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Has International Trade Affected Workers? Bargaining Power?

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Has International Trade Affected Workers' Bargaining Power ?

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ABSTRACT

In this paper, we investigate whether international trade has affected workers' wages and their bargaining power in particular in the Belgian manufacturing industry over the period 1987-1995 by relying on a rent-sharing framework. Using a sample of more than 12 000 firms, we find that international trade has an effect on workers' wages through changes in the firms' profits. Our regression results reveal that increased foreign competition in the form of lower export prices reduces both wages per worker and profits per worker. Besides, our findings indicate that technological change is an important determinant of the workers' (relative) bargaining power. Globalisation seems also to play some role.

JEL Classification : C23, D21, F16, F23, J50, L13.

Key Words : Rent Sharing, International Trade, Instrumental Variables, Panel Data.

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1. INTRODUCTION

During the past decades, the labour market consequences of the international integration process have been at the centre of hot debate. Anti-globalisation protests surrounding the WTO, IMF and World Bank meetings reveal that many people fear that they will lose their job or will be confronted with lower wages because of the threat of fiercer international competition.

One strand of the literature, investigating the impact of international trade on the labour market has taken its outset in the integration of emerging economies. Compared to OECD countries, these countries have a relatively large supply of unskilled workers with low wages. Accordingly, it has been a concern whether the position of unskilled versus skilled workers in OECD countries would deteriorate. This could show up either in lower relative wages and/or higher unemployment for these unskilled workers.

One favourite framework of trade economists to study the impact of international trade on the labour market, is the Heckscher-Ohlin-Samuelson theory (HOS) in which the Stolper-Samuelson (SS) theorem is an important building block. According to this theorem, the relative (real) wages of unskilled workers in OECD countries decline if the integration process is associated with a decline in relative prices of commodities using a lot of unskilled labour. However, a voluminous literature linking changes in product prices to changes in factor prices (see Slaughter, 2000 for a survey of these studies) has found that international trade can account for only a very small fraction of the deterioration of the position of unskilled workers. Instead, technological progress seems to be the main reason for observed relative wage changes.

Labour economists have mainly used the so-called Factor Content of Trade (FCT) approach. In this approach, the amount of labour (eventually split-up between skilled and unskilled workers) embodied in a country's exports and imports is calculated. Subsequently, these changes in labour flows are linked to labour demand elasticities in order to calculate the impact of international trade on wages. Except for Wood (1995), most authors also find a small to moderate impact of international trade on worker's wages.

The studies mentioned above focus on factor revenues and do not address the capture or distribution of rents in response to international trade. A growing body of the trade-labour literature has relied on rent-sharing models to explain changes in wages by changes in rents in response to openness. In rent-sharing models, workers no longer obtain the competitive wage but are able to capture a fraction of the firm's profits per worker in the form of higher wages. Abowd and Lemieux (1993) for Canada, Borjas and Ramey (1995) for the US and Kramarz (2003) for France show how increased international competition triggers a shift in the rents from domestic to foreign firms. This leads to a change in profits of the domestic firm, which translates in wage changes in the domestic

market. Fontagné and Mirza (2001) focus on trade volumes to address the international rent-sharing hypothesis in developed and developing countries. Their empirical results show that an increase in exports as well as domestic market shares induces higher wages in a number of industries in the OECD. In developing countries, such as the Mediterranean countries and those in Latin America, similar rent-sharing effects are observed. However, these effects are not present in Asia.

In this paper, we also rely on a rent-sharing framework to investigate the impact of international trade on labour market outcomes in Belgium. We argue that there are at least two valid reasons for doing so. First, Belgium is one of the most open economies in the world. More specifically, the export/GDP ratio equals 85% in 2002 compared to 10% in the US¹. Krugman (1995) among others argues that globalisation cannot explain US labour market developments because the US economy is just not open enough for trade to matter a lot. Turning this argument around, we expect to find significant labour market effects from trade in Belgium. Second, the Belgian economy is characterised by the presence of wage negotiations between firms and their workers at the national, the sectoral and the firm level. Hence, this makes a rent-sharing framework very valid to explain wages in the Belgian economy.

