05	.	1.25	1.08	.	1.16
Railroad equipment	.	.	.	1.69	.	.	1.13
Motor vehicles	1.09	1.17	1.15	1.13	1.02	.	1.14
Aircraft	.	.	.	1.21	1.10	.	1.25

1. Reported mark-ups estimates are statistically significant at 5 per cent level.
2. A dot indicates that no data were available or that the estimated mark-up was not statistically significant.

Source: OECD Secretariat calculations based on STAN database.

Table 2. **Estimated sectoral mark-ups for other OECD countries: Roeger's method (1)**
(period 1970-92)

Sector (by market structure type and ISIC classification	Australia	Belgium	Denmark	Finland	Netherlands	Norway	Sweden
Food products	1.13	1.15	1.10	1.09	1.12	.	1.03
Textiles	1.13	1.08	1.12	1.13	1.08	1.13	1.14
Wearing apparel	1.11	.	1.14	1.13	1.09	1.13	.
Leather products	1.16	1.28	1.15	1.10	1.08	1.16	1.10
Footwear	1.11	1.10	.	1.09	1.09	1.13	1.04
Wood products	1.21	.	1.12	.	1.21	1.17	1.24
Furniture	1.14	1.18	1.16	1.17	1.12	1.16	1.08
Printing & Publishing	1.22	1.13	1.11	1.10	1.20	1.11	1.13
Plastic products	1.21	.	1.18	1.23	1.24	1.11	1.17
Non-metal mineral products	1.25	.	1.28	1.21	.	1.24	.
Metal products	1.17	1.08	1.15	1.19	1.13	1.15	1.13
Chemical products	1.27	1.12	1.15	1.18	1.33	1.08	.
Machinery & equipment	1.17	.	1.12	1.14	1.16	1.10	1.07
Motorcycles & bicycles	.	.	1.13	1.31	1.16	.	.
Professional goods	1.22	1.31	.	1.16	1.25	1.33	1.13
Other manufacturing	1.18	.	1.25	1.17	1.13	1.16	.
Beverages	1.27	1.19	1.21	1.25	1.63	.	1.19
Paper products & pulp	1.18	1.11	1.13	1.08	1.16	1.14	1.29
Petroleum & coal products	1.23	.	1.33	1.34	.	1.15	.
Rubber products	1.17	1.06	1.12	1.13	1.13	1.15	1.08
Pottery & china	1.15	.	1.41	1.32	1.16	1.11	.
Glass products	1.26	1.15	1.22	1.12	1.19	1.07	.
Iron & steel	1.14	1.25	.	1.18	1.40	1.33	1.10
Non-ferrous metals	1.18	1.17	1.14	1.05	1.30	1.35	1.11
Shipbuilding & repair	1.07	.	.	1.14	.	1.11	.
Other transport equipment	.	.	.	1.33	.	1.39	.
Tobacco products	1.57	1.07	.	1.30	1.53	.	.
Petroleum refineries	1.35	.	.	1.11	.	.	.
Industrial chemicals	1.23	1.10	1.24	1.20	1.41	1.42	1.22
Drugs & medicines	1.42	.	1.41	1.68	1.10	1.22	1.43
Office & computing machinery	.	.	1.44	.	1.15	1.37	1.15
Radio, TV & comm. equipment	2.02	.	1.10	1.20	1.19	1.20	1.32
Electrical apparatus	1.07	.	1.17	1.26	.	1.19	.
Railroad equipment	1.44	.	.	1.22	.	.	.
Motor vehicles	1.08	.	.	1.14	1.12	1.21	1.15
Aircraft	.	.	.	.	1.19	1.43	.

1. Reported mark-ups estimates are statistically significant at 5 per cent level.
2. A dot indicates that no data were available or that the estimated mark-up was not statistically significant.
Source: OECD Secretariat calculations based on STAN database.

Table 3. **Estimated sectoral mark-ups for G-7 countries: Roeger's method (1)**
(period 1980-92)

Sector (by market structure type and ISIC classification)	United States	Japan	Germany	France	Italy	United Kingdom	Canada
Food products	1.07	1.35	1.10	1.10	.	1.19	1.10
Textiles	1.09	1.17	1.13	1.10	1.18	1.03	1.23
Wearing apparel	1.11	.	1.08	1.14	1.16	1.03	1.11
Leather products	1.10	.	1.14	1.11	1.17	1.04	1.15
Footwear	1.10	.	1.04	1.10	1.15	.	1.08
Wood products	1.23	.	1.17	1.14	1.18	1.17	1.24
Furniture	1.05	1.18	1.13	1.19	1.21	1.15	1.14
Printing & Publishing	1.22	.	1.15	1.16	1.19	1.07	1.17
Plastic products	1.06	1.15	.	.	1.05	.	1.15
Non-metal mineral products	1.19	1.30	1.28	1.19	1.31	1.20	1.31
Metal products	1.10	1.12	1.20	1.17	1.42	1.03	1.14
Chemical products	1.26	1.37	1.29	1.19	.	1.05	1.21
Machinery & equipment	.	1.14	.	1.12	1.18	.	1.16
Motorcycles & bicycles	1.09	.	1.34	.	.	.	.
Professional goods	1.07	1.27	1.77	.	1.24	1.28	.
Other manufacturing	1.08	1.47	1.25	.	1.10	.	.
Beverages	1.04	1.09	1.31	1.64	.	1.54	1.22
Paper products & pulp	1.12	1.23	1.23	1.11	1.15	1.04	1.37
Petroleum & coal products	1.12	1.15	1.08	.	.	1.08	1.25
Rubber products	.	1.10	.	1.16	1.12	.	.
Pottery & china	1.10	1.15	1.26	1.19	1.31	.	1.44
Glass products	1.17	1.72	1.27	1.23	1.31	1.08	1.30
Iron & steel	1.10	1.43	1.18	1.11	1.14	.	1.26
Non-ferrous metals	1.12	1.21	1.09	1.25	1.11	1.05	1.18
Shipbuilding & repair	.	1.29	.	.	.	.	1.19
Other transport equipment	.	.	.	.	1.05	.	.
Tobacco products	1.73	.	1.60	3.17	.	1.67	1.12
Petroleum refineries	1.05	.	.	1.16	.	1.07	.
Industrial chemicals	1.22	1.27	1.40	1.21	1.17	1.05	1.50
Drugs & medicines	1.45	1.75	1.49	.	.	1.11	1.27
Office & computing machinery	1.39	1.32	.	1.18	1.65	1.43	1.14
Radio, TV & comm. equipment	1.38	1.15	1.28	1.11	1.19	1.28	.
Electrical apparatus	.	.	.	1.27	1.08	.	1.14
Railroad equipment	.	.	.	1.70	.	.	1.13
Motor vehicles	1.06	1.18	1.13	1.13	1.02	.	1.14
Aircraft	.	.	.	1.19	1.11	.	.

1. Reported mark-ups estimates are statistically significant at 5 per cent level.
2. A dot indicates that no data were available or that the estimated mark-up was not statistically significant.
Source: OECD Secretariat calculations based on STAN database.

Table 4. **Estimated sectoral mark-ups for other OECD countries: Roeger's method (1)**
(period 1980-92)

Sector (by market structure type and ISIC classification)	Australia	Belgium	Denmark	Finland	Nether-lands	Norway	Sweden
Food products	1.14	1.16	1.12	1.07	.	.	.
Textiles	1.14	1.12	1.11	1.22	.	1.13	1.13
Wearing apparel	1.12	.	1.18	1.12	.	1.13	.
Leather products	1.17	1.35	1.21	1.14	1.11	1.15	1.12
Footwear	1.14	1.12	.	1.09	.	1.16	.
Wood products	1.20	.	1.13	1.24	1.19	1.17	1.16
Furniture	1.13	1.29	1.15	1.31	.	1.14	1.05
Printing & Publishing	1.21	1.16	1.10	1.20	1.22	1.11	1.15
Plastic products	1.21	.	1.16	1.34	1.14	1.11	1.21
Non-metal mineral products	1.21	1.09	1.25	1.39	.	1.25	1.12
Metal products	1.17	1.18	1.14	1.22	1.10	1.16	1.12
Chemical products	1.25	1.13	1.12	1.26	.	1.08	1.17
Machinery & equipment	1.15	.	1.12	1.22	.	1.11	.
Motorcycles & bicycles	.	.	.	1.31	1.20	.	.
Professional goods	1.23	.	.	.	1.24	1.31	1.12
Other manufacturing	1.24	.	1.22	1.24	1.13	1.12	.
Beverages	1.29	1.12	.	1.63	1.59	.	1.23
Paper products & pulp	1.20	1.21	1.13	1.24	1.15	1.11	1.19
Petroleum & coal products	1.33	.	1.39	1.16	.	1.15	.
Rubber products	1.10	1.05	1.13	1.50	.	1.13	.
Pottery & china	1.17	.	1.36	1.82	.	1.17	.
Glass products	1.33	.	.	1.22	1.36	.	1.13
Iron & steel	1.31	1.30	1.09	1.30	1.39	1.25	1.09
Non-ferrous metals	1.28	1.17	1.17	1.13	1.27	1.35	.
Shipbuilding & repair	1.19	.	.	.	.	.	1.14
Other transport equipment	.	.	.	1.33	.	1.15	.
Tobacco products	1.58	1.08	.	1.30	1.51	.	.
Petroleum refineries	1.21	.	.	1.22	.	.	.
Industrial chemicals	1.20	1.17	1.26	1.27	1.19	1.28	1.18
Drugs & medicines	1.35	.	1.59	1.57	.	1.24	1.35
Office & computing machinery	.	.	1.44	1.92	.	1.45	1.17
Radio, TV & comm. equipment	1.61	.	1.10	1.59	1.17	1.16	1.30
Electrical apparatus	.	.	1.21	1.22	.	1.15	.
Railroad equipment	1.44	.	.	1.22	.	.	.
Motor vehicles	1.12	.	.	1.17	1.15	1.19	1.12
Aircraft	.	.	.	.	1.44	.	.

1. Reported mark-ups estimates are statistically significant at 5 per cent level.
2. A dot indicates that no data were available or that the estimated mark-up was not statistically significant.

Source: OECD Secretariat calculations based on STAN database.

