Price and Wage Setting in an Integrating Europe: Firm Level Evidence

Filip Abraham, Jozef Konings and Stijn Vanormelingen
Katholieke Universiteit Leuven
June 2006

PRELIMINARY VERSION

I. Introduction

In recent years, Europe has witnessed an accelerated process of economic integration: Within the EU market barriers were removed, the Euro was introduced in twelve member states and ten new member states joined the EU in 2004. On a global level, the EU is confronted with the rapid development of several Asian countries, the membership of China in the WTO and the emergence of China and India as new world powers.

This trend towards market integration and globalization opens up European economies to international trade and foreign competition. This is seen in Table 1 where selected indicators of trade openness and its evolution are reported for the EU. Trade has become more important over the last decade. Compared to 1992 total trade in the EU as a percentage of GDP has gone up substantially and especially so between the EU and the rest of the world. At the same time, the regional pattern of trade has been shifting. In 1992 only 4 % of total extra-EU imports came from China. By 2003 the Chinese market share had increased to 10%. Likewise, the share of the new member states of Central and Eastern Europe (CEEC) in extra EU15-imports attained 16% in 2003. Such figures imply that trade flows from low wage regions have gained substantial ground in a relatively short period of time.

This integration and globalisation process affects European labor markets. In line with research for the US, several authors have found that international trade matters for the evolution of European employment and wages levels, f.e. Abraham and Konings (1999), Kramarz (2003) and Brock and Dobbelaere (2006). This research furthermore suggests that structural rigidities in European product and labor markets

are a key factor in the transmission from global trade shocks to labor markets. Those rigidities are closely related to wage and price setting practices which are determined by factors such as the monetary policy regime, the integration of product markets, the existence of collective agreements and the bargaining power of unions and employers.

This growing interest in structural rigidities underlies the recent research that explores the impact of globalisation on price and wage setting behavior. As Rodrik (1997) points out, globalization weakens the bargaining position of trade unions as it increases the substitutability of employees. This hypothesis is tested in a growing number of empirical studies. Spillovers between product and labor markets are also emphasized in various macro models that show how more competitive pricing in the product markets has beneficial effects, such as lower unemployment rates, on labor market outcomes (e.g. Blanchard and Giavazzi, 2003).

This paper adds to this research by focusing on the Belgian case. We analyze how price-cost margins in firms are affected by international competition, taking explicitly into account that firms bargain over wages and employment with trade unions. Most papers study imperfections in product and labor markets separately[1]. However, ignoring labor market imperfections when measuring competitiveness in the product market, leads to product market power being underestimated. We correct for this problem by measuring simultaneously price-cost margins and union bargaining power. In doing so, we analyse the effects of increased international economic integration on both price-cost margins of firms and the bargaining power of trade unions. To this end, we rely on a rich panel of Belgian firms that operate in the manufacturing sector between 1996 and 2003.

Our focus on Belgium and on Belgian firm data is motivated by various reasons. First, Belgium is characterized by strong labor unions and rigid product markets. It therefore provides an interesting benchmark to test how international integration affects a small regulated economy in the core of the European Union. Second, the firm level data available are unusually rich. Our data set includes all firms between 1996 and 2003 that have to submit by Belgian law full or abbreviated company

[1] Exceptions are Bughin(1993, 1996), Crépon et al. (2002) and Dobbelaere (2004).

accounts. In light of the recent insights of Melitz (2003) and others on the role of firm heterogeneity in international trade it seems natural to use micro data to model the effects of international competition. Third, Belgium is characterized by a substantial increase in its volume of trade. Figure 1 shows how the value of trade in Belgium has nearly doubled during the last decade. As a consequence almost all manufacturing sectors experienced a rising import penetration between 1995 and 2003 (see Figure 2). The increase in import penetration was especially pronounced in Chemicals and Motor Vehicles.

The paper is organized as follows. In the next section we develop a stylised theoretical framework that captures the effects of international competition on price-cost margins and labor market outcomes. Section 3 introduces the model that we seek to estimate and discusses the estimation strategy. In particular, we start from Hall (1988) to estimate price-cost margins, but extend the model to allow for bargaining as pointed out by Crépon et al. (2002) . In doing so, we introduce an estimation strategy that offers an alternative to using instrumental variables, which is due to Olley and Pakes (1996). Section 4 summarizes the results. Section 5 concludes the paper.

II. The Effects of Globalization: Theoretical Background

To focus ideas it is useful to introduce a standard benchmark model with one production factor labor. The model illustrates how interactions between the product and the labor market matters for understanding equilibrium unemployment. It is built around two crucial equations, the first being a wage-setting relation, the second a price-setting relation.

Turning to the wage equation first, let the nominal wage level depend on the actual price level $(P)^2$ and on a function that captures the institutional factors that determine wages or

[2] Typically, it depends on the expected price level, but for simplicity we assume that the expected prices are equal to the actual prices. In the Belgian context of wage indexation this is a reasonable assumption.

$$W = PF(u, z) \qquad (1)$$

Where W stands for the nominal wage, u for the unemployment rate, z for all other factors affecting the wage. Typically, the unemployment rate exerts a negative influence on the wage. The intuition is straightforward: a higher unemployment rate weakens the bargaining position of workers and so lowers the wage.

A similar equation can be derived for the price-setting behavior of firms. To keep things simple, we assume that prices are set as a simple mark-up over the wage or

$$P = (1 + \mu)W \qquad (2)$$

In equation (2) the degree of competition in the product market plays a determining role. In a non-competitive product market, prices are set significantly higher than marginal cost (W in this model) resulting in a large mark-up μ. In a perfectly competitive market, μ=0 and prices are fully determined by the wage (hence the real wage W/P reaches a maximum value equal to 1).

Figure 3 shows the equilibrium point A in this simple economy, where the price-setting relation is equal to the wage-setting relation. Through its impact on the mark-up μ, the degree of competition in the product market has an impact on the equilibrium unemployment rate. Hence, characteristics of the product market affect the equilibrium outcome in the labor market.

How does economic integration in the product market spill over to the labor market in this simple framework? A variety of theoretical models show that economic integration causes μ to fall e.g. when integration makes more product varieties available (Krugman, 1979) and/or reduces the market share of domestic firms (Helpman and Krugman, 1985). In Figure 3 international competition therefore shift the price-setting equation upwards: for given wage levels, prices are lower and hence real wage costs for firms rise to a level closer to the competitive benchmark. As a consequence, profit rates for individual companies decline. In addition, international economic integration changes the wage-setting relationship. For a given

unemployment rate, lower profit rates translate in smaller rents that can be redistributed to union members. If globalization moreover implies that multinational enterprises can shift employment across affiliates more easily[3], then the bargaining power of workers will decline. All of this will force union members to accept wage moderation, shifting the wage setting curve down. The new equilbrium is found in B. Compared to the initial equilibrium in A, unemployment has gone down, prices and nominal wages are lower and the markup μ' of prices over wage costs has been reduced.

The bottom-line from this analysis is that spillovers between product and labor markets matter for understanding equilibrium unemployment of an economy. It is also clear though that the effects of international competition depend very much on the slopes and the responsiveness of the wage and price-setting relations in the economy, which is ultimately an empirical question. This is what we take up in the rest of the paper.