We focus on two issues. In the first part of the paper, we concentrate on the effect of international trade through changes in the firms' rents. To our knowledge, this issue has not been taken up for the Belgian economy. Veugelers (1989) and Goos and Konings (2001) examine the rent-sharing hypothesis using Belgian firm-level data and find a positive profit-wage relationship. However, these authors do not relate their rent-sharing framework to a story of globalisation. Following Abowd and Lemieux (1993) for Canada, which like Belgium is a typical example of a small open economy, we also use import and export prices in our analysis. However, we also experiment with other measures, such as exchange rates, to test whether increased globalisation has affected wages through changes in the firms' rents.

Whereas the studies mentioned above and our first part analyse the effect of globalisation through the *size* of the rents, we focus explicitly on the *distribution* of the rents in the second part of this paper. As pointed out by Rodrik (1997), increased international competition has led to a lower *share* of the enterprise surplus ending up with workers. A related consequence is that unions have become weaker. In other words, lower wages in the case of increased international competition are not only induced by a decline in the firm's rents but can also be the result of the union's lower bargaining power. In this paper, we therefore study whether the globalisation process has influenced the nature of bargaining between workers and employees. Within this framework, we explicitly test whether in sectors characterised by strong international product market competition (measured by variables related to e.g. export and import competition, outsourcing, tariffs and foreign direct investment), workers/unions will have less bargaining power during wage negotiations.

Budd and Slaughter (2003) focus on Canada and investigate whether profits are shared across international borders. More specifically, Canadian wages are regressed on Canadian and US profits, both interacted with several variables related to international linkages such as multinational ownership, union type and tariffs and transportation costs. The empirical results regarding the profits of Canadian firms reveal that rent-sharing is less present when the Canadian firm is part of a US multinational and/or international union. When the Canadian profits are interacted with Canadian tariffs on US imports and transportation costs, the results reveal that higher Canadian profits are related to higher wages but there is no variation in rent-sharing across tariff levels and transport costs. In this paper, we further investigate whether increased globalisation has indeed an effect on the workers' bargaining power.

Veugelers (1989) and Goos and Konings (2001) for Belgium and Svejnar (1986) for the US point out that there is indeed a lot of cross- industry variation in the relative bargaining power coefficient. Svejnar (1986) and Veugelers (1989) further investigate the determinants of this cross-industry variation of the bargaining power coefficient. Although a well-developed theory of these determinants of relative bargaining power is lacking, these authors link the sectoral bargaining power parameters to variables relating to the economic bargaining environment such as the consumer price index, the sectoral unemployment rates and several variables capturing output market concentration. However, they do not relate the workers' bargaining power to globalisation. More specifically, we use a two-stage approach in which we first estimate the workers' (relative) bargaining power for each sector following Svejnar (1986) and Veugelers (1989). Our unique dataset encompassing the entire population of Belgian firms enables us to split up our data into several sectors². In the second stage, we relate the workers' (relative) bargaining power of each sector and each year to a broad range of globalisation measures such as trade, outsourcing, tariffs and measures related to foreign direct investment.

The organisation of the paper is as follows. In section 2, we describe the theoretical framework and also present an overview of the literature on the effect of international trade on wages in a collective bargaining framework. Section 3 discusses the regression results of the first stage. Section 4 focuses on the determinants of the workers' bargaining power and hence deals with the regression results of the second stage. The paper ends with a summary of the main results and points out some extensions for future work.

¹ The data are obtained from the OECD International Trade Statistics and the OECD Main Economic Indicators (see <http://www.oecd.org>).

² Our dataset has the advantage of being a more exhaustive dataset in comparison to the Amadeus firm-level dataset of Bureau van Dijk. This is because the latter database only contains firms satisfying at least one of the following criteria: number of employees greater than 100, total assets and operating revenues exceeding 16 million and 8 million USD, respectively.