Table 5. **Comparison of Mark-ups for the United States following different approaches**

Sectors (by ISIC ranking)	Hall (1990) 1953-84[1]	Roeger (1995) 1953-84	Current paper 1970-92
Food products and beverages	*5.29*	1.50	-
Food products	-	-	1.05
Tobacco products	2.77	2.75	1.56
Textiles	2.58	1.34	1.08
Wearing apparel	0.82	1.15	1.10
Leather products and footwear	*2.10*	1.19	1.08
Wood products	1.80	1.75	1.22
Furniture	1.98	1.28	1.06
Paper products and pulp	3.72	1.57	1.13
Printing and publishing	*14.26*	1.40	1.19
Chemical products	*20.11*	2.11	-
Industrial chemicals			1.18
Drugs and medicines			1.44
Chemical products, nec.			1.26
Rubber and plastic products	1.51	1.36	-
Plastic products			1.07
Non-metallic mineral products	2.54	1.59	-
Pottery, china, etc.			1.09
Glass products			1.17
Non-metallic min. prod.			1.18
Basic metal products	2.17	1.58	-
Iron and steel			1.10
Non-ferrous metals			1.14
Metal products	1.65	1.33	1.09
Machinery and equipment	1.43	1.41	-
Machinery and equipment, nec.			1.06
Office and computing machinery			1.54
Electrical machinery	3.09	1.34	-
Radio, TV and comm. equipment			1.40
Motor vehicles	1.76	2.06	1.09
Other transport equipment	0.95	1.22	-
Motorcycles and bicycles			1.13
Aircraft			1.05
Professional goods	*1.40*	1.47	1.09
Other manufacturing	*4.49*	1.62	1.08

1. Italicised mark-ups are insignificant.
Source: Hall (1990); Roeger (1995); Table 1.

Table 6. **Breakdown of industries according to market structure characteristics**

ISIC	Sectors (ordered by R&D intensity)	Establishment size[1]	R & D intensity by establishment[2]	R & D/Output intensity[3]	R&D Stock/Output intensity[4]
	Fragmented, low-differentiation				
3320	Furniture and fixtures	62	3	8	7
3310	Wood products	61	3	7	5
3230	Leather products	56	4	13	15
3220	Wearing apparel	72	4	16	19
3210	Textiles	98	7	11	9
3240	Footwear	109	7	14	13
3420	Printing and publishing	68	9	17	11
3810	Metal products	71	17	35	22
3690	Non-metal products, nec	65	23	39	30
3112	Food products	101	25	15	12
3560	Plastic products, nec	75	30	57	33
	Fragmented, high-differentiation				
3900	Other manufacturing nec	84	74	111	58
3829	Machinery & equipment, nec	96	84	105	67
3844	Motorcycles & bicycles	98	112	116	138
3850	Professional goods	106	197	276	167
3529	Chemical products, nec	123	212	141	112
	Segmented, low-differentiation				
3610	Pottery, china etc.	152	33	50	39
3410	Paper products & pulp	195	46	12	8
3620	Glass products	171	65	43	32
3550	Rubber products	179	74	66	39
3841	Shipbuilding & repair	153	75	69	63
3130	Beverages	193	92	29	20
3849	Transport equipment, nec	176	95	111	100
3540	Petroleum & coal products	156	134	123	86
3710	Iron & steel	336	156	40	26
3720	Non-ferrous metals	233	199	54	35
3140	Tobacco products	696	379	30	22
3530	Petroleum refineries	654	2400	36	32
	Segmented, high-differentiation				
3842	Railroad equipment	466	327	117	136
3843	Motor vehicles	255	445	136	95
3839	Electrical apparatus, nec	151	492	154	260
3510	Industrial chemicals	268	730	131	120
3825	Office & computing machinery	271	935	488	316
3832	Radio, TV & comm. equipment	242	1123	589	602
3522	Drugs & medicines	272	2178	612	417
3845	Aircraft	568	3207	604	433

1. Average employment per establishment normalised by the total manufacturing average in each country.
2. R&D expenses by establishment normalised by the total manufacturing average in each country.
3. R&D /expenditure gross output ratio normalised by the total manufacturing average in each country.
4. R&D Stock/gross output ratio normalised by the total manufacturing average in each country. R&D stocks are calculated as cumulated R&D expenditures, using an annual depreciation rate of 15 per cent. See Griliches (1995).

Sources: Calculations based on OECD-STAN database (OECD, 1995) OECD-ISIS data bases (OECD, 1995*a)* for establishment size data and OECD-ANBERD (OECD, 1995*b)* for data on R&D expenditure.

Table 7. **The effect of mark-ups on TFP measurement, 1970-92**
(annual compound growth rates, total manufacturing)

	Growth of value added	Solow residual	Average mark-up	Growth of capital intensity	TFP growth
United States	1.88	1.04	0.152	3.38	1.38
Japan[1]	5.77	2.42	0.208	5.07	2.95
Germany	1.63	1.34	0.205	2.94	1.77
France	1.98	1.53	0.173	3.72	1.93
Italy[2]	3.09	3.16	0.174	0.85	3.24
United Kingdom[3]	0.78	1.99	0.153	4.26	2.47
Canada	2.31	0.85	0.198	3.32	1.28
Australia[4]	1.85	1.02	0.173	3.01	1.33
Belgium[3]	2.96	3.25	0.139	4.83	3.70
Denmark[5]	2.00	1.47	0.142	3.44	1.82
Finland	2.73	2.17	0.141	4.67	2.59
Netherlands[5]	1.93	1.37	0.263	4.29	2.01
Norway[3]	0.71	0.58	0.193	5.16	1.26
Sweden	1.13	1.48	0.190	3.52	1.98

1. 1976-91. 2. 1971-88 3. 1970-91. 4. 1970-88. 5. 1970-90.

Source: OECD Secretariat calculations based on STAN data-base. The average mark-up is the production-weighted average of significant sectoral mark-ups.

Figure 1 (a)**: Mark-up ratios in manufacturing, G7 countries, 1970-92**

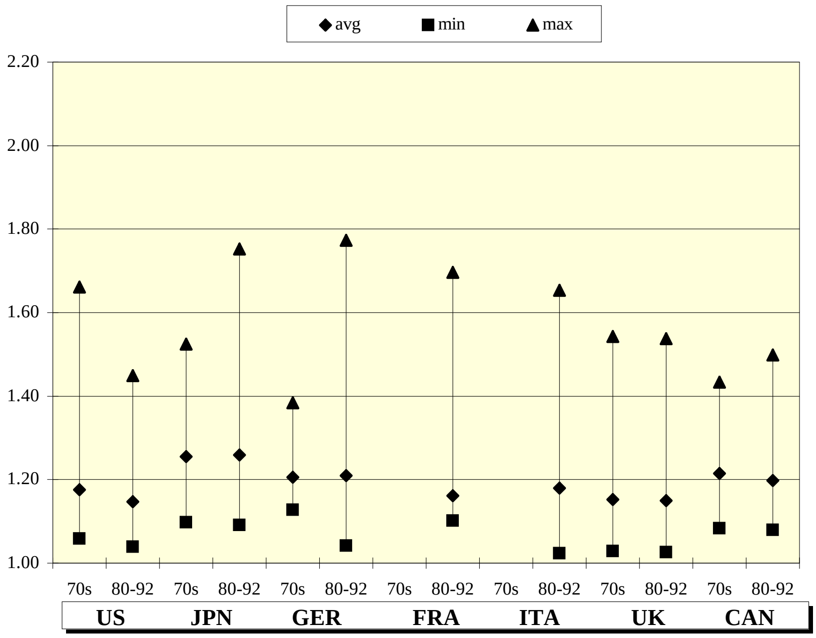
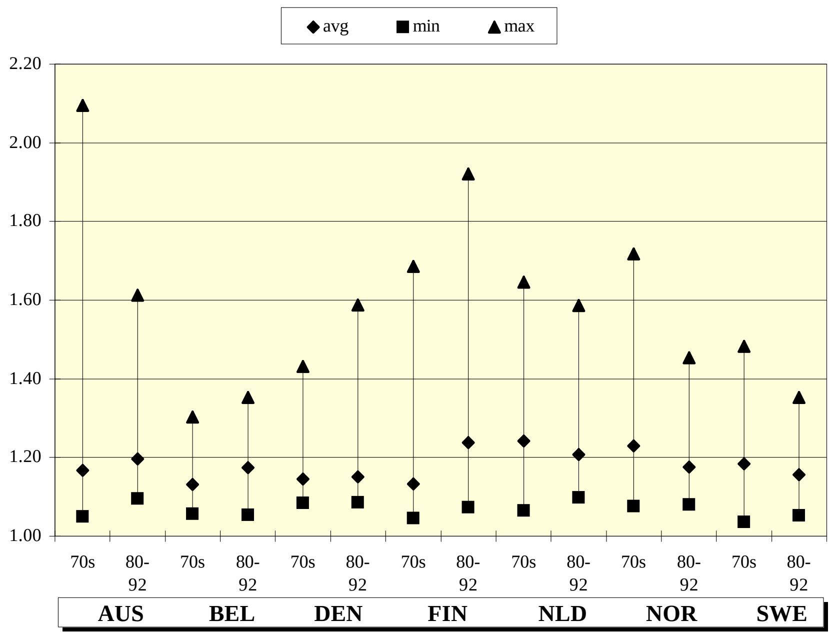


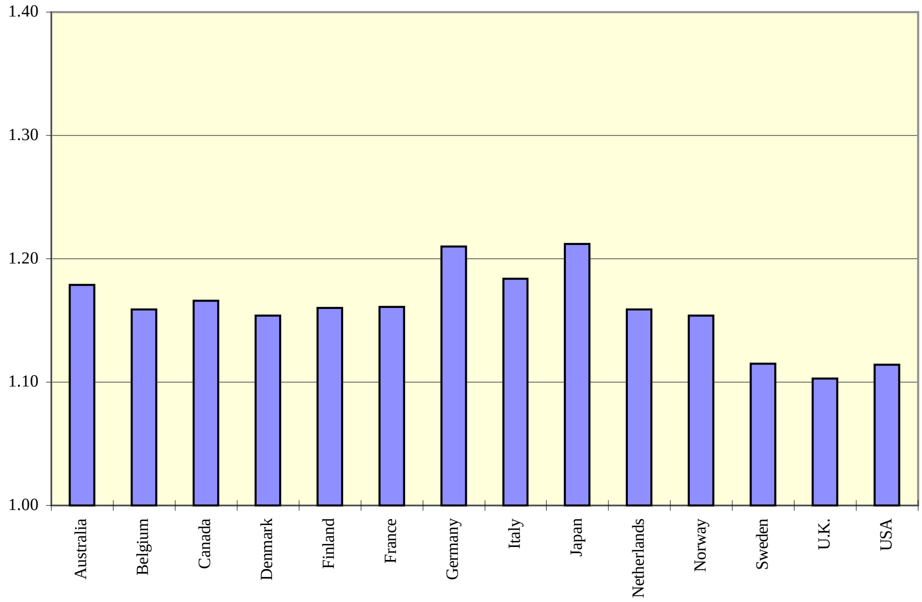
Figure 1 (b)**: Mark-up ratios in manufacturing, small countries, 1970-92**



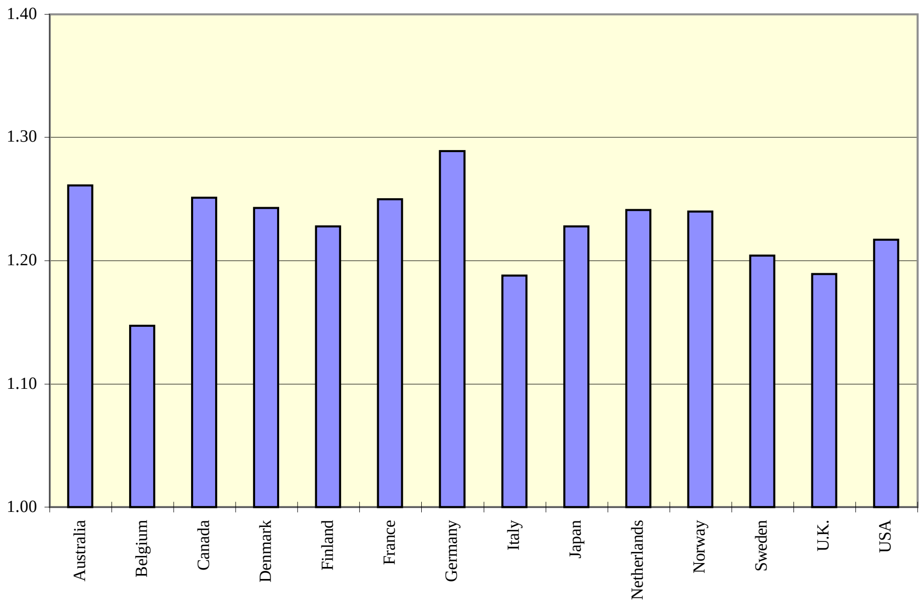
Note: Average mark-ups are weighted by 1990 production shares.