III. Model and Methodology

III.1. Model

The model relies on the work of Hall (1988) who showed that the Solow residual should be corrected for imperfect competition in the product market. It thereby offers a method to estimate the price cost margin without observing prices and marginal costs directly. Starting from a production function where output Q_{it} of firm i in year t is produced from three inputs, namely labor L_{it}, capital K_{it} and materials M_{it}:

$$Q_{it} = A_{it} F(L_{it}, K_{it}, M_{it}) \tag{3}$$

Where A_{it} captures the productivity level. The function $F(.)$ is homogeneous of degree $1+\lambda$ for all input factors, i.e. the returns to scale are $1+\lambda$. $F(.)$ can exhibit

[3] Recent evidence confirms that multinational enterprises do relocate employment across affiliates, for the US see Brainard and Riker (1997) and Hanson, Matoloni and Slaughter (2004) for the US, for Europe see Braconier and Ekholm (2000) and Konings and Murphy (2006).

decreasing ($\lambda < 0$), constant ($\lambda = 0$) or increasing ($\lambda > 0$) returns to scale. By taking a total differential of (3) we get:

$$\Delta(q_{it} - k_{it}) = \varepsilon_{L,it}\Delta(l_{it} - k_{it}) + \varepsilon_{M,it}\Delta(m_{it} - k_{it}) + \lambda_{it}\Delta k_{it} + \Delta a_{it} \quad (4)$$

The variables $q_{it}, l_{it}, m_{it}, k_{it}$ and a_{it} are the natural logarithms of $Q_{it}, L_{it}, M_{it}, K_{it}$ and A_{it} respectively. ε_X is the elasticity of output with respect to input X, namely $\varepsilon_X = \frac{\delta Q}{\delta X}\frac{X}{Q}$. Now, we use the first order conditions of profit maximization, which imply that $\varepsilon_X = \mu\alpha_X$:

$$\Delta(q_{it} - k_{it}) = \mu_{it}\left(\alpha_{L,it}\Delta(l_{it} - k_{it}) + \alpha_{M,it}\Delta(m_{it} - k_{it})\right) + \lambda_{it}\Delta k_{it} + \Delta a_{it} \quad (5)$$

Where $\mu_{it} = \frac{P_{it}}{MC_{it}}$ or the markup at the output market and α_X is the cost share in total revenue of input X, i.e. $\frac{P_X X}{PQ}$ (X=L,M,K). We can also rewrite (5) in terms of the Lerner index, β_{it} defned as $\beta_{it} = \frac{P_{it} - MC_{it}}{P_{it}} = 1 - \frac{1}{\mu_{it}}$ or (5) becomes

$$\begin{aligned} &\Delta(q_{it} - k_{it}) - \left(\alpha_{L,it}\Delta(l_{it} - k_{it}) + \alpha_{M,it}\Delta(m_{it} - k_{it})\right) = \\ &\beta\Delta(q_{it} - k_{it}) + \frac{\lambda}{\mu}\Delta k_{it} + (1-\beta)\Delta a_{it} \end{aligned} \quad (6)$$

From this equation the Lerner index and returns to scale can be estimated. This framework has been used to estimate the impact of trade liberalization on market power of firms in a number of papers, starting with Levinsohn (1993) for Turkey and Harrison (1994) for Côte-d'-Ivoir and more recently by Konings, Van Cayseele and Warzynski (2001, 2005) for a number of industrialized and emerging economies. As pointed out by Crépon et al (2002), one potential problem of this framework is that it assumes competitive labor markets. However, most European countries are characterized by labor markets where negotiations between unions and firms take place. We therefore follow Crépon et al (2002) to incorporate a model of efficient

bargaining in the above framework. In this model unions and firms bargain over both wages and employment[4]. In particular, the typical Nash bargaining problem can be summarized as follows:

$$\max_{w,L} \Omega = (Lw + (\bar{L} - L)w_a - \bar{L}w_a)^{\Phi} (PQ - wL)^{1-\Phi} \tag{7}$$

Where $\bar{L}$ is union membership, $0 < L \leq \bar{L}$, and w_a represents the alternative wage[5]. Φ is the union bargaining power; $0 \leq \Phi \leq 1$. Maximizing the equation for employment and wage rate gives the following first order conditions:

$$w = (1 - \Phi)w_a + \Phi \frac{PQ}{L} \tag{8}$$

$$w = \Phi\left(\frac{PQ - R_L L}{L}\right) + R_L \text{ with } R_L = \frac{\delta(PQ)}{\delta L} \tag{9}$$

Solving these two expressions simultaneously gives an expression for the contract curve, $R_L = w_a$. Using $R_L = \frac{\delta(PQ)}{\delta Q}\frac{\delta Q}{\delta L} = \frac{P}{\mu}\frac{\delta Q}{\delta L}$ together with (8) and the expression for the contract curve, one can find that:

$$\varepsilon_L = \mu\alpha_L + \mu\frac{\Phi}{1-\Phi}(\alpha_L - 1) \tag{10}$$

Combining equations (4) and (10), an extra term which captures the union bargaining power appears in equation (6) or

$$\begin{aligned} &\Delta(q_{it} - k_{it}) - \left(\alpha_{L,it}\Delta(l_{it} - k_{it}) + \alpha_{M,it}\Delta(m_{it} - k_{it})\right) \\ &= \beta(\Delta(q_{it} - k_{it}) + \frac{\lambda}{\mu}\Delta k_{it} + \frac{\Phi}{1-\Phi}(\alpha_{L,it} - 1)\Delta(l_{it} - k_{it}) + (1-\beta)\Delta a_{it} \end{aligned} \tag{11}$$

[4] For an application of this approach to the Belgian context see also Dobbelaere (2004)

[5] Note that for now we assume there is no other variable input factor than labor, so we assume the materials input to be fixed. This does not affect the bargaining outcome as long as the union preferences do not depend on materials (Bughin 1993, 1996).

This will be our basic equation used in the further analysis and allows us to estimate price cost margins and bargaining power simultaneously without having to make assumptions about the alternative wage rate. Crépon et al. (2002) show that in this setting the price-cost mark-up must be interpreted as the ratio of price over cost evaluated at the alternative wage instead of the bargained wage[6]. A potential problem with estimating (11) is the endogeneity of the unobserved productivity shock, Δa_{it}. Since l_{it} is a variable input, it depends on the productivity a_{it} in the same period. As a result Δl_{it} is correlated with Δa_{it} and OLS estimates of the bargaining term are likely to be biased. Similarly, Δq_{it} will be correlated with Δa_{it} because higher productivity will lead to higher output.

One solution is to use an instrumental variables approach. Unfortunately, it is often difficult to come up with appropriate instruments. Our alternative approach is based on recent findings of the productivity literature, more specifically on the methodology to estimate production functions developed by Olley and Pakes (1996). We follow Hoekman and Kee (2003) and De Loecker and Warzynski (2006), who have applied this methodology to estimate price-cost margins. In a nutshell this approach proxies the unobservable productivity shock by a polynomial in capital and investment, both in present and lagged values. As discussed in the Appendix to this paper, this yields reliable estimates for the Lerner index and for union bargaining power but does not allow a separate identification of the returns to scale parameter.

IV. Data and Results

IV.1 Data

Firm data are taken from the Belfirst database. The database includes the full company accounts of every Belgian firm that has to report to the tax authorities. It includes the whole manufacturing sector (NACE code 15 to 36) with the exception of the recycling sector. We retrieved data for the period 1996 to 2003. The variables

[6] This follows from the fact that in the efficient bargaining framework marginal revenue of labor equals the alternative wage. As a result, firms makes input and output decisions as if it was maximizing profit computed at the alternative wage.

used for the analysis are turnover, tangible assets, number of employees (in full time equivalents), wage bill and material costs (raw materials, consumables and services). Turnover is deflated with a Producer Price Index at the 3 digit NACE level provided by Eurostat. If this PPI was not available for the sector, a 2 digit NACE deflator was used. Tangible assets are deflated using a countrywide investment deflator and material costs are deflated with a countrywide intermediate goods deflator. The database provides also information about the ownership structure, so we are able to determine whether a firm has a foreign owner. However we only observe ownership in 2003. Industry production data is retrieved from the PRODCOM database at a 4 digit NACE level. Imports and source country of imports, are made available by the National Bank of Belgium also at the 4 digit NACE level.

In order for a firm to be added to the sample, we required at least three consecutive observations in our sample. In addition, we dropped observations which seemed to be obvious data input mistakes (such as firms with negative wage costs) and observations for which the growth rates in inputs and output were unrealistically high. About 4% of the data were dropped by this cleaning procedure. Our final sample consists of an unbalanced panel of 6091 firms and in total 35075 observations. In Table 2 we report summary statistics. The median firm has 20 employees, earns a revenue of 3.7 million euros and faces a labor cost of 34,400 euros per employee per year. The labor cost share in total turnover is about 23% in the average manufacturing firm.

IV.2 Results

We start by estimating equation (6) and (11) to first obtain an estimate of the average mark-up without and with controlling for the bargaining power of the union. In a second set of regressions we augment equation (11) with factors that capture international economic integration.