2. THEORETICAL FRAMEWORK

The methodology in this paper borrows from the rent-sharing literature. A lot of papers deal with this issue and investigate the link between a firm's ability to pay and the workers' wages. Within this framework, workers no longer obtain the competitive wage but are able to capture a fraction of the firm's profits per worker in the form of higher wages.

In this section, we first describe the efficient bargaining framework. Then, we briefly discuss the three channels through which international trade can affect wages during the bargaining process.

2.1. Efficient Bargaining Framework

The union and the firm are involved in an efficient bargaining procedure with both real wages (w) and employment (N) as the subject of agreement (McDonald and Solow, 1981). Relying on the Efficient Bargaining model is motivated by stylised facts about Belgian industrial relations, i.e. Belgian collective agreements do not only deal with wages but also with employment issues like hours of work and part-time labour policies (Bughin, 1996). Microeconomic evidence in favour of Efficient Bargaining for Belgium has been provided by e.g. Bughin (1993).

The union is risk neutral³ and its objective function is specified in a utilitarian form: $U(w, N) = Nw + (\bar{N} - N)w_a$, where \bar{N} is union membership ($0 < N \leq \bar{N}$) and $w_a \leq w$ is the alternative wage (i.e. a weighted average of the alternative market wage and the unemployment benefit).

The firm's utility equals its profits π , with $\pi(w, N) = R(N) - wN - F$, where $R = PQ$ stands for total revenue ($R'_N < 0$), P for the output price, Q for output and F for all other costs associated with production. For simplicity, we assume that labour is the only variable input for the firm. Hence, F represents fixed costs. It can be shown that this assumption on the fixed nature of inputs other than labour does not affect the bargaining outcome provided the union preferences do not depend on those inputs (Bughin, 1996).

The threat point for the union is assumed to equal the alternative wage w_a ⁴. If no revenue accrues to the firm when negotiation breaks down, the firm's fall-back utility equals $-F$. The outcome of the bargaining of the asymmetric generalised Nash solution therefore reduces to:

³ See Svejnar (1986) and Veugelers (1989) among others for the derivation in the case of a risk-averse union.

⁴ It is not necessary for the unions' threat point to be equal to the alternative wage (see e.g. McDonald and Suen, 1992 and Layard et al., 1991, for a discussion). Blanchflower et al. (1996) interpret the workers' threat point as the wage of temporary work in case of a breakdown in bargaining. Others such as Layard et al. (1991) also refer to the threat point as the income received from strike pay or from unemployment benefits in case these are payable.

$$\max_{w, N} \Omega = \left\{ Nw + (\bar{N} - N)w_a - \bar{N}w_a \right\}^\phi \{R - wN\}^{1-\phi} \quad (1.1)$$

where $\phi \in [0,1]$ represents the union's bargaining power.

Maximisation of Eq. (1.1) with respect to the wage rate (w) gives the following equation:

$$w = w_a + \frac{\phi}{1-\phi} \left[\frac{R - wN}{N} \right] \quad (1.2)$$

Maximising Eq. (1.1) with respect to employment (N) leads to the following first-order condition:

$$\begin{aligned} w &= R_N + \frac{\phi}{1-\phi} \left[\frac{R - wN}{N} \right] \\ &\quad \Downarrow \\ w &= R_N + \phi \left[\frac{R - R_N N}{N} \right] \end{aligned} \quad (1.3)$$

From Eq. (1.3), it follows that unions extract a rent from bargaining, expressed as a premium over the marginal revenue of labour (R_N).

By solving simultaneously both first-order conditions, we obtain an expression for the contract curve, which results from the tangency between iso-profit curves and union indifference curves: $R_N = w_a$. This equation shows that the employment level depends on the alternative wage (w_a) but not on the negotiated wage (w). It also follows that the contract curve outcome is to the right of the labour demand curve. The first-order condition related to optimal employment, Eq. (1.3), shows the extent to which the bargaining outcome is off the labour demand curve.

2.2. Channels through which International Trade affects Wages in a Bargaining Framework

Theoretically, there are three channels through which product market integration (globalisation) can affect wages during the bargaining process (see Eq. (1.2)).