Figure 2. **Average mark-up by country and market structure, 1970-1992**[1]

Fragmented



Segmented

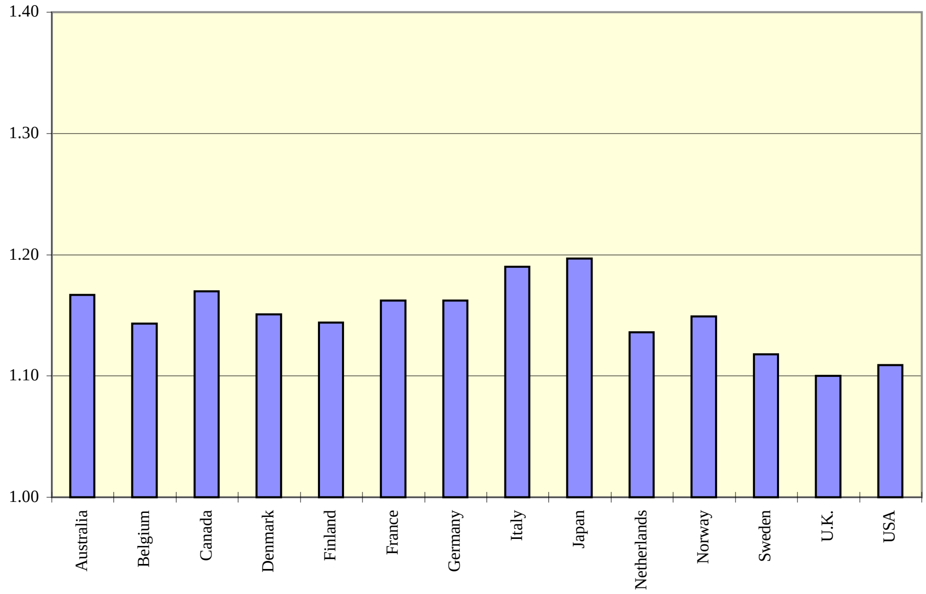


1. The average mark-up is an unweighted average of the available mark-ups.

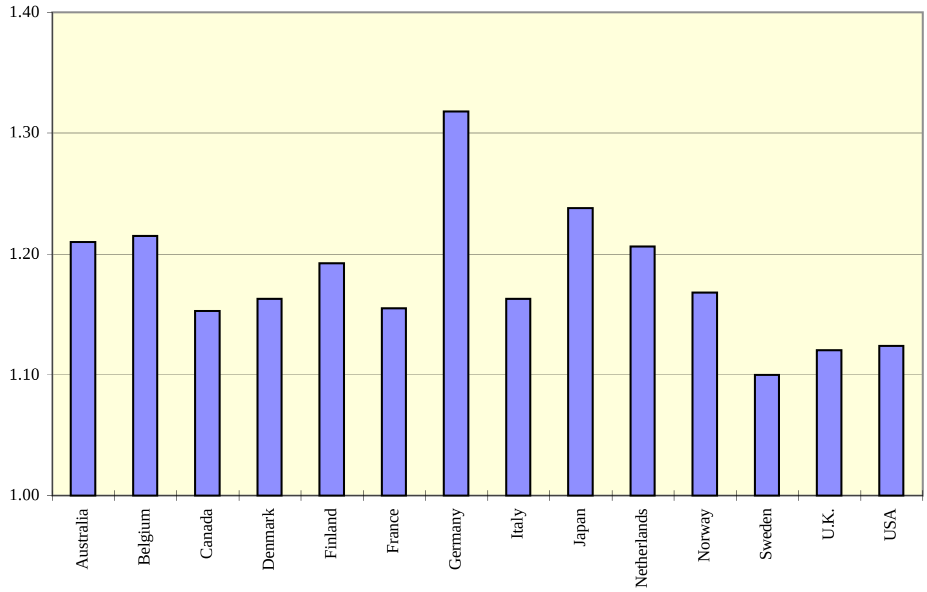
Source : OECD Secretariat calculations, based on Tables 1 and 2.

Figure 3. **Average mark-up by country and market structure, 1970-1992**[1]

Fragmented, Low differentiation



Fragmented, High differentiation

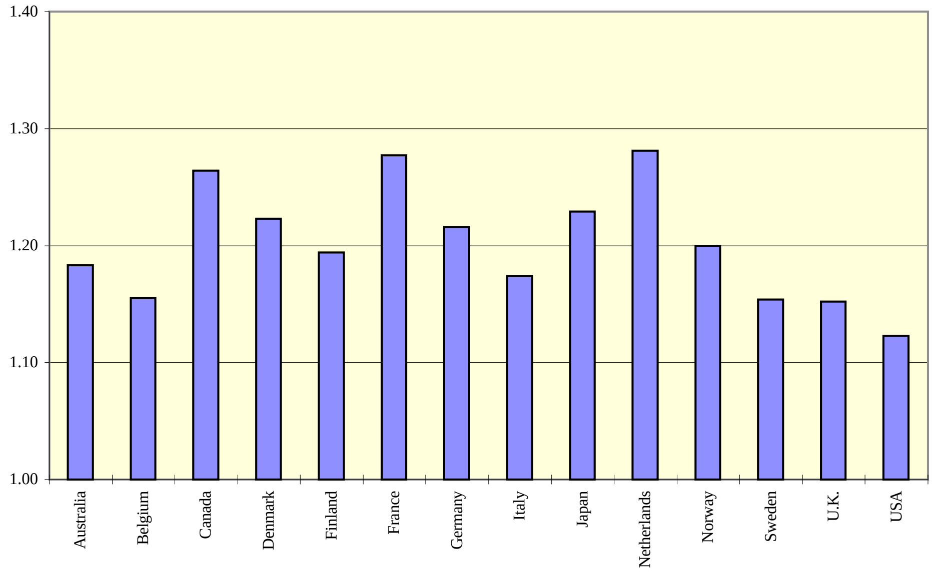


1. The average mark-up is an unweighted average of the available mark-ups.

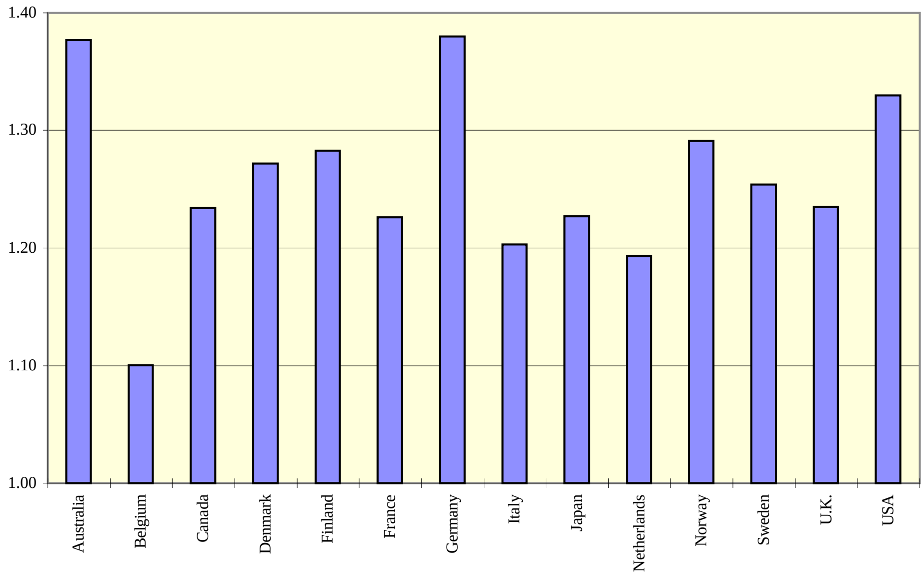
Source : OECD Secretariat calculations, based on Tables 1 and 2.

Figure 3 (ct'd). **Average mark-up by country and market structure, 1970-1992**[1]

Segmented,Low differentiation[2]



Segmented, High differentiation[3]



1. The average mark-up is an unweighted average of the available mark-ups.
2. Excluding Petroleum refineries and Tobacco products.
3. The average mark-up for Belgium includes Industrial chemicals only.

Source : OECD Secretariat calculations, based on Tables 1 and 2.

ANNEX TABLES

Table A.1. **Estimation of mark-ups by sector , 1970-1992 - *United States***

		Estimation results					Estimated mark-ups		
ISIC	Sectors	B	T-test	R2	DW	Nob	Net indirect tax rate %[1]	VA/PR ratio[2]	Mark-up ratio[3]
3112	Food products	0.06	4.43	0.48	1.87	20	3.02	0.24	1.05
3210	Textiles	0.08	9.57	0.84	2.42	20	2.10	0.31	1.08
3220	Wearing apparel	0.09	6.61	0.71	1.96	20	0.94	0.39	1.10
3230	Leather products	0.07	3.86	0.44	2.08	20	0.95	0.35	1.08
3240	Footwear	0.08	4.51	0.49	2.94	20	0.95	0.40	1.08
3310	Wood products	0.20	13.69	0.91	1.76	20	3.54	0.42	1.22
3320	Furniture	0.06	3.63	0.41	2.32	20	1.79	0.41	1.06
3420	Printing & Publishing	0.17	10.08	0.84	2.83	20	2.00	0.45	1.19
3560	Plastic products	0.09	4.00	0.46	1.92	20	6.33	0.37	1.07
3690	Non-metal products	0.17	7.56	0.75	2.08	20	3.50	0.39	1.18
3810	Metal products	0.09	7.88	0.75	2.25	21	2.67	0.41	1.09
3529	Chemical products	0.21	6.85	0.71	2.02	20	1.88	0.41	1.26
3829	Machinery & Equipment	0.06	2.23	0.17	1.87	20	2.33	0.39	1.06
3844	Motorcycles & Bicycles	0.12	4.07	0.53	1.60	19	1.69	0.26	1.13
3850	Professional goods	0.09	3.73	0.40	1.93	21	1.83	0.43	1.09
3900	Other manufacturing	0.08	2.81	0.29	2.63	21	1.83	0.46	1.08
3130	Beverages	0.12	4.58	0.51	1.84	20	49.31	0.31	.
3140	Tobacco products	0.47	9.26	0.81	2.65	20	37.67	0.52	1.56
3410	Paper products & Pulp	0.12	8.22	0.79	1.98	20	2.99	0.35	1.13
3530	Petroleum refineries	0.07	2.79	0.29	2.66	20	49.42	0.09	1.03
3540	Petroleum & Coal products	0.10	4.12	0.46	2.33	20	1.88	0.27	1.11
3550	Rubber products	0.02	0.50	0.01	1.93	20	6.33	0.39	.
3610	Pottery & China	0.10	3.60	0.41	2.64	20	3.50	0.52	1.09
3620	Glass products	0.16	5.23	0.59	2.30	20	2.87	0.44	1.17
3710	Iron & Steel	0.10	3.91	0.43	2.79	20	3.65	0.36	1.10
3720	Non-ferrous metals	0.13	8.76	0.80	2.55	20	3.39	0.26	1.14
3841	Shipbuilding & Repair	-0.12	-1.94	0.18	1.33	20	1.69	0.42	.
3849	Other transport equipment	.	.	.	.	.	.	.	.
3510	Industrial chemicals	0.17	6.36	0.68	2.04	20	5.54	0.34	1.18
3522	Drugs & Medicines	0.31	6.51	0.70	1.75	20	0.78	0.53	1.44
3825	Office & Computing mach.	0.36	8.25	0.78	2.35	20	2.08	0.54	1.54
3832	Radio , TV & Comm. equip.	0.29	9.93	0.82	1.73	20	1.78	0.52	1.40
3839	Electrical apparatus	-0.07	-1.24	0.07	2.87	20	2.39	0.35	.
3842	Railroad equipment	0.02	0.99	0.05	2.08	19	1.69	0.33	.
3843	Motor vehicles	0.10	4.23	0.47	1.47	20	4.79	0.29	1.09
3845	Aircraft	0.01	0.29	0.01	1.90	19	1.95	0.45	.