Table 3 reports the results for the mark-up and bargaining power in the combined sample of all manufacturing companies. In the first column we report a simple OLS estimate of equation (6). In the second column we provide OLS estimates of equation

(11) where we control for the bargaining power of firms. Finally in the third column we apply the Olley-Pakes correction to equation (11) in order to correct for potential endogeneity of the right hand side variables. All equations are estimated with year and industry dummies, capturing time and industry specific shocks[7].

From column (1), it can be seen that the average mark-up[8] in Belgian industry is around 1.28. This increases to 1.35 when we take into account that unions bargain over wages and employment with employers. The Olley-Pakes correction in the last column does not affect our results all that much[9].

The estimate of the average mark-up is in line with earlier work by Konings, Van Cayseele and Warzynski (2001) who report for Belgium an average mark-up of 1.28. These findings are also consistent with the results found by Dobbelaere (2004) and Crépon et al. (2002), who estimate an average mark-up and bargaining power for Belgium and France of 1.49 and 1.42 respectively. The fact that the average mark-up is smaller when the bargaining power of firms is not taken into account is logical as bargaining power is likely to be positively correlated with the markup or the Lerner index.

How important are sectoral differences in mark-ups and levels of bargaining power? To address this question, we estimated equation (11) for each 2-digit NACE sector separately[10]. The estimated sectoral mark-ups are reported in Figure 4. The mark-up ranges from 1.24 in the Manufacturing of Furniture to 1.45 in the sector of Medical, Precision and Optical Instruments. Other sectors with a high mark-up are Basic Metals, Mineral Products, Fabricated Metals, Machinery, Electrical Machinery and Publishing and Printing. Sectors with a low mark-up include Wood Products, Food

[7] The estimations were also done with interactions between time and industry dummies. This did not change the results.

[8] $\mu = \frac{1}{1-\beta}$

[9] Note that for the correction only the observations with positive investment can be used. Estimation of specification (3) on this subsample showed a Lerner index of 0.259 and the coefficient for the bargaining term was 0.143.

[10] Tobacco products (NACE 16), Coke, refined petroleum and nuclear fuel (NACE 23), Leather (NACE 19), Other transport equipment (NACE 35) and Office machinery and computers (NACE 30) are excluded due to too few observations for reliable estimates.

and Beverages, Chemicals, Pulp and Paper Products, Motor Vehicles and Wearing Apparel.

Figure 5 shows the bargaining power per 2 digit NACE sector. Comparing Figures 4 and 5, we observe that sectors with higher mark-ups are often sectors with stronger union bargaining power. For instance, the sector of Medical Equipment has the highest bargaining power, which coincides with high markups. At the other end of the range, the Furniture sector is characterized by both a low bargaining power and markup. This positive correlation is clearly shown in Figure 6 where we plot the union bargaining power against the mark-up for each sector. The statistically significant Pearson correlation coefficient between the two parameters equals 0.46.[11] Those results suggest that unions are able to negotiate successful deals in sectors with substantial economic rents but find limited room for wage gains in competitive sectors where the average mark-up is low.

In Table 4 we turn to the impact of globalization on mark-ups and union bargaining power. The first three columns report OLS estimates, while the last three report the same specifications but with the Olley-Pakes correction. We start by augmenting equation (11) with import penetration[12] and interactions of import penetration with the right hand side variables in (11), to test whether higher import penetration is associated with lower mark-ups and lower bargaining power[13]. As discussed in section II, we expect that import competition lowers mark-ups as more import competition disciplines firm price setting behaviour. We expect the union bargaining power to be lower in sectors with high import penetration rates. Binmore et al. (1986) show how bargaining power can be determined by the perceived risk of both parties that bargaining will break down. So, if unions think globalization increases the risk of firms leaving the bargaining table, their bargaining power will drop. In the same line of reasoning, Dumont et al. (2006) claim that bargaining power can be considered as a

[11] The same exercise was done using different depreciation levels to compute investment to correct for the unobservable productivity growth using Olley-Pakes. We also experimented with a system GMM estimator as in Blundell and Bond (1998), using lagged employment and output as instruments. The results did not change.

[12] Import penetration in sector j is defined as: $\frac{imports_{jt}}{imports_{jt} + production_{jt}}$.

[13] Whenever the interaction between a variable and the Lerner index term or bargaining term is included, the variable itself also enters the equation, but results are omitted here.

measure of the credibility of the respective outside options. As globalization increases the credibility of the firm leaving the bargaining round, sectors with higher import penetration should be associated with lower bargaining power. From columns (2) and (5) we note that import penetration has indeed a negative and strongly significant effect on the mark-up and on the bargaining power of unions. Column (5) shows that a 10 percentage point increase in import penetration lowers the Lerner index by 0.011. The impact of import penetration on the union bargaining power is slightly lower.

In columns (3) and (6) we add a dummy LARGE which equals one if the firm has more than 50 employees. This dummy interacted with bargaining captures an essential aspect of firm level bargaining in the Belgian economy. Large firms have different legal obligations for union representation than small firms. In large firms it is moreover easier to organize a strike which can put pressure on the negotiations. Hence we expect the LARGE dummy to be positive. The OLS results finds this to be the case but this size effect becomes insignificant when applying the Olley-Pakes correction.

In this same specification we also check whether the share of employment in foreign firms[14] in total sectoral employment matters for the bargaining power. One would expect this interaction to be negative since multinationals may be more footloose than domestic firms and as a result unions fear multinationals will reallocate their production. However, the interaction shows up to be positive and significant using the Olley-Pakes correction. This could be explained by international rent sharing where workers in affiliate plants are able to capture part of the parent company's profits (Budd et al. 2005)[15]

Finally, the Lerner index and bargaining term were interacted with a foreign owner dummy[14] and an EMU dummy[16]. The interactions show up to be insignificant except for the impact of foreign ownership on the Lerner index and the interaction between the EMU dummy and union bargaining power. Surprisingly, the results show that foreign firms have a lower mark-up than domestic firms. Most theoretical and empirical literature shows however that foreign firms are more efficient than domestic firms and should therefore, all other things equal, be able to charge a higher mark-up.

[14] A foreign firm is a firm which has any foreign owner in 2003.
[15] Note that our framework does not explicitly take into account international rent sharing. The bargaining power is a measure for the share of domestic rents captured by the union. Because of international rent sharing, more rents go to the union but this does not mean that the true union bargaining power is higher.
[16] This dummy equals one in 1999 and the years afterwards.

A possible explanation could be that foreign firms produce mainly for world markets, which typically are more competitive.

The above results show that sectors with high import penetration rates tend to have lower mark-ups and union bargaining power. Now, we distinguish between the different source countries of imports. In our dataset we observe for each 4 digit NACE sector the amount of imports coming from each country. We classify all countries in four groups, namely imports from other EU 15 countries, imports from the 10 new EU members, imports from OECD countries other than EU 25 and countries other than EU 25 and OECD. The last category can be seen as a low wage countries group. Import penetration from country group k in sector j is now defined as[17] $IP_{jk} = \frac{imports_{jk}}{total\_imports_j + production_k}$ such that $IP_j = \sum_{k=1}^{4} IP_{jk}$.

Figure 7 shows the import penetration evolution for all four groups of countries. Especially imports from low wage countries and the new EU accession countries have increased the past 10 years. However, it should be noted that the bulk of imports still come from other EU 15 countries. In 2004, almost 75% of Belgian imports came from other EU 15 countries, while the new accession countries and low wage countries accounted for 2.4% and 12.1% respectively. The share of imports from OECD countries other than EU 25 was 13.4%. In Figure 8 import penetration is shown per NACE 2 digit sector[18]. It is clear that sectors with relatively high import rates from low wage countries are Wearing Apparel, Leather, Furniture and other Manufacturing, Textiles and Wood Products. Sectors with almost no imports from low wage countries include Chemicals, Motor Vehicles and Publishing and Printing.