First, international trade can induce movements in the firm's financial conditions π , i.e. affecting the *size* of the rents (or the 'pie') that can be shared between the workers and the firm. Abowd and Lemieux (1993) for Canada and Kramarz (2003) for France use foreign competition shocks as an exogenous source of variation in product market conditions to identify the effect of the firm's financial conditions on negotiated wages. The results of Abowd and Lemieux (1993) reveal that

foreign competition in the form of lower import or export prices decreases both wages per worker and quasi-rents per worker. Moreover, the effect on the quasi-rents is larger than on the wages which implies that workers are not able to capture all the changes in quasi-rents induced by changes in import and export prices. Kramarz (2003) uses US export prices to determine the effect on (quasi-) rents and hence wages. He finds that export prices of US firms to OECD countries increase French quasi-rents. US export prices to Eastern European countries and oil-producing countries decrease French quasi-rents. The author considers the former result as a potential proof of increased import competition while the latter can be consistent with an increase in oil prices.

Second, international trade can affect the bargaining outcome through movements in the firm's and the workers' threat points. Biscourp and Kramarz (2002) and Kramarz (2003) show how intermediate imports may act as substitutes for part of the labour input. Firms that use intermediate inputs in the production process have to announce the amount of imports well in advance. In other words, these intermediate imports can be seen as investments that influence the firm's threat point and provide the workers with hold-up opportunities (Malcomson, 1997). More specifically, Kramarz (2003) shows that there is a positive relation between the firm's intermediate imports and the workers' wages. At the same time, imports of finished goods by the firm itself or by its competitors decrease the workers' outside options (Kramarz, 2003). During wage negotiations, the workers have possible access to other jobs in case bargaining breaks down. The availability of these temporary jobs is inversely related to the amount of imported finished goods in an industry (see Kramarz, 2003, p. 6, for a discussion). The empirical results of Kramarz (2003) for France reveal that increased import competition not only affects wages through changes in the quasi-rents but also through the workers' threat point, affecting their wages negatively.

The third channel through which international trade can affect wages using a collective bargaining framework is through the workers' bargaining power parameter ϕ . There are two solution concepts within the bargaining framework: the axiomatic approach and the strategic approach. The static axiomatic (normative) approach concentrates on the outcome of the bargaining process satisfying certain principles that might be achieved by an objective arbitrator in case of disagreement between the parties (Booth, 1995)⁵. The dynamic game-theoretic (strategic) approach involves modelling the bargaining process in order to determine the actual outcome. It can be shown that in a simple 'alternating offers model' with no uncertainty, the game-theoretic solution equals the generalised Nash bargaining solution (see Binmore et al., 1986 and Sutton, 1986 for an extensive comparison of both approaches). More specifically, the outcome of a bargain can be compared to the division of a continuous supply of a cake between two parties (see Layard et al., 1991 for an interpretation). Binmore et al. (1986) show that when two assumptions are fulfilled, the cake would be

equally split. These assumptions are: both parties have the same discount rate and neither party gets any extra income from other sources while disagreement is going on.

The real advantage of the game-theoretic approach is that an economic interpretation can be given to the bargaining power parameter ϕ (see Booth, 1995). First, in models where parties discount the future and hence, where delay of a settlement diminishes the present value of the result, the workers' bargaining power will be higher if workers have a lower discount rate than the employer and are hence less willing to have a disagreement⁶. Reasoning in this way, Lindén (1995) defines ϕ as the ratio of the hiring rate from the unemployed to the sum of the hiring rate and the rate of filling vacancies (and hence on the labour market tightness) in an equilibrium search model. The more impatient the employer or the tighter the labour market, the higher the bargaining strength of the union and vice versa (Teulings and Hartog, 1998). Therefore, measures related to globalisation could have an impact on the tightness of the labour market and hence on the union's bargaining power. Higher import competition (export competition) could decrease (increase) the workers' bargaining power as the labour market becomes less