1. Net indirect tax rates are calculated as the average rate of 1975 and 1987. They are based on BEA's input-output tables for those years.
2. The value added/production ratio is the average ratio of 1975 and 1987.
3. A dot indicates that : i) The B coefficient was not available or not statistically greater than zero at the 5 % level; ii) There were less than five data points for the estimation of the B coefficient; iii) Data on net indirect taxes were not available; iv) The adjustment for net indirect taxes resulted in a mark-up ratio below one.

Source: Calculations based on STAN database.

Table A.2. **Estimation of mark-ups by sector , 1970-1992 -** ***Japan***

ISIC	Sectors	B	T-test	R2	DW	Nob	Net indirect tax rate %[1]	VA/PR ratio[2]	Mark-up ratio[3]
		Estimation results					Estimated mark-ups		
3112	Food products	0.19	23.30	0.96	1.48	20	-20.58	0.34	1.32
3210	Textiles	0.17	14.74	0.92	1.43	20	4.76	0.32	1.19
3220	Wearing apparel	-0.04	-2.72	0.29	1.92	20	4.84	0.35	.
3230	Leather products	0.00	0.01	0.00	2.20	20	2.12	0.26	.
3240	Footwear	-0.02	-1.26	0.00	2.46	20	.	.	.
3310	Wood products	0.02	1.19	0.17	2.14	16	3.34	0.29	.
3320	Furniture	0.21	7.78	0.78	3.03	16	3.96	0.41	1.25
3420	Printing & Publishing	0.11	7.87	0.78	1.79	20	2.98	0.46	1.10
3560	Plastic products	0.14	10.39	0.86	2.09	20	4.79	0.28	1.15
3690	Non-metal products	0.22	21.68	0.97	2.22	20	4.66	0.38	1.26
3810	Metal products	0.12	5.55	0.73	1.69	17	3.30	0.43	1.11
3529	Chemical products	0.22	11.08	0.87	2.03	20	7.63	0.32	1.26
3829	Machinery & Equipment	0.10	3.06	0.42	1.71	16	3.52	0.37	1.09
3844	Motorcycles & Bicycles	0.28	1.32	0.21	2.93	7	6.80	0.43	.
3850	Professional goods	0.20	10.10	0.80	2.52	17	6.24	0.44	1.22
3900	Other manufacturing	0.30	22.93	0.96	2.25	21	10.72	0.37	1.38
3130	Beverages	0.34	11.34	0.87	2.24	20	59.14	0.33	1.26
3140	Tobacco products	0.04	4.85	0.58	1.35	20	81.62	0.11	.
3410	Paper products & Pulp	0.18	26.37	0.97	2.28	20	4.50	0.29	1.20
3530	Petroleum refineries	0.09	3.53	0.39	2.38	20	71.73	0.07	1.04
3540	Petroleum & Coal products	0.10	6.55	0.69	2.49	20	6.40	0.11	1.10
3550	Rubber products	0.14	6.64	0.71	2.02	20	3.69	0.32	1.15
3610	Pottery & China	0.19	15.41	0.92	2.27	20	2.78	0.46	1.22
3620	Glass products	0.31	15.88	0.93	2.21	20	5.22	0.45	1.41
3710	Iron & Steel	0.17	12.04	0.89	1.97	20	6.71	0.20	1.19
3720	Non-ferrous metals	0.22	25.83	0.97	2.13	20	5.69	0.29	1.26
3841	Shipbuilding & Repair	0.23	7.03	0.72	1.97	16	4.22	0.39	1.27
3849	Other transport equipment	-0.02	-0.19	0.00	2.77	7	3.99	0.42	.
3510	Industrial chemicals	0.20	8.52	0.81	1.91	20	5.50	0.24	1.23
3522	Drugs & Medicines	0.36	10.92	0.88	2.04	18	3.18	0.46	1.54
3825	Office & Computing mach.	0.19	6.73	0.75	2.77	16	0.16	0.41	1.24
3832	Radio , TV & Comm. equip.	0.15	5.44	0.60	2.17	16	12.23	0.33	1.13
3839	Electrical apparatus	0.07	3.24	0.33	1.65	16	5.11	0.43	1.05
3842	Railroad equipment	0.12	1.12	0.21	2.45	7	3.16	0.45	.
3843	Motor vehicles	0.18	9.13	0.82	2.01	16	13.55	0.29	1.17
3845	Aircraft	0.28	1.96	0.37	2.04	7	-1.42	0.46	.

1. Net indirect tax rates are calculated as the average rate of 1975 and 1985. They are based on input-output tables, for those years, Management and Coordination Agency, Tokyo.
2. The value added/production ratio is the average ratio of 1975 and 1985.
3. See note on Table A.1.

Source: Calculations based on STAN database.

Table A.3. **Estimation of mark-ups by sector , 1970-1992 - *Germany***

ISIC	Sectors	Estimation results: B	T-test	R2	DW	Nob	Estimated mark-ups: Net indirect tax rate %[1]	VA/PR ratio[2]	Mark-up ratio[3]
3112	Food products	0.11	8.93	0.81	2.31	20	-0.92	0.21	1.12
3210	Textiles	0.14	5.46	0.59	1.73	20	1.72	0.37	1.15
3220	Wearing apparel	0.10	4.20	0.50	2.39	20	1.89	0.35	1.11
3230	Leather products	0.16	6.15	0.66	1.05	20	1.54	0.37	1.18
3240	Footwear	0.03	1.57	0.09	1.62	20	2.29	0.31	.
3310	Wood products	0.18	7.44	0.73	2.53	20	2.73	0.36	1.20
3320	Furniture	0.14	4.95	0.56	1.70	20	2.17	0.39	1.15
3420	Printing & Publishing	0.09	2.20	0.19	2.08	20	1.85	0.45	1.09
3560	Plastic products	0.12	1.83	0.15	2.56	20	2.03	0.36	.
3690	Non-metal products	0.22	5.15	0.58	1.90	20	3.31	0.43	1.26
3810	Metal products	0.18	4.94	0.57	2.18	20	1.86	0.55	1.20
3529	Chemical products	0.21	4.19	0.57	2.23	14	3.49	0.33	1.24
3829	Machinery & Equipment	0.06	2.32	0.23	2.78	19	1.96	0.32	1.06
3844	Motorcycles & Bicycles	0.15	1.82	0.23	1.76	13	0.60	0.28	.
3850	Professional goods	0.41	3.10	0.36	2.20	14	2.22	0.91	1.67
3900	Other manufacturing	0.24	6.62	0.69	1.94	21	3.09	0.45	1.30
3130	Beverages	0.34	10.66	0.85	2.07	20	30.61	0.44	1.33
3140	Tobacco products	0.57	7.02	0.70	1.93	20	84.14	0.63	1.52
3410	Paper products & Pulp	0.23	6.43	0.69	1.83	20	2.30	0.39	1.29
3530	Petroleum refineries	0.08	1.33	0.11	1.26	18	79.64	0.25	.
3540	Petroleum & Coal products	0.09	3.00	0.34	2.06	18	3.49	0.17	1.09
3550	Rubber products	0.08	0.90	0.04	2.33	20	2.10	0.38	.
3610	Pottery & China	-0.04	-0.83	0.02	1.67	20	0.98	0.46	.
3620	Glass products	0.20	5.29	0.59	2.84	20	2.69	0.43	1.23
3710	Iron & Steel	0.13	3.68	0.42	2.81	20	1.24	0.37	1.14
3720	Non-ferrous metals	0.04	1.64	0.14	1.55	20	1.08	0.28	.
3841	Shipbuilding & Repair	0.06	1.04	0.06	2.54	19	-4.83	0.33	.
3849	Other transport equipment	0.08	1.39	0.15	2.64	13	0.60	0.34	.
3510	Industrial chemicals	0.17	1.01	0.04	2.35	20	3.49	0.36	.
3522	Drugs & Medicines	0.32	4.40	0.61	2.40	14	3.49	0.49	1.45
3825	Office & Computing mach.	0.38	2.14	0.39	1.40	13	1.23	0.73	1.58
3832	Radio , TV & Comm. equip.	0.26	5.87	0.71	1.30	13	1.19	0.54	1.34
3839	Electrical apparatus	0.05	0.99	0.06	2.19	13	1.19	0.33	.
3842	Railroad equipment	-0.14	-0.74	0.01	1.66	13	1.72	0.37	.
3843	Motor vehicles	0.14	4.40	0.60	1.93	13	2.45	0.33	1.15
3845	Aircraft	0.04	0.46	0.01	1.42	15	-1.38	0.39	.

1. Net indirect tax rates are calculated as the average rate of data for 1970, 1980, 1985 and 1987. They are based on data derived from Statistisches Bundesamt, Volkswirtschaftliche Gesamtrechnungen, Wiesbaden, various issues.
2. The value added/production ratio is calculated as the average ratio of 1971, 1980, 1985 and 1987.
3. See note on Table A.1.

Source: Calculations based on STAN database.