We use these figures to estimate whether mark-ups are correlated differently with import penetration from different countries. Results are shown in Table 5. The interaction between import penetration and the right-hand side variables has a negative sign for all different country groups, except for the new EU member states. The only interaction that is strongly significant is the one with imports from low wage

[17] For expositional reasons, time subscripts are omitted.
[18] Imports from new accession countries are included in EU 25 figures, since the share of imports for this countrygroup was too small to show in the graph.

countries[19]. The results show that sectors with high competition from low wage countries have a significantly lower mark-up and union bargaining power. This is consistent with Bernard et al. (2006) who show that plant survival and growth are negatively associated with imports from low-wage countries. Because of the fear of firms exiting the market, unions will be more reluctant to demand for higher wages. The interaction with imports from OECD countries is marginally significant at the 10% level.

IV.3 Outsourcing

In recent years, outsourcing of intermediate inputs has developed at a fast pace. In this section we attempt to measure the impact of outsourcing on mark-ups and union bargaining power. We expect intermediate imports to have a positive influence on a firm's mark-up because imported intermediates lower total costs and thus increase the mark-up, all else equal (e.g. Amiti and Konings 2005). The impact of outsourcing on union bargaining power is less clear. On the one hand, a high outsourcing degree of a sector can lower the union bargaining power of a firm. This will be true when unions fear that firms will outsource more of their production to low-wage countries if wages are set too high. On the other hand, Kramarz (2003) suggests that bargained wages will increase in the intermediate imports since firms which buy their intermediates abroad have to specify the amount of intermediates, their attributes,… well in advance to the foreign producer. When the bargaining between union and firm takes place, the intermediates are already ordered. This provides the unions with hold-up opportunities.

Following Feenstra ad Hanson (1996) we measure outsourcing as the share of imported intermediate inputs in total intermediate inputs[20]. We observe both variables directly from the Belgian input-output tables for the years 1995 and 2000[21]. For the whole manufacturing sector (NACE 15 to 36) in the year 2000, 69% of all intermediates was imported. In 1995, this percentage was 64%. Figure 9 shows the

[19] Since imports from low wage countries show a clear upward trend, we also ran the regression with year dummies interacted with the Lerner index and bargaining power next to the interactions with the import penetration variables. This did not change the results.
[20] Intermediate inputs are defined as inputs coming fom industrial sectors (NACE 15 to 36)
[21] These tables are made every five years, the most recent was from 2005 and used data from 2000.

outsourcing measure for each 2 digit NACE sector (except for the Tobacco industry). Sectors with the most imported intermediates are the Pulp and Paper Products, Transport Equipment, Office Machinery, and Radio, TV and Communication sectors. Among sectors with the lowest level of outsourcing are Food and Beverages as well as Publishing and Printing, Fabricated Metals and Mineral Products. Most sectors have witnessed an increase in there imported intermediates between 1995 and 2000.

To measure the impact of outsourcing on bargaining, we interact the Lerner and bargaining term with the outsourcing measure. A danger of this approach is that the outsourcing measure would pick up the impact of import penetration on mark-ups and bargaining power. To prevent this we decided to additionally interact the Lerner index and bargaining term with import penetration. We do not only include the level of outsourcing in the equations but also the growth in outsourcing[22]. The results are reported in Table 5. The first three columns represent simple OLS estimations, the last three columns show the same equations but with Olley-Pakes correction. The results show clearly that the growth in outsourcing is positively correlated with both mark-ups and union bargaining power while the level of outsourcing has no significant effect. Increased outsourcing is likely to have a positive impact on efficiency and productivity as suggested by a number of recent papers that have studied the impact of outsourcing on total factor productivity. The results in Table 5 confirm this hypothesis. Moreover, we can also note that bargaining power increases with increased outsourcing, which suggests that the Kramarz hypothesis holds.

V. Conclusions

Europe has witnessed the last decade an accelerated process of economic integration. Within the EU, trade barriers were removed and the euro was introduced. The EU has been enlarged with ten new member states and imports from low wage countries have risen dramatically. Economic integration is likely to have an impact on labor and product markets which are both characterized by structural rigidities. Most papers study the impact of economic integration on product and labor markets separately although they are clearly interlinked. Our paper bridges this gap by looking

[22] Growth = (outsourcing2000-outsourcing1995)/outsourcing2000

at the link between globalization and product and labor market imperfections simultaneously. To do this, we rely on a rich panel of Belgian manufacturing firms. The model we use, allows us to estimate product market power and union bargaining power together.

Several results emerge from our estimations. We show that union bargaining power and product market power are positively correlated. Unions are able to negotiate successful deals in sectors with high mark-ups, while they are more reluctant to press for high wage claims in more competitive sectors.

Concerning the impact of globalization, we find sectors with high import penetration rates to have significantly lower mark-ups and union bargaining power. This result is consistent with the imports as market disciplining device and several papers that look at the impact of globalization on union bargaining power. Furthermore, we split up import penetration rates with respect to the country where the imports come from. Especially imports from low wage countries are shown to be concentrated in sectors characterized by low mark-ups and bargaining power. Finally we show that sectors that have been rationalizing their production process by outsourcing part of their production, tend to have higher mark-ups and union bargaining power.

References

Abraham, F. and J. Konings (1999): "Does the opening of Central and Eastern Europe kill jobs in the West?"; *World Economy* vol.22(4), pp. 585-601.

Amiti M. and J. Konings (2005): "Trade Liberalization, Intermediate Inputs and Productivity: Evidence from Indonesia"; CEPR Discussion Paper 5104.

Bernard A., J. Jensen and P. Schott (2006): "Survival of the Best Fit: Exposure to Low Wage Countries and The (Uneven) Growth of US Manufacturing Plants"; *Journal of International Economics* vol 68, pp. 219-237

Binmore, K., A. Rubinstein and A. Wolinsky (1986) "The Nash Bargaining Solution in Economic Modelling"; *Rand Journal of Economics* vol.17(2), pp. 176-188.

Blanchard O. and F. Giavazzi (2003): "The Macroeconomic Effects of Regulation and Deregulation in Goods and Labor Markets"; *Quarterly Journal of Economics* vol.118(3), pp. 879-909.

Blundell, R. and S. Bond (1998): "Initial Conditions and Moment Restrictions in Dynamic Paneld Data Models", *Journal of Econometrics* vol.87, pp. 115-143.

Braconier H. and K. Ekholm (2000): "Swedish Multinationals and Competition from High- and Low-Wage Locations"; *Review of International Economics* vol.8(3), pp. 448-461.

Brainard, S. L. and D. A. Riker (1997): "Are U.S. Multinationals Exporting U.S. Jobs?" NBER Working Paper no. 5958.

Brock, E. and S. Dobbelaere (2006): "Has International Trade Affected Workers' Bargaining Power"; *Weltwirtschaftliches Archiv*, forthcoming.

Budd J., J. Konings and M. Slaughter (2005): "Wages and International Rent Sharing in Multinational Firms", *Review of Economics and Statistics*, vol.87(1), pp. 73-84.

Bughin J. (1993): "Union-Firm Efficient Bargaining and Test of Oligopolistic Conduct"; *Review of Economics and Statistics*, vol.75(3), pp.563-567.

Bughin J. (1996): "Trade Unions and Firms' Product Market Power."; *The Journal of Industrial Economics* vol.44(3), pp.289-307.

Crépon B., R. Desplatz and J. Mairesse (2002): "Price-cost Margins and Rent Sharing: Evidence from a Panel of French Manufacturing Firms"; CREST, Paris, *mimeo.*

De Loecker J. and F. Warzynski (2006) "Manuscript without Title", *mimeo.*

Dobbelaere S. (2004): "Estimation of Price-Cost Margins and Union Bargaining Power for Belgian Manufacturing"; *International Journal of Industrial Organization* vol.22, pp. 1381-1398.

Dumont M., G. Rayp and P. Willemé (2006): "Does Internationalization Affect Union Bargaining Power? An Empirical Study for Five EU Countries", *Oxford Economic Papers* vol.58, pp. 77-102.

Feenstra R. and G. Hanson (1996): "Globalization, Outsourcing and Wage Inequality"; *American Economic Review* vol.86(2), pp. 40-45.

Hall R.E. (1988): "The Relation between Price and Marginal Cost in U.S. Industry"; *Journal of Political Economy* vol.96(5), pp.921-947.