Table A.4. **Estimation of mark-ups by sector , 1970-1992 - *France***

ISIC	Sectors	Estimation results: B	T-test	R2	DW	Nob	Estimated mark-ups: Net indirect tax rate %[1]	VA/PR ratio[2]	Mark-up ratio[3]
3112	Food products	0.10	10.18	0.89	2.28	14	3.73	0.25	1.11
3210	Textiles	0.11	5.03	0.60	1.36	14	4.04	0.36	1.10
3220	Wearing apparel	0.15	6.85	0.71	1.30	16	4.04	0.43	1.15
3230	Leather products	0.12	5.19	0.63	2.30	14	4.04	0.42	1.11
3240	Footwear	0.13	4.72	0.47	2.25	16	4.04	0.52	1.13
3310	Wood products	0.15	8.87	0.89	1.79	16	5.01	0.39	1.15
3320	Furniture	0.19	3.18	0.49	1.81	16	5.01	0.44	1.21
3420	Printing & Publishing	0.20	3.45	0.53	1.52	17	2.25	0.42	1.24
3560	Plastic products	.	.	.	.	.	.	.	.
3690	Non-metal products	0.21	7.06	0.81	1.77	17	4.40	0.45	1.24
3810	Metal products	0.17	8.48	0.79	1.71	20	3.69	0.47	1.18
3529	Chemical products	0.18	6.98	0.84	2.00	14	5.83	0.38	1.19
3829	Machinery & Equipment	0.12	5.61	0.66	1.95	13	4.77	0.39	1.12
3844	Motorcycles & Bicycles	.	.	.	.	.	.	.	.
3850	Professional goods	.	.	.	.	.	.	.	.
3900	Other manufacturing	.	.	.	.	.	.	.	.
3130	Beverages	0.41	5.72	0.66	2.95	16	3.73	0.43	1.68
3140	Tobacco products	0.69	28.14	0.98	1.40	14	3.73	0.75	3.12
3410	Paper products & Pulp	0.12	6.43	0.65	1.51	17	2.25	0.33	1.13
3530	Petroleum refineries	0.34	4.41	0.60	2.24	15	89.09	0.31	1.19
3540	Petroleum & Coal products	.	.	.	.	.	.	.	.
3550	Rubber products	0.19	4.40	0.55	2.15	17	4.22	0.47	1.20
3610	Pottery & China	0.24	7.35	0.78	2.42	17	4.40	0.41	1.29
3620	Glass products	0.20	4.68	0.57	2.35	17	4.40	0.54	1.22
3710	Iron & Steel	0.15	3.13	0.37	1.92	17	4.57	0.28	1.16
3720	Non-ferrous metals	0.22	5.11	0.67	1.99	17	4.28	0.28	1.26
3841	Shipbuilding & Repair	0.09	0.66	0.04	2.07	15	-40.15	0.27	.
3849	Other transport equipment	.	.	.	.	.	.	.	.
3510	Industrial chemicals	0.19	4.76	0.60	0.72	15	5.83	0.31	1.21
3522	Drugs & Medicines	0.06	2.42	0.32	2.05	15	5.43	0.31	1.04
3825	Office & Computing mach.	0.14	3.37	0.50	1.61	13	-1.91	0.46	1.17
3832	Radio , TV & Comm. equip.	0.11	7.50	0.81	1.84	13	1.70	0.41	1.11
3839	Electrical apparatus	0.22	7.52	0.84	1.47	13	4.48	0.55	1.25
3842	Railroad equipment	0.36	11.45	0.87	2.14	15	-19.00	0.42	1.69
3843	Motor vehicles	0.13	4.60	0.61	1.21	15	5.87	0.31	1.13
3845	Aircraft	0.16	3.59	0.45	2.47	15	-3.01	0.34	1.21

1. Net indirect tax rates are calculated as the average rate of 1980, 1985 and 1990. They are based on the OECD input-output database, OECD, Paris, 1995.
2. The value added/production ratio is the average ratio of 1980, 1985 and 1990.
3. See note on Table A.1.

Source: Calculations based on STAN database.

Table A.5. **Estimation of mark-ups by sector , 1970-1992 - *Italy***

ISIC	Sectors	B	T-test	R2	DW	Nob	Net indirect tax rate %[1]	VA/PR ratio[2]	Mark-up ratio[3]
		Estimation results					Estimated mark-ups		
3112	Food products	0.13	33.18	0.99	2.87	14	.	0.21	.
3210	Textiles	0.16	18.90	0.97	1.49	14	7.19	0.39	1.16
3220	Wearing apparel	0.15	16.93	0.96	1.39	14	7.19	0.40	1.14
3230	Leather products	0.14	10.33	0.90	1.94	14	7.19	0.27	1.14
3240	Footwear	0.14	15.18	0.95	1.42	14	7.19	0.38	1.13
3310	Wood products	0.17	29.28	0.99	2.25	11	7.38	0.36	1.17
3320	Furniture	0.20	52.97	1.00	1.34	11	7.38	0.39	1.21
3420	Printing & Publishing	0.16	41.23	1.00	1.05	12	3.11	0.45	1.18
3560	Plastic products	0.09	8.54	0.90	0.94	12	3.47	0.41	1.08
3690	Non-metal products	0.23	56.16	1.00	0.92	13	1.06	0.39	1.30
3810	Metal products	0.29	37.96	0.99	1.48	12	2.28	0.71	1.39
3529	Chemical products	.	.	.	.	.	.	.	.
3829	Machinery & Equipment	0.16	26.06	0.99	1.78	10	0.98	0.38	1.19
3844	Motorcycles & Bicycles	0.10	4.73	0.70	1.97	11	.	0.26	.
3850	Professional goods	0.21	28.40	0.99	2.03	12	7.29	0.57	1.21
3900	Other manufacturing	0.14	37.27	0.99	1.30	12	23.11	0.30	1.09
3130	Beverages	0.26	14.43	0.94	2.39	14	.	0.55	.
3140	Tobacco products	0.05	1.82	0.20	2.60	14	.	0.24	.
3410	Paper products & Pulp	0.14	33.68	0.99	2.27	12	3.11	0.31	1.15
3530	Petroleum refineries	0.07	17.24	0.97	2.70	11	.	0.11	.
3540	Petroleum & Coal products	0.09	9.89	0.91	2.84	11	85.68	0.24	.
3550	Rubber products	0.11	13.04	0.95	0.48	12	3.47	0.47	1.10
3610	Pottery & China	0.23	55.54	1.00	0.76	13	1.06	0.40	1.30
3620	Glass products	0.23	53.58	1.00	0.96	13	1.06	0.40	1.30
3710	Iron & Steel	0.13	15.76	0.96	1.40	14	-6.24	0.21	1.17
3720	Non-ferrous metals	0.12	5.85	0.72	3.02	14	-1.42	0.19	1.15
3841	Shipbuilding & Repair	0.00	-0.14	0.01	1.36	11	-26.15	0.22	.
3849	Other transport equipment	0.07	3.72	0.61	1.82	11	9.10	0.26	1.05
3510	Industrial chemicals	0.16	34.63	0.99	2.01	11	8.32	0.32	1.16
3522	Drugs & Medicines	.	.	.	.	.	.	0.50	.
3825	Office & Computing mach.	0.42	6.16	0.83	2.15	10	3.82	0.76	1.67
3832	Radio , TV & Comm. equip.	0.19	16.80	0.97	2.20	10	9.83	0.42	1.19
3839	Electrical apparatus	0.08	15.94	0.97	1.30	10	0.68	0.29	1.08
3842	Railroad equipment	0.11	3.49	0.55	1.29	11	.	0.33	.
3843	Motor vehicles	0.06	7.51	0.86	1.86	11	17.61	0.25	1.02
3845	Aircraft	0.09	4.32	0.69	1.67	11	0.33	0.27	1.10

1. Net indirect tax rates refer to 1985 and are derived from OECD's input-output database, OECD, Paris, 1995.
2. The value added/production ratio is the 1985 ratio.
3. See note on Table A.1.

Source: Calculations based on STAN database.

Table A.6. **Estimation of mark-ups by sector , 1970-1992 - *United Kingdom***[1]

		Estimation results					Estimated Mark-up ratio[2]
ISIC	Sectors	B	T-test	R2	DW	Nob	
3112	Food products	0.17	12.90	0.90	1.75	20	1.20
3210	Textiles	0.03	4.34	0.49	1.77	20	1.03
3220	Wearing apparel	0.03	3.97	0.44	1.91	20	1.03
3230	Leather products	0.05	6.10	0.66	2.23	20	1.06
3240	Footwear	0.03	4.42	0.50	1.66	20	1.04
3310	Wood products	0.15	12.35	0.90	2.18	20	1.18
3320	Furniture	0.16	15.87	0.94	2.23	20	1.19
3420	Printing & Publishing	0.08	8.48	0.80	1.60	20	1.09
3560	Plastic products	0.03	1.46	0.10	2.27	20	.
3690	Non-metal products	0.13	11.86	0.88	2.49	20	1.15
3810	Metal products	0.03	4.61	0.51	1.77	20	1.03
3529	Chemical products	0.07	5.82	0.65	1.66	20	1.08
3829	Machinery & Equipment	0.01	0.98	0.04	1.04	19	.
3844	Motorcycles & Bicycles	0.03	0.76	0.19	1.78	14	.
3850	Professional goods	0.13	6.30	0.67	1.97	20	1.16
3900	Other manufacturing	.	.	.	.	.	.
3130	Beverages	0.35	17.16	0.94	1.50	20	1.54
3140	Tobacco products	0.36	11.86	0.88	2.71	20	1.56
3410	Paper products & Pulp	0.04	5.05	0.59	1.81	20	1.05
3530	Petroleum refineries	0.07	4.96	0.56	2.60	20	1.07
3540	Petroleum & Coal products	0.05	3.81	0.44	1.75	20	1.06
3550	Rubber products	-0.01	-0.67	0.01	1.67	20	.
3610	Pottery & China	-0.03	-1.43	0.10	2.04	20	.
3620	Glass products	0.06	3.49	0.39	2.47	20	1.06
3710	Iron & Steel	-0.02	-1.45	0.08	1.72	20	.
3720	Non-ferrous metals	0.05	4.48	0.52	2.09	20	1.05
3841	Shipbuilding & Repair	-0.06	-1.86	0.14	2.24	19	.
3849	Other transport equipment	0.03	0.76	0.05	2.09	11	.
3510	Industrial chemicals	0.06	4.57	0.53	1.11	20	1.06
3522	Drugs & Medicines	0.14	9.28	0.82	1.87	20	1.16
3825	Office & Computing mach.	0.32	14.30	0.92	2.29	19	1.47
3832	Radio , TV & Comm. equip.	0.20	18.90	0.95	2.21	19	1.25
3839	Electrical apparatus	-0.12	-8.06	0.78	2.50	19	.
3842	Railroad equipment	-0.04	-1.16	0.19	2.80	11	.
3843	Motor vehicles	0.02	1.81	0.17	1.90	19	.
3845	Aircraft	0.04	1.50	0.29	2.30	14	.

1. Gross output and value added are at factor cost, which implies that no adjustment for net indirect taxes is required.
2. See note on Table A.1

Source: Calculations based on STAN database.

Table A.7. **Estimation of mark-ups by sector , 1970-1992 - *Canada*[1]**

ISIC	Sectors	Estimation results B	T-test	R2	DW	Nob	Estimated Mark-up ratio[2]
3112	Food products	0.09	7.33	0.77	1.48	19	1.09
3210	Textiles	0.17	9.63	0.84	2.52	19	1.20
3220	Wearing apparel	0.09	9.81	0.85	2.25	19	1.10
3230	Leather products	0.10	2.34	0.22	2.32	19	1.11
3240	Footwear	0.06	2.72	0.29	2.59	19	1.07
3310	Wood products	0.22	13.07	0.92	1.88	19	1.28
3320	Furniture	0.14	8.12	0.79	1.52	19	1.16
3420	Printing & Publishing	0.17	10.62	0.87	1.76	19	1.21
3560	Plastic products	0.15	8.20	0.79	2.06	19	1.17
3690	Non-metal products	0.24	15.58	0.93	1.86	19	1.32
3810	Metal products	0.14	8.13	0.77	2.26	21	1.16
3529	Chemical products	0.17	10.42	0.86	2.40	19	1.20
3829	Machinery & Equipment	0.13	7.27	0.74	2.04	19	1.15
3844	Motorcycles & Bicycles	.	.	.	.	.	.
3850	Professional goods	.	.	.	.	.	.
3900	Other manufacturing	0.10	3.21	0.33	2.66	21	1.11
3130	Beverages	0.23	8.28	0.79	1.47	19	1.30
3140	Tobacco products	0.16	4.09	0.53	2.61	19	1.19
3410	Paper products & Pulp	0.28	6.74	0.72	2.05	19	1.39
3530	Petroleum refineries	0.01	0.14	0.00	3.24	19	.
3540	Petroleum & Coal products	0.24	4.17	0.50	2.97	19	1.31
3550	Rubber products	0.11	3.43	0.37	2.14	19	1.12
3610	Pottery & China	0.28	9.60	0.85	1.01	19	1.40
3620	Glass products	0.24	8.14	0.79	2.55	19	1.31
3710	Iron & Steel	0.20	7.94	0.77	2.47	19	1.25
3720	Non-ferrous metals	0.12	4.61	0.54	2.21	19	1.14
3841	Shipbuilding & Repair	0.14	2.49	0.25	1.76	19	1.16
3849	Other transport equipment	0.09	1.85	0.15	2.19	19	.
3510	Industrial chemicals	0.28	5.52	0.63	2.01	19	1.40
3522	Drugs & Medicines	0.20	6.27	0.75	0.88	19	1.25
3825	Office & Computing mach.	0.08	1.87	0.16	2.26	19	.
3832	Radio , TV & Comm. equip.	0.24	5.38	0.62	2.39	19	1.31
3839	Electrical apparatus	0.14	6.42	0.70	2.38	19	1.16
3842	Railroad equipment	0.12	3.90	0.44	1.97	19	1.13
3843	Motor vehicles	0.12	6.41	0.71	1.11	19	1.14
3845	Aircraft	0.20	2.03	0.19	2.83	19	1.25

1. Gross output and value added are at factor cost, which implies that no adjustment for net indirect taxes is required.
2. See note on Table A.1.

Source: Calculations based on STAN database.

Table A.8. **Estimation of mark-ups by sector , 1970-1992 - *Australia***

ISIC	Sectors	Estimation results: B	T-test	R2	DW	Nob	Estimated mark-ups: Net indirect tax rate %[1]	VA/PR ratio[2]	Mark-up ratio[3]
3112	Food products	0.13	22.31	0.97	1.87	15	4.55	0.32	1.13
3210	Textiles	0.14	19.10	0.97	1.82	15	5.94	0.42	1.13
3220	Wearing apparel	0.12	17.12	0.96	1.89	15	5.94	0.50	1.11
3230	Leather products	0.15	18.84	0.96	2.29	15	5.94	0.32	1.16
3240	Footwear	0.12	14.22	0.94	1.95	15	5.94	0.51	1.11
3310	Wood products	0.19	29.47	0.98	1.67	15	4.07	0.46	1.21
3320	Furniture	0.14	24.33	0.98	2.22	15	4.07	0.46	1.14
3420	Printing & Publishing	0.20	26.65	0.98	2.23	15	5.12	0.59	1.22
3560	Plastic products	0.19	21.30	0.97	2.75	15	4.76	0.43	1.21
3690	Non-metal products	0.22	32.23	0.99	0.97	15	5.64	0.42	1.25
3810	Metal products	0.16	31.01	0.99	2.05	15	3.99	0.45	1.17
3529	Chemical products	0.23	33.39	0.99	2.10	15	5.69	0.47	1.27
3829	Machinery & Equipment	0.15	5.97	0.73	1.60	10	1.72	0.46	1.17
3844	Motorcycles & Bicycles	.	.	.	.	.	.	.	.
3850	Professional goods	0.20	11.72	0.91	1.77	15	2.84	0.53	1.22
3900	Other manufacturing	0.17	17.05	0.95	1.41	15	3.59	0.50	1.18
3130	Beverages	0.22	20.56	0.97	2.06	15	4.55	0.43	1.27
3140	Tobacco products	0.38	15.42	0.95	2.43	15	4.55	0.53	1.57
3410	Paper products & Pulp	0.17	19.98	0.97	2.30	15	5.12	0.40	1.18
3530	Petroleum refineries	0.34	29.73	0.99	2.54	15	46.22	0.25	1.35
3540	Petroleum & Coal products	0.20	11.37	0.91	2.40	15	5.67	0.28	1.23
3550	Rubber products	0.16	12.71	0.93	2.26	15	4.76	0.48	1.17
3610	Pottery & China	0.16	9.80	0.87	2.22	15	5.64	0.68	1.15
3620	Glass products	0.23	23.48	0.98	1.16	15	5.64	0.59	1.26
3710	Iron & Steel	0.13	7.46	0.80	2.56	15	4.22	0.36	1.14
3720	Non-ferrous metals	0.16	15.69	0.95	2.63	15	4.04	0.31	1.18
3841	Shipbuilding & Repair	0.08	3.13	0.50	1.30	14	2.94	0.57	1.07
3849	Other transport equipment	.	.	.	.	.	.	.	.
3510	Industrial chemicals	0.21	33.82	0.99	1.59	15	8.08	0.38	1.23
3522	Drugs & Medicines	0.31	25.47	0.98	2.25	15	5.69	0.52	1.42
3825	Office & Computing mach.	0.13	1.61	0.00	1.34	10	1.72	0.57	.
3832	Radio , TV & Comm. equip.	0.51	19.59	0.95	1.13	14	3.26	0.57	2.02
3839	Electrical apparatus	0.09	11.26	0.90	3.00	15	4.49	0.47	1.07
3842	Railroad equipment	0.31	2.57	0.51	0.60	7	1.21	0.64	1.44
3843	Motor vehicles	0.09	5.44	0.62	2.34	14	6.21	0.34	1.08
3845	Aircraft	0.01	0.06	0.00	1.45	7	0.76	0.64	.

1. Net indirect tax rates are calculated as the average rate of 1974 and 1986. They are based on OECD's input-output database, OECD, Paris, 1995.
2. The value added/production ratio is the average ratio of 1974 and 1986.
3. See note on Table A.1.

Source: Calculations based on STAN database.

Table A.9. **Estimation of mark-ups by sector , 1970-1992 - *Belgium*[1]**

		Estimation results					Estimated Mark-up ratio[2]
ISIC	Sectors	B	T-test	R2	DW	Nob	
3112	Food products	0.13	10.70	0.87	1.23	20	1.15
3210	Textiles	0.07	3.09	0.31	2.21	20	1.08
3220	Wearing apparel	0.05	1.56	0.10	2.64	20	.
3230	Leather products	0.22	7.25	0.69	1.30	20	1.28
3240	Footwear	0.09	3.30	0.22	2.04	20	1.10
3310	Wood products	-0.05	-4.54	0.49	2.59	19	.
3320	Furniture	0.16	5.59	0.59	0.99	19	1.18
3420	Printing & Publishing	0.12	3.73	0.42	1.87	20	1.13
3560	Plastic products	.	.	.	.	.	.
3690	Non-metal products	0.03	0.57	0.02	2.20	21	.
3810	Metal products	0.07	2.18	0.19	2.28	19	1.08
3529	Chemical products	0.11	4.50	0.49	2.57	20	1.12
3829	Machinery & Equipment	.	.	.	.	.	.
3844	Motorcycles & Bicycles	.	.	.	.	.	.
3850	Professional goods	0.24	3.28	0.35	1.79	19	1.31
3900	Other manufacturing	.	.	.	.	.	.
3130	Beverages	0.16	7.41	0.73	2.15	20	1.19
3140	Tobacco products	0.06	5.93	0.66	2.40	20	1.07
3410	Paper products & Pulp	0.10	2.97	0.31	2.30	20	1.11
3530	Petroleum refineries	0.01	0.21	0.00	2.73	18	.
3540	Petroleum & Coal products	0.10	1.24	0.05	2.56	18	.
3550	Rubber products	0.05	3.34	0.35	2.52	20	1.06
3610	Pottery & China	0.07	1.06	0.05	2.17	21	.
3620	Glass products	0.13	2.43	0.23	1.85	21	1.15
3710	Iron & Steel	0.20	4.53	0.58	1.40	20	1.25
3720	Non-ferrous metals	0.15	5.07	0.58	1.50	20	1.17
3841	Shipbuilding & Repair	.	.	.	.	.	.
3849	Other transport equipment	.	.	.	.	.	.
3510	Industrial chemicals	0.09	4.01	0.45	1.90	20	1.10
3522	Drugs & Medicines	.	.	.	.	.	.
3825	Office & Computing mach.	.	.	.	.	.	.
3832	Radio , TV & Comm. equip.	.	.	.	.	.	.
3839	Electrical apparatus	.	.	.	.	.	.
3842	Railroad equipment	.	.	.	.	.	.
3843	Motor vehicles	.	.	.	.	.	.
3845	Aircraft	.	.	.	.	.	.

1. Gross output and value added are at factor cost, which implies that no adjustment for net indirect taxes is required.
2. See note on Table A.1.

Source: Calculations based on STAN database.

Table A.10. **Estimation of mark-ups by sector , 1970-1992 - *Denmark***[1]

ISIC	Sectors	Estimation results B	T-test	R2	DW	Nob	Estimated Mark-up ratio[2]
3112	Food products	0.09	10.02	0.89	2.28	19	1.10
3210	Textiles	0.11	7.79	0.77	1.93	19	1.12
3220	Wearing apparel	0.12	5.77	0.66	2.55	19	1.14
3230	Leather products	0.13	4.62	0.50	2.07	19	1.15
3240	Footwear	0.06	1.75	0.13	2.25	19	.
3310	Wood products	0.11	10.05	0.85	1.65	19	1.12
3320	Furniture	0.14	11.71	0.88	2.50	19	1.16
3420	Printing & Publishing	0.10	6.46	0.70	3.14	19	1.11
3560	Plastic products	0.15	5.43	0.63	3.11	19	1.18
3690	Non-metal products	0.22	13.08	0.92	1.84	19	1.28
3810	Metal products	0.13	7.20	0.74	2.41	19	1.15
3529	Chemical products	0.13	5.33	0.67	2.19	17	1.15
3829	Machinery & Equipment	0.10	3.11	0.56	2.02	9	1.12
3844	Motorcycles & Bicycles	0.11	2.42	0.26	3.28	17	1.13
3850	Professional goods	.	.	.	.	.	.
3900	Other manufacturing	0.20	7.51	0.79	1.52	19	1.25
3130	Beverages	0.17	7.06	0.74	2.91	19	1.21
3140	Tobacco products	.	.	.	.	.	.
3410	Paper products & Pulp	0.11	7.17	0.74	2.56	19	1.13
3530	Petroleum refineries	0.03	1.03	0.05	2.66	18	.
3540	Petroleum & Coal products	0.25	5.04	0.59	1.71	18	1.33
3550	Rubber products	0.11	2.91	0.33	2.35	19	1.12
3610	Pottery & China	0.29	5.67	0.64	1.80	18	1.41
3620	Glass products	0.18	4.79	0.56	1.79	18	1.22
3710	Iron & Steel	0.07	1.96	0.18	1.55	18	.
3720	Non-ferrous metals	0.12	3.84	0.53	2.22	18	1.14
3841	Shipbuilding & Repair	0.10	1.82	0.19	2.44	18	.
3849	Other transport equipment	.	.	.	.	.	.
3510	Industrial chemicals	0.19	6.54	0.72	2.41	19	1.24
3522	Drugs & Medicines	0.29	7.26	0.77	2.16	17	1.41
3825	Office & Computing mach.	0.30	4.19	0.68	2.20	9	1.44
3832	Radio , TV & Comm. equip.	0.09	2.73	0.33	2.61	17	1.10
3839	Electrical apparatus	0.15	4.47	0.53	1.96	17	1.17
3842	Railroad equipment	0.05	1.32	0.12	1.63	17	.
3843	Motor vehicles	.	.	.	.	.	.
3845	Aircraft	.	.	.	.	.	.