Hanson G., R. Mataloni jr. and M. Slaughter (2005) "Vertical Production Networks in Multinational Firms"; *Review of Economics and Statistics* vol. 87(4), pp. 664-678.

Harrison, A.E. (1994) "Productivity, Imperfect Competition and Trade Reform. Theory and Evidence"; *Journal of International Economics* vol.36, pp. 53-73

Helpman E. and P. Krugman (1989) “Trade Policy and Market Structure”; Cambridge: MIT Press.

Hoekman, B. and H.L. Kee (2003) “Imports, Entry and Competition Law as Market Disciplines”; CEPR Discussion Paper No. 3777.

Konings J. and A. Murphy (2006): “Do Multinational Enterprises Substitute Parent Jobs for Foreign Ones? Evidence from European Firm Level Panel Data”; *Weltwirtschaftliches Archiv*, forthcoming.

Konings J, P. Van Cayseele and F. Warzynski (2001) “The Dynamics of Industrial Mark-ups in Two Small Open Economies: Does National Competition Policy Matter?”; *International Journal of Industrial Organization* vol.19, pp. 841-859.

Konings J, P. Van Cayseele and F. Warzynski (2005) “The Effects of Privatization and Competitive Pressure on Firms' Price-cost Margins: Micro Evidence from Emerging Economies”; *Review of Economics and Statistics* vol.87(1), pp.124-134.

Kramarz F. (2003) “Wages and International Trade”, CEPR discussion paper No. 3963.

Levinsohn J. (1993): “Testing the Imports-as-Market-Discipline Hypothesis”; *Journal of International Economics* vol.35, pp.1-22.

Melitz M. (2003): “The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity”; *Econometrica* vol.71(6), pp.1695-1725.

Olley S. and A. Pakes (1996): “The Dynamics of Productivity in the Telecommunication Equipment Industry”; *Econometrica* vol.64(5), pp.1263-1297.

Rodrik D. (1997): “Has Globalization Gone too Far?”, Institute for International Economics, 128p.; Washington D.C.

Table 1 Openness 1992-2004 (ratio of imports and exports to GDP in current prices)

	1992	1997	2004
Openness EU 15	0.51	0.61	0.68
Openness EU 25	NA	0.62	0.70
Openness EU 15 (extra EU trade only)	0.14	0.20	0.21*
Fraction imports from US in total Extra EU 15 imports	0.19	0.20	0.15*
Fraction imports from China in total Extra EU 15 imports	0.04	0.06	0.10*
Fraction imports from CEEC in total Extra EU 15 imports	NA	0.10	0.16*
Fraction exports to US in total Extra EU 15 exports	0.19	0.19	0.22*
Fraction exports to China in total Extra EU 15 exports	0.02	0.02	0.04*
Fraction exports to CEEC in total Extra EU 15 exports	NA	0.14	0.18*
Share of imports of services in total (EU 15)	0.20	0.20	0.21*
Share of imports of services in total (EU 25)	NA	0.20	0.21*
Share of exports of services in total (EU 15)	0.21	0.20	0.22*
Share of exports of services in total (EU 25)	NA	0.20	0.22*

Source: Eurostat and author's calculations

*refers to the year 2003 rather than 2004

Table 2 Summary Statistics of the Sample of Belgian Firms

Variable	Mean	Median	S.D.
Turnover (X 1000 Euro)	27012	3690	148937
Employment	91	20	350.0
Material costs (X 1000 Euro)	21110	2382	1261968
Tangible Fixed Assets	4395	474	27243
Labor cost per worker (X 1000 Euro)	36.6	34.4	17.7
Labor cost share in turnover	0.23	0.21	0.14
Material costs share in turnover	0.67	0.69	0.17

Table 3 Mark-up and Bargaining for Manufacturing as a Whole

	OLS1	OLS2	OP
Lerner index	0.217	0.258	0.261
	(0.005)**	(0.005)**	(0.008)**
Δk	0.126	0.065	
	(0.005)**	(0.006)**	
Bargaining term		0.142	0.143
		(0.005)**	(0.007)**
Mark-up	1.28	1.35	1.35
Returns to scale	1.16	1.09.	
Bargaining power		0.124	0.125
Observations	31521	31521	16048
R-squared	0.23	0.32	0.33
Nr. Firms	6091	6091	4499

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

Table 4 Determinants bargaining power and mark-up

	(1) OLS1	(2) OLS2	(3) OLS3	(4) OP1	(5) OP2	(6) OP3
Lerner Index	0.270	0.286	0.281	0.288	0.298	0.295
	(0.007)**	(0.008)**	(0.011)**	(0.013)**	(0.014)**	(0.018)**
Δk	0.063	0.064	0.063			
	(0.006)**	(0.006)**	(0.006)**			
Bargaining	0.140	0.164	0.150	0.144	0.171	0.132
	(0.005)**	(0.007)**	(0.011)**	(0.007)**	(0.010)**	(0.015)**
Importpenetration X Lerner	-0.046	-0.083	-0.080	-0.086	-0.108	-0.105
	(0.009)**	(0.015)**	(0.015)**	(0.024)**	(0.026)**	(0.027)**
Importpenetration X bargaining		-0.058	-0.059		-0.068	-0.058
		(0.015)**	(0.015)**		(0.021)**	(0.022)**
LARGE X bargaining			0.021			0.011
			(0.007)**			(0.013)
FOREIGN X Lerner			-0.038			-0.012
			(0.012)**			(0.023)
FOREIGN X bargaining			-0.014			-0.003
			(0.014)			(0.019)
ForemploymentshareXLerner			0.023			-0.002
			(0.017)			(0.029)
ForemploymentshareXbargaining			0.030			0.056
			(0.019)			(0.026)*
EMU X Lerner			0.003			0.009
			(0.008)			(0.014)
EMU X bargaining			0.007			0.045
			(0.009)			(0.013)**
Observations	27194	27194	27194	13813	13813	13813
R-squared	0.32	0.32	0.32	0.33	0.34	0.34
Nr. Firms	5394	5394	5394.00	3939	3939	3939

Robust standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

Table 5 Source of imports and Lerner/bargaining power

	(1) OLS1	(2) OLS2	(3) OP1	(4) OP2
Lerner	0.266	0.278	0.279	0.285
	(0.007)**	(0.009)**	(0.014)**	(0.015)**
Δk	0.063	0.064		
	(0.006)**	(0.006)**		
Bargaining	0.140	0.157	0.144	0.163
	(0.005)**	(0.008)**	(0.007)**	(0.011)**
Imp.Pen.intraEU15 X Lernerx	-0.024	-0.042	-0.045	-0.058
	(0.017)	(0.026)	(0.045)	(0.047)
Imp.Pen.OECD X Lerner	-0.042	-0.036	-0.162	-0.169
	(0.042)	(0.069)	(0.088)+	(0.098)+
Imp.Pen.Other X Lerner	-0.091	-0.188	-0.135	-0.193
	(0.023)**	(0.038)**	(0.054)*	(0.058)**
Imp. Pen. NewEU X Lerner	0.010	0.011	0.399	0.642
	(0.137)	(0.242)	(0.430)	(0.456)
Imp. Pen.IntraEU15 X Bargaining		-0.028		-0.043
		(0.027)		(0.037)
Imp.Pen.OECD X Bargaining		0.015		-0.009
		(0.073)		(0.124)
Imp.Pen.Other X Bargaining		-0.161		-0.210
		(0.039)**		(0.063)**
Imp.Pen.NewEU X Bargaining		0.035		0.774
		(0.285)		(0.429)+
Observations	27194	27194	13813	13813
R-squared	0.32	0.32	0.34	0.34
Nr. Firms	5394	5394	3939	3939

Robust standard errors in parentheses; + significant at 10%; * significant at 5%; ** significant at 1%

Table 6 Impact outsourcing on mark-up and bargaining power.