1. Gross output and value added are at factor cost, which implies that no adjustment for net indirect taxes is required.
2. See note on Table A.1.

Source: Calculations based on STAN database.

Table A.11. **Estimation of mark-ups by sector , 1970-1992 - *Finland***

ISIC	Sectors	Estimation results: B	T-test	R2	DW	Nob	Estimated mark-ups: Net indirect tax rate %[1]	VA/PR ratio[2]	Mark-up ratio[3]
3112	Food products	0.08	27.47	0.98	1.82	18	-0.42	0.19	1.09
3210	Textiles	0.12	9.94	0.84	1.75	18	-0.39	0.40	1.13
3220	Wearing apparel	0.11	14.76	0.93	2.00	18	-0.32	0.47	1.13
3230	Leather products	0.09	9.58	0.84	2.32	18	0.11	0.32	1.10
3240	Footwear	0.08	5.81	0.63	2.77	18	0.11	0.39	1.09
3310	Wood products	0.04	1.67	0.16	1.75	18	0.29	0.27	.
3320	Furniture	0.14	8.47	0.80	1.87	18	0.29	0.45	1.17
3420	Printing & Publishing	0.09	6.52	0.72	0.95	18	-0.69	0.44	1.10
3560	Plastic products	0.19	9.47	0.85	2.58	17	0.08	0.43	1.23
3690	Non-metal products	0.17	11.62	0.89	1.33	18	0.15	0.42	1.21
3810	Metal products	0.16	17.36	0.95	1.26	18	0.10	0.49	1.19
3529	Chemical products	0.15	5.76	0.66	3.13	17	0.00	0.36	1.18
3829	Machinery & Equipment	0.12	12.07	0.89	2.02	18	-0.13	0.45	1.14
3844	Motorcycles & Bicycles	0.24	3.14	0.45	1.69	13	-0.27	0.32	1.31
3850	Professional goods	0.14	7.74	0.77	1.80	18	0.02	0.60	1.16
3900	Other manufacturing	0.14	11.79	0.89	2.06	18	0.02	0.51	1.17
3130	Beverages	0.22	9.75	0.84	1.87	18	5.90	0.41	1.25
3140	Tobacco products	0.24	7.58	0.80	1.69	18	0.56	0.44	1.30
3410	Paper products & Pulp	0.08	4.30	0.51	1.03	18	0.87	0.25	1.08
3530	Petroleum refineries	0.10	3.63	0.47	3.00	17	1.77	0.12	1.11
3540	Petroleum & Coal products	0.26	13.33	0.91	2.00	17	1.77	0.29	1.34
3550	Rubber products	0.11	2.79	0.28	3.28	17	0.08	0.49	1.13
3610	Pottery & China	0.24	10.50	0.86	1.76	18	0.15	0.69	1.32
3620	Glass products	0.11	6.88	0.73	2.03	18	0.15	0.48	1.12
3710	Iron & Steel	0.15	9.51	0.87	1.02	18	0.60	0.25	1.18
3720	Non-ferrous metals	0.05	3.31	0.40	2.01	18	0.60	0.12	1.05
3841	Shipbuilding & Repair	0.13	2.70	0.26	2.56	18	-0.27	0.44	1.14
3849	Other transport equipment	0.25	3.82	0.65	1.52	13	-0.27	0.38	1.33
3510	Industrial chemicals	0.16	9.94	0.86	2.37	17	0.00	0.27	1.20
3522	Drugs & Medicines	0.40	11.89	0.90	1.96	17	0.00	0.62	1.68
3825	Office & Computing mach.	0.08	1.24	0.09	2.19	18	-0.13	0.53	.
3832	Radio , TV & Comm. equip.	0.17	5.10	0.61	2.49	18	0.00	0.42	1.20
3839	Electrical apparatus	0.20	19.73	0.96	1.84	18	0.00	0.51	1.26
3842	Railroad equipment	0.18	2.32	0.37	2.92	13	-0.27	0.43	1.22
3843	Motor vehicles	0.12	11.94	0.91	1.36	18	0.25	0.33	1.14
3845	Aircraft	0.13	0.94	0.08	2.71	13	-0.27	0.58	.

1. The net indirect tax rates were derived from data provided by Statistics Finland. Data were originally based on the NACE classification, but were reclassified according to the STAN industrial breakdown.
2. This ratio is calculated as the average ratio of 1975 and 1985. Data for motorcycles & bicycles, transport equipment, railroad equipment and aircraft are only available for 1985.
3. See note on Table A.1.

Source: Calculations based on STAN database.

Table A.12. **Estimation of mark-ups by sector , 1970-1992 - *Netherlands***

		Estimation results					Estimated mark-ups		
ISIC	Sectors	B	T-test	R2	DW	Nob	Net indirect tax rate %[1]	VA/PR ratio[2]	Mark-up ratio[3]
3112	Food products	0.05	3.02	0.31	2.93	19	-46.78	0.13	1.12
3210	Textiles	0.08	4.70	0.60	2.07	19	0.89	0.31	1.08
3220	Wearing apparel	0.07	4.13	0.47	2.75	19	-4.45	0.29	1.09
3230	Leather products	0.08	4.01	0.49	1.98	19	0.66	0.36	1.08
3240	Footwear	0.09	2.67	0.25	2.50	19	0.66	0.46	1.09
3310	Wood products	0.17	5.64	0.64	2.12	19	0.36	0.49	1.21
3320	Furniture	0.11	5.32	0.58	1.98	19	0.36	0.32	1.12
3420	Printing & Publishing	0.17	14.00	0.92	1.93	19	0.61	0.44	1.20
3560	Plastic products	0.20	6.98	0.73	2.69	19	0.74	0.38	1.24
3690	Non-metal products	.	.	.	.	.	.	.	.
3810	Metal products	0.11	4.40	0.53	2.08	19	0.22	0.46	1.13
3529	Chemical products	0.25	5.69	0.68	1.71	19	1.15	0.39	1.33
3829	Machinery & Equipment	0.13	5.38	0.64	2.28	19	-1.21	0.45	1.16
3844	Motorcycles & Bicycles	0.13	2.90	0.40	2.13	19	-3.18	0.30	1.16
3850	Professional goods	0.20	9.48	0.83	1.84	19	0.31	0.41	1.25
3900	Other manufacturing	0.12	3.54	0.37	2.50	19	0.31	0.39	1.13
3130	Beverages	0.52	23.73	0.97	1.73	19	44.46	0.61	1.63
3140	Tobacco products	0.53	13.89	0.92	2.00	19	64.70	0.63	1.53
3410	Paper products & Pulp	0.14	3.53	0.43	2.71	19	1.41	0.34	1.16
3530	Petroleum refineries	0.08	1.02	0.03	2.20	19	76.58	0.18	.
3540	Petroleum & Coal products	.	.	.	.	.	.	.	.
3550	Rubber products	0.12	2.51	0.26	2.19	19	0.74	0.48	1.13
3610	Pottery & China	0.14	3.09	0.33	2.89	19	1.47	0.55	1.16
3620	Glass products	0.17	3.20	0.38	2.42	19	1.47	0.49	1.19
3710	Iron & Steel	0.29	3.86	0.49	2.67	19	0.79	0.42	1.40
3720	Non-ferrous metals	0.23	5.19	0.60	2.77	19	0.79	0.28	1.30
3841	Shipbuilding & Repair	0.03	1.06	0.07	1.51	19	-3.18	0.40	.
3849	Other transport equipment	0.07	0.86	0.03	3.54	19	-3.18	0.39	.
3510	Industrial chemicals	0.30	6.14	0.68	2.13	19	1.17	0.28	1.41
3522	Drugs & Medicines	0.10	2.09	0.13	1.78	19	1.15	0.43	1.10
3825	Office & Computing mach.	0.13	2.16	0.19	2.13	19	-1.21	0.33	1.15
3832	Radio , TV & Comm. equip.	0.16	3.31	0.59	1.79	14	0.13	0.43	1.19
3839	Electrical apparatus	0.18	1.14	0.02	1.31	14	0.13	0.54	.
3842	Railroad equipment	.	.	.	.	.	.	.	.
3843	Motor vehicles	0.11	2.86	0.33	2.62	19	1.66	0.28	1.12
3845	Aircraft	0.15	2.33	0.23	2.82	19	-3.18	0.32	1.19

1. Net indirect tax rates are calculated as the average rate of 1976 and 1987. They are based on input-output tables from the Central Bureau of Statistics for those years.
2. The value added/production ratio is the average ratio of 1976 and 1987.
3. See note on Table A.1.

Source: Calculations based on STAN database.

Table A.13. **Estimation of mark-ups by sector , 1970-1992 -** ***Norway***

ISIC	Sectors	Estimation results: B	T-test	R2	DW	Nob	Estimated mark-ups: Net indirect tax rate %[1]	VA/PR ratio[2]	Mark-up ratio[3]
3112	Food products	-0.04	-2.38	0.17	0.95	20	-30.24	0.15	.
3210	Textiles	0.09	6.55	0.66	2.44	20	-6.81	0.37	1.13
3220	Wearing apparel	0.09	4.90	0.41	1.80	20	-6.81	0.39	1.13
3230	Leather products	0.11	5.33	0.59	2.06	20	-9.13	0.35	1.16
3240	Footwear	0.08	3.83	0.47	2.11	20	-9.13	0.42	1.13
3310	Wood products	0.14	10.13	0.81	1.76	20	-4.11	0.30	1.17
3320	Furniture	0.12	6.65	0.58	2.68	20	-6.50	0.36	1.16
3420	Printing & Publishing	0.08	3.14	0.28	2.88	20	-3.78	0.43	1.11
3560	Plastic products	0.10	4.22	0.43	2.24	20	-1.01	0.35	1.11
3690	Non-metal products	0.19	8.20	0.73	2.83	20	-0.36	0.37	1.24
3810	Metal products	0.11	9.16	0.74	1.94	20	-4.39	0.41	1.15
3529	Chemical products	0.08	4.36	0.28	2.08	20	3.64	0.35	1.08
3829	Machinery & Equipment	0.08	5.48	0.59	1.70	20	-2.87	0.26	1.10
3844	Motorcycles & Bicycles	.	.	.	.	0	.	.	.
3850	Professional goods	0.22	9.96	0.84	1.85	20	-9.66	0.40	1.33
3900	Other manufacturing	0.10	3.62	0.39	1.64	20	-9.66	0.44	1.16
3130	Beverages	0.43	15.85	0.91	2.44	20	177.59	0.65	.
3140	Tobacco products	0.71	20.34	0.95	2.12	20	697.37	0.87	.
3410	Paper products & Pulp	0.13	5.11	0.64	1.72	20	2.99	0.26	1.14
3530	Petroleum refineries	0.07	1.15	0.07	2.71	20	11.41	0.08	.
3540	Petroleum & Coal products	0.13	2.39	0.11	1.98	20	1.67	0.19	1.15
3550	Rubber products	0.13	3.16	0.30	2.33	20	-1.01	0.43	1.15
3610	Pottery & China	0.10	2.56	0.08	1.39	20	-0.36	0.57	1.11
3620	Glass products	0.06	2.01	0.13	2.86	20	-0.36	0.41	1.07
3710	Iron & Steel	0.24	4.74	0.59	1.55	20	-1.58	0.29	1.33
3720	Non-ferrous metals	0.26	7.70	0.79	1.29	20	1.66	0.23	1.35
3841	Shipbuilding & Repair	0.04	2.30	0.29	1.81	20	-22.16	0.28	1.11
3849	Other transport equipment	0.27	5.30	0.64	2.13	20	-3.11	0.44	1.39
3510	Industrial chemicals	0.30	8.81	0.83	1.29	20	3.54	0.28	1.42
3522	Drugs & Medicines	0.19	6.29	0.69	1.76	20	3.64	0.38	1.22
3825	Office & Computing mach.	0.26	4.20	0.48	2.53	20	-2.87	0.35	1.37
3832	Radio , TV & Comm. equip.	0.15	3.69	0.46	1.73	20	-3.86	0.42	1.20
3839	Electrical apparatus	0.14	4.63	0.49	1.97	20	-3.86	0.40	1.19
3842	Railroad equipment	0.01	0.12	0.00	1.28	20	-3.11	0.47	.
3843	Motor vehicles	0.16	5.00	0.58	2.71	20	-3.11	0.35	1.21
3845	Aircraft	0.29	3.49	0.38	2.87	20	-3.11	0.44	1.43

1. Net indirect tax rates are calculated as the average rate of 1981 and 1991. They are based on data derived from the 1991 Norwegian national accounts.
2. The value added/production ratio is the average ratio of 1981 and 1991.
3. See note on Table A.1.