	(1) OLS1	(2) OLS2	(3) OLS3	(4) OP1	(5) OP2	(6) OP3
Lerner	0.283	0.252	0.226	0.267	0.268	0.278
	(0.026)**	(0.027)**	(0.029)**	(0.048)**	(0.050)**	(0.051)**
Δk	0.066	0.066	0.063			
	(0.006)**	(0.006)**	(0.006)**			
bargaining	0.131	0.105	0.100	0.156	0.131	0.126
	(0.028)**	(0.028)**	(0.029)**	(0.044)**	(0.042)**	(0.042)**
Outsourcing*Lerner	-0.041	-0.008	0.092	-0.011	-0.014	0.012
	(0.043)	(0.042)	(0.048)+	(0.078)	(0.078)	(0.089)
Outsourcing*bargaining	0.019	0.044	0.104	-0.022	0.003	0.061
	(0.047)	(0.045)	(0.051)*	(0.074)	(0.070)	(0.074)
(ΔOutsourcing)*Lerner		0.046	0.026		0.007	0.035
		(0.013)**	(0.014)+		(0.046)	(0.028)
(ΔOutsourcing)*bargaining		0.044	0.023		0.054	0.035
		(0.014)**	(0.014)+		(0.020)**	(0.020)+
Import penetration*Lerner			-0.086			-0.098
			(0.017)**			(0.031)**
Imp. Pen.*bargaining			-0.065			-0.064
			(0.018)**			(0.024)**
Observations	31521	31521	27194	16048	16048	13813
R-squared	0.32	0.32	0.32	0.33	0.34	0.34
Nr. Firms	6091	6091	5394	4499	4499	3939

Robust standard errors in parentheses;+ significant at 10%; * significant at 5%; ** significant at 1%

Figure 1 Belgian trade and production

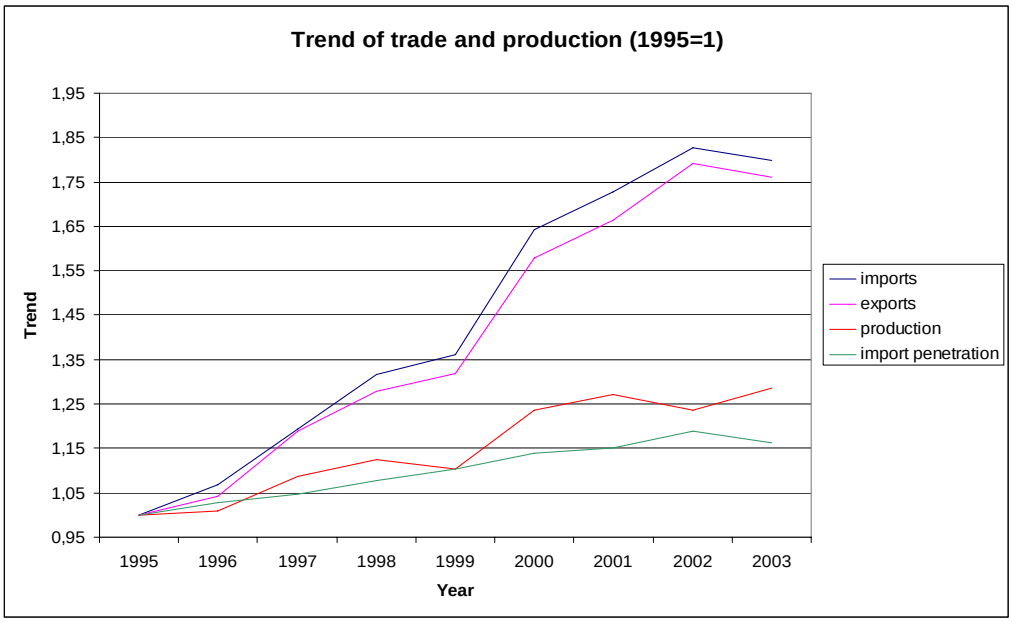


Figure 2 Import penetration per sector

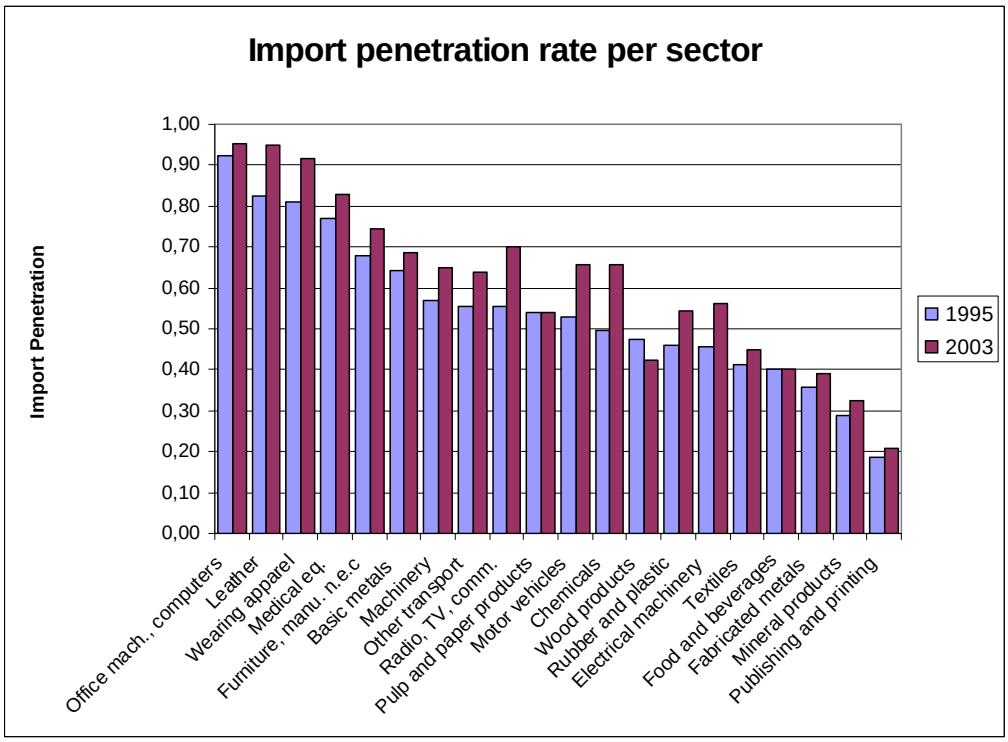


Figure 3 Interaction between labor market and product market

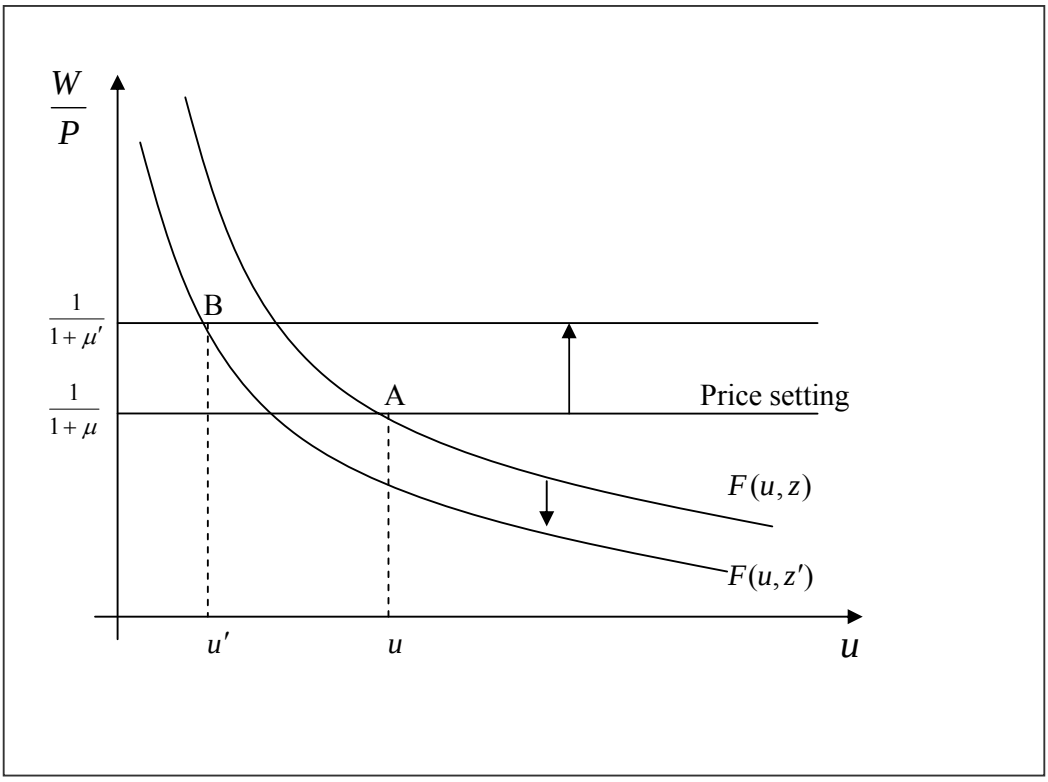


Figure 4 Mark-up per NACE 2 digit Sector

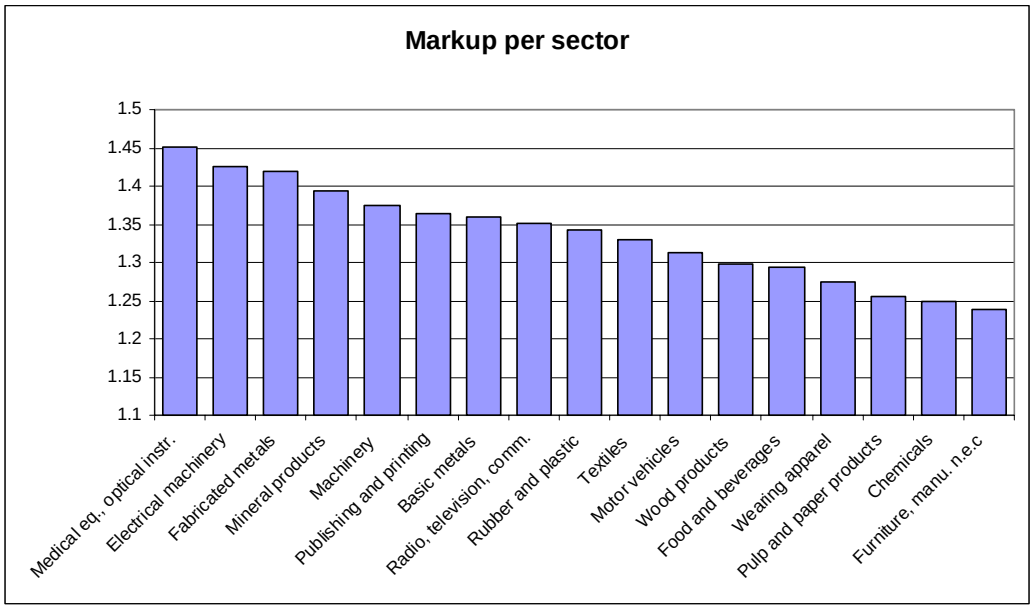


Figure 5 Bargaining power per NACE 2 digit sector

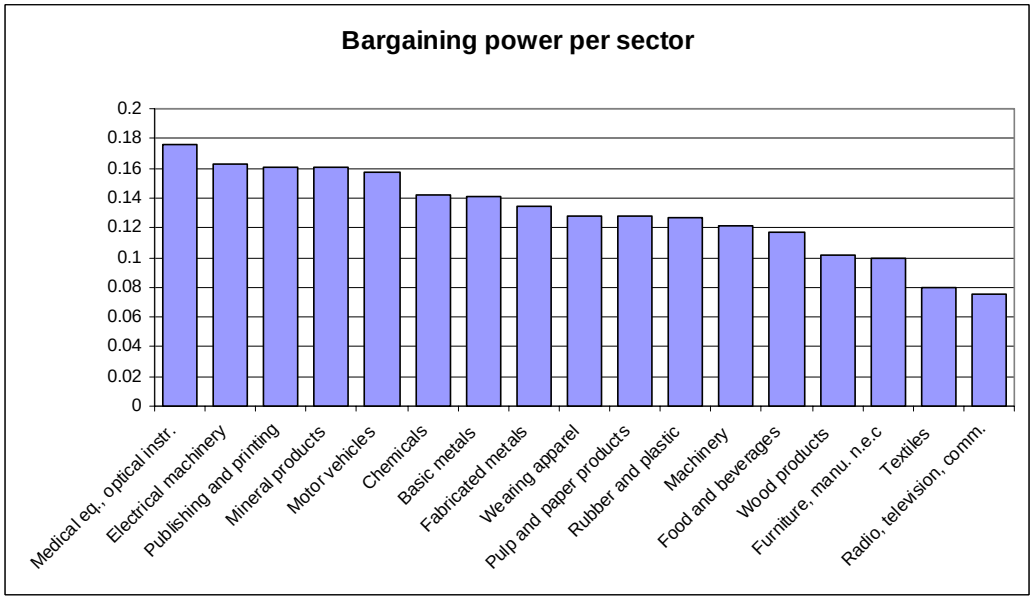


Figure 6 Link between mark-ups and bargaining power

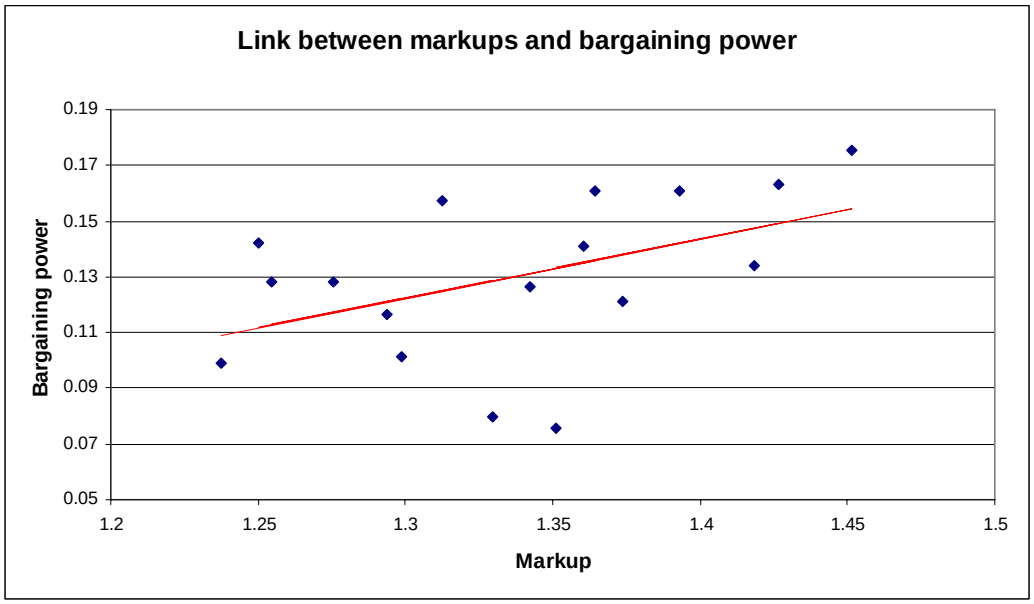


Figure 7 Trend import penetration different country groups

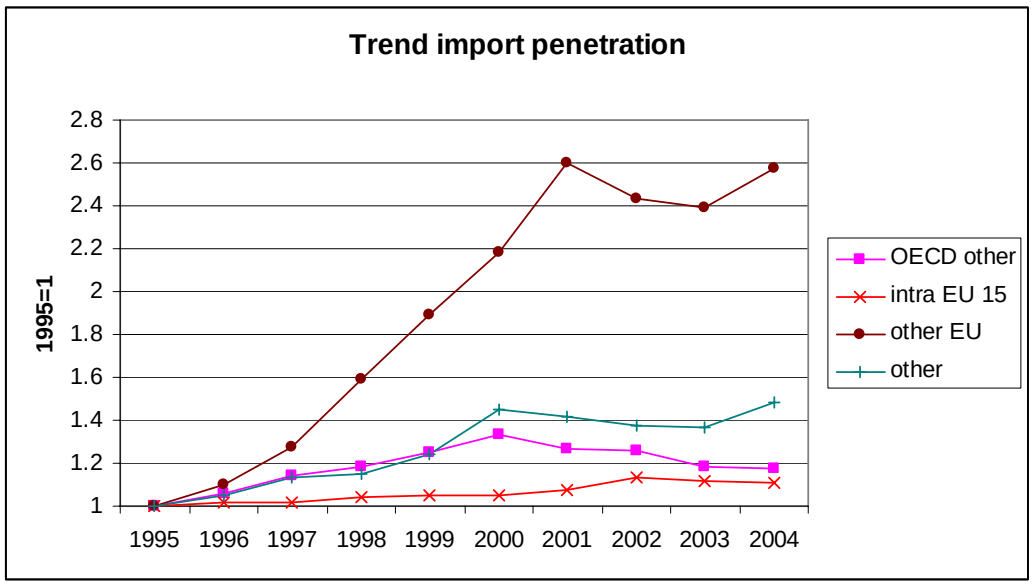


Figure 8 Import penetration per sector and country group

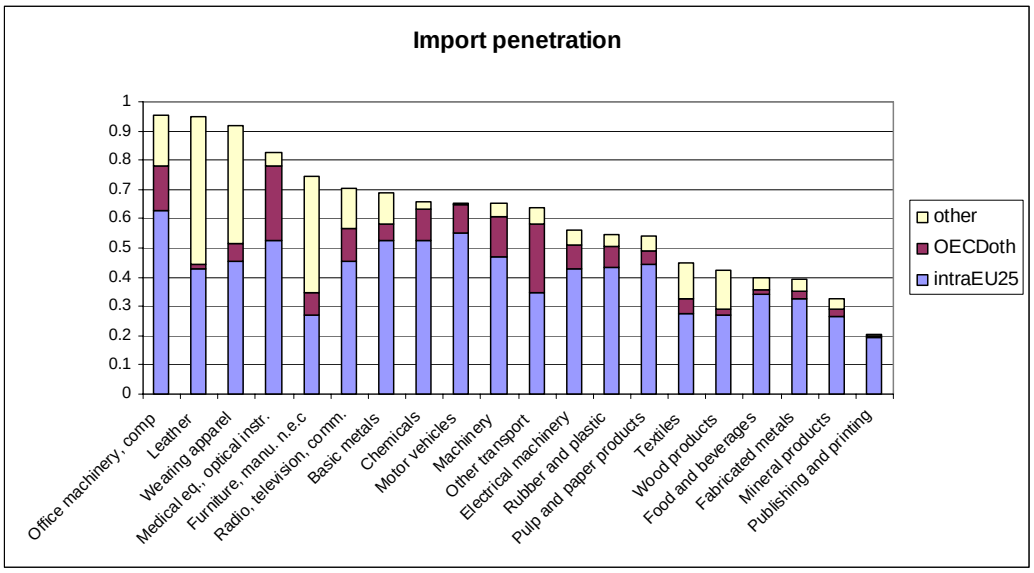
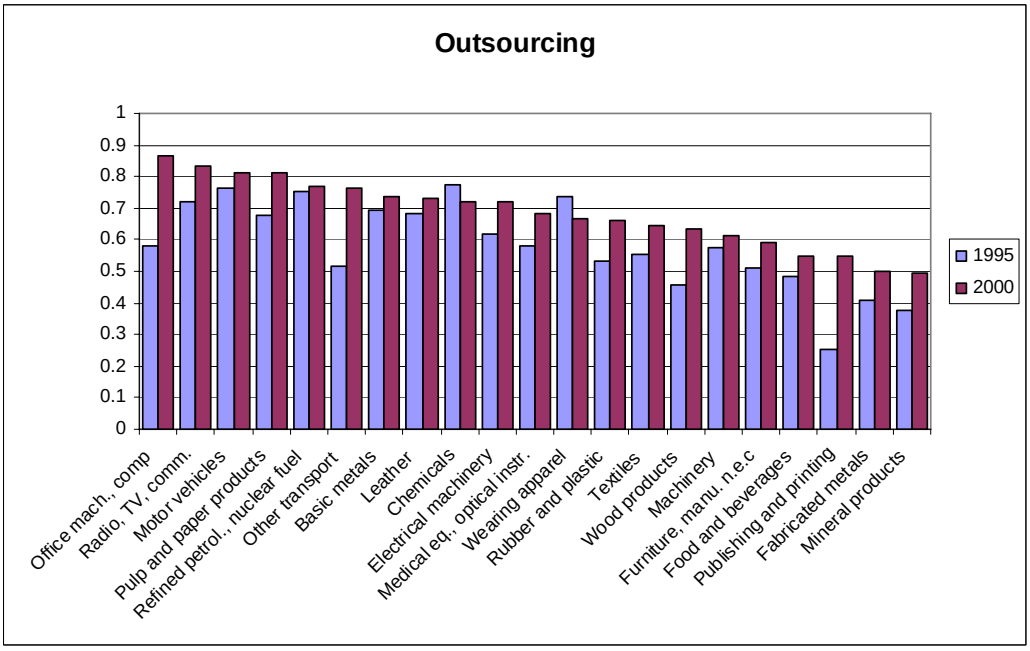


Figure 9 Outsourcing measure per sector



Appendix: Controlling for the unobserved productivity shock

We start from an adjusted version of equation (4):,

$$\Delta q_{it} = \varepsilon_{L,it}\Delta l_{it} + \varepsilon_{M,it}\Delta m_{it} + \varepsilon_{K,it}\Delta k_{it} + \Delta a_{it} \quad \text{(A1)}$$

This expression can be rewritten in the following way:

$$\Delta q_{it} - \alpha_{L,it}\Delta l_{it} - \alpha_{M,it}\Delta m_{it} = \beta\Delta q_{it} + (1-\beta)(\varepsilon_{K,it}\Delta k_{it} + \Delta a_{it}) \quad \text{(A2)}$$

Where a_{it} can be decomposed in ω_{it} and η_{it}. ω_{it} represents firm specific productivity, observed by the firm when making its variable inputs decisions in period t, but not by the econometrician. η_{it} is an i.i.d. error term, either measurement error or a productivity shock not anticipated by the firm when making its input decisions. The accumulation equation for capital is given by $k_{t+1} = (1-\delta)k_t + i_t$, where i_t represents investment and δ the depreciation rate of capital. A firm makes the investment decision in period t, which enters the capital stock in period $t+1$. Olley and Pakes (1996) show that in equilibrium, investment at period t is a function of capital and productivity in period t.