Source: Calculations based on STAN database.

Table A.14. **Estimation of mark-ups by sector , 1970-1992 - *Sweden***

ISIC	Sectors	Estimation results: B	T-test	R2	DW	Nob	Estimated mark-ups: Net indirect tax rate %[1]	VA/PR ratio[2]	Mark-up ratio[3]
3112	Food products	0.04	2.43	0.27	2.00	21	2.77	0.24	1.03
3210	Textiles	0.13	8.03	0.87	1.28	16	1.97	0.40	1.14
3220	Wearing apparel	0.04	1.83	0.35	0.98	16	1.97	0.43	.
3230	Leather products	0.10	3.41	0.46	2.08	16	1.97	0.38	1.10
3240	Footwear	0.05	2.12	0.31	1.65	16	1.97	0.42	1.04
3310	Wood products	0.19	6.97	0.77	1.49	16	0.67	0.32	1.24
3320	Furniture	0.11	10.33	0.89	1.61	16	9.16	0.37	1.08
3420	Printing & Publishing	0.12	6.03	0.65	0.96	21	1.05	0.39	1.13
3560	Plastic products	0.16	4.87	0.54	2.72	21	2.28	0.42	1.17
3690	Non-metal products	0.07	1.68	0.19	2.22	16	2.24	0.40	.
3810	Metal products	0.12	8.16	0.77	1.69	21	2.29	0.43	1.13
3529	Chemical products	0.08	1.73	0.11	2.11	18	2.61	0.09	.
3829	Machinery & Equipment	0.08	2.71	0.32	1.70	18	2.41	0.38	1.07
3844	Motorcycles & Bicycles	0.07	1.13	0.07	2.24	18	2.29	0.37	.
3850	Professional goods	0.12	4.29	0.48	1.82	21	1.54	0.47	1.13
3900	Other manufacturing	-0.35	-5.34	0.59	2.61	21	1.54	0.28	.
3130	Beverages	0.16	5.18	0.70	1.12	21	1.65	0.35	1.19
3140	Tobacco products	.	.	.	.	.	.	.	.
3410	Paper products & Pulp	0.23	8.90	0.81	1.09	21	1.87	0.31	1.29
3530	Petroleum refineries	0.04	0.65	0.02	2.80	20	0.64	0.21	.
3540	Petroleum & Coal products	.	.	.	.	.	.	0.27	.
3550	Rubber products	0.08	2.05	0.18	2.18	21	2.62	0.42	1.08
3610	Pottery & China	-0.06	-0.75	0.03	2.67	16	2.24	0.52	.
3620	Glass products	0.04	0.63	0.03	1.69	16	2.24	0.43	.
3710	Iron & Steel	0.10	2.78	0.30	1.38	21	2.53	0.25	1.10
3720	Non-ferrous metals	0.11	3.18	0.32	1.45	21	1.80	0.27	1.11
3841	Shipbuilding & Repair	0.08	1.99	0.22	2.34	20	2.50	0.31	.
3849	Other transport equipment	0.03	0.49	0.01	2.56	18	2.29	0.35	.
3510	Industrial chemicals	0.19	7.82	0.75	2.57	21	2.89	0.31	1.22
3522	Drugs & Medicines	0.32	4.55	0.56	2.36	18	2.61	0.79	1.43
3825	Office & Computing mach.	0.14	3.15	0.37	1.95	18	2.41	0.40	1.15
3832	Radio , TV & Comm. equip.	0.25	4.65	0.56	1.79	18	2.68	0.60	1.32
3839	Electrical apparatus	0.03	0.47	0.01	1.77	18	2.68	0.19	.
3842	Railroad equipment	-0.13	-2.34	0.31	2.10	18	2.29	0.31	.
3843	Motor vehicles	0.14	6.64	0.73	1.97	18	2.29	0.29	1.15
3845	Aircraft	-0.01	-0.17	0.00	1.46	18	2.29	0.40	.

1. The net indirect tax rates were derived from 1975 Swedish input-output tables and from 1990 national accounts data.
2. The value added/production ratio is the average ratio of 1975 and 1990.
3. See note on Table A.1.

Source : Calculations based on STAN database.

Table A.15. **Estimated sectoral mark-ups for G-7 countries: Roeger's method (1)**
(period 1970-80)

Sector (by market structure type and ISIC classification)	United States	Japan	Germany	France	Italy	United Kingdom	Canada
Food products	.	1.37	1.14	.	.	1.20	1.09
Textiles	1.06	1.20	1.17	.	.	1.04	1.16
Wearing apparel	1.07	.	1.13	.	.	1.03	1.08
Leather products	.	.	1.19	.	.	1.06	.
Footwear	.	.	.	.	.	1.04	.
Wood products						1.18	1.34
Furniture	1.07	.	1.17	.	.	1.20	1.20
Printing & Publishing	1.14	1.10	.	.	.	1.09	1.26
Plastic products	1.08	1.16	.	.	.	.	1.20
Non-metal mineral products	1.16	1.27	1.24	.	.	1.14	1.36
Metal products	1.06	.	1.20	1.21	.	1.03	1.20
Chemical products	1.25	1.26	.	.	.	1.09	1.19
Machinery & equipment	.	.	.	.	.	.	1.11
Motorcycles & bicycles	1.23	.	.	.	.	.	.
Professional goods	1.12	.	.	.	.	1.09	.
Other manufacturing	.	1.37	1.34	.	.	.	1.19
Beverages	.	1.30	1.31	.	.	1.54	1.42
Paper products & pulp	1.14	1.20	1.38	.	.	1.05	1.42
Petroleum & coal products	.	1.10	.	.	.	1.05	1.43
Rubber products	.	1.16	.	.	.	.	1.20
Pottery & china	1.07	1.22	.	.	.	.	1.22
Glass products	1.17	1.41	1.20	.	.	1.06	1.34
Iron & steel	1.10	1.18	.	.	.	.	1.22
Non-ferrous metals	1.17	1.27	.	.	.	1.05	.
Shipbuilding & repair	.	.	.	.	.	.	.
Other transport equipment	.	.	.	.	.	.	.
Tobacco products	1.26	.	1.47	.	.	1.53	1.33
Petroleum refineries	.	1.07	.	.	.	1.07	.
Industrial chemicals	1.10	1.23	.	.	.	1.06	1.29
Drugs & medicines	1.41	1.52	.	.	.	1.17	1.22
Office & computing machinery	1.66	.	.	.	.	1.49	.
Radio, TV & comm. equipment	1.47	.	.	.	.	1.24	1.40
Electrical apparatus	.	.	.	.	.	.	1.19
Railroad equipment	.	.	.	.	.	.	1.14
Motor vehicles	1.17	.	.	.	.	.	1.13
Aircraft	.	.	.	.	.	.	1.22

1. Reported mark-ups estimates are statistically significant at 5 per cent level.
2. A dot indicates that no data were available or that the estimated mark-up was not statistically significant.

Source: OECD Secretariat calculations based on STAN database.

Table A.16. **Estimated sectoral mark-ups for other OECD countries: Roeger's method (1)**
(period 1970-80)

Sector (by market structure type and ISIC classification)	Australia	Belgium	Denmark	Finland	Nether-lands	Norway	Sweden
Food products	1.13	1.14	1.09	1.09	1.07	.	1.04
Textiles	1.12	1.06	1.13	1.12	1.09	1.15	1.15
Wearing apparel	1.10	.	1.12	1.13	1.10	1.13	1.05
Leather products	1.14	1.25	1.12	1.10	1.07	1.19	.
Footwear	1.10	1.09	.	1.09	1.11	.	1.08
Wood products	1.21	.	1.11	.	1.22	1.20	1.28
Furniture	1.14	1.13	1.16	1.15	1.16	1.18	1.11
Printing & Publishing	1.22	.	1.12	1.09	1.20	.	1.11
Plastic products	1.21	.	1.20	1.22	1.30	1.13	1.15
Non-metal mineral products	1.26	.	1.30	1.19	.	1.21	.
Metal products	1.17	.	1.17	1.19	1.15	1.14	1.14
Chemical products	1.27	1.10	1.16	1.17	1.41	1.08	.
Machinery & equipment	.	.	.	1.13	1.17	1.09	.
Motorcycles & bicycles	.	.	.	.	.	.	.
Professional goods	1.23	1.30	.	1.15	1.26	1.37	1.13
Other manufacturing	1.18	.	1.28	1.15	1.13	1.20	.
Beverages	1.27	1.23	1.24	1.24	1.65	.	1.13
Paper products & pulp	1.18	.	1.13	1.07	1.17	1.19	1.33
Petroleum & coal products	1.22	.	1.28	1.36	.	.	.
Rubber products	1.17	1.06	.	1.10	1.23	.	.
Pottery & china	1.16	.	1.43	1.29	1.17	.	.
Glass products	1.26	.	1.27	1.11	.	.	.
Iron & steel	1.13	1.23	.	1.17	.	1.47	.
Non-ferrous metals	1.17	1.17	.	1.05	1.32	1.33	1.10
Shipbuilding & repair	1.05	.	.	.	.	1.15	.
Other transport equipment	.	.	.	.	.	1.49	.
T o b	a	c	c	o		p .	r . o d
Petroleum refineries	1.47	.	.	1.08	.	.	.
Industrial chemicals	1.24	1.06	1.20	1.19	1.64	1.56	1.25
Drugs & medicines	1.42	.	1.28	1.69	.	1.19	1.48
Office & computing machinery	.	.	.	.	.	.	.
Radio, TV & comm. equipment	2.09	.	.	1.15	.	1.28	1.34
Electrical apparatus	1.08	.	1.15	1.26	.	1.26	.
Railroad equipment	.	.	.	.	.	.	.
Motor vehicles	1.07	.	.	1.13	.	1.24	1.18
Aircraft	.	.	.	.	.	1.72	.

1. Reported mark-ups estimates are statistically significant at 5 per cent level.
2. A dot indicates that no data were available or that the estimated mark-up was not statistically significant.
Source: OECD Secretariat calculations based on STAN database.

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