$$i_{it} = i(\omega_{it}, k_{it}) \quad \text{(A3)}$$

Provided $i_{it} > 0$, this function is increasing in a_{it} and thus invertible:

$$\omega_{it} = h(i_{it}, k_{it}) \quad \text{(A4)}$$

It follows then that:

$$\Delta\omega_{it} = h(i_{it}, k_{it}) - h(i_{it-1} - k_{it-1}) = g(i_{it}, i_{it-1}, k_{it}, k_{it-1}) \quad \text{(A5)}$$

This expression states the unobservable change productivity shock as a function of observables. Proxying for this function by a polynomial in capital and investment, both in present and lagged values, allows us to control for the unobserved productivity

shock in equation (11). As a result reliable estimates for the Lerner index and union bargaining power are obtained; Because of the construction of a polynomial in investment and capital to proxy for the unobserved productivity shock, it is not possible to separately identify an estimate for the returns to scale.

Rewriting equation (A2) , the equations, under the assumption of perfect competition on the labour markets and an efficient bargaining framework respectively[23] are the following:

$$\Delta q_{it} - (\alpha_{L,it}\Delta l_{it} + \alpha_{M,it}\Delta m_{it}) = \beta_1 \Delta q_{it} + g'(i_{it}, i_{it-1}, k_{it}, k_{it-1}) + \eta_{it} \quad \text{(A6)}$$

$$\Delta q_{it} - (\alpha_{L,it}\Delta l_{it} + \alpha_{M,it}\Delta m_{it}) = \beta_1 \Delta q_{it} + \beta_2(\alpha_{L,it} - 1)\Delta l_{it} + g'(i_{it}, i_{it-1}, k_{it}, k_{it-1}) + \eta_{it} \quad \text{(A7)}$$

[23] Note that the efficient bargaining framework seems to be inconsistent with the Olley-Pakes methodology at first sight. Olley and Pakes (1996) assume perfect competition in the labour market, so firms can freely adjust their labor stock at a given wage rate. However, Belgian firms can react to productivity shocks by making use of temporarily labor contracts and interim labor. All this at a given wage rate, since this is negotiated every two years in the joint commission the firm belongs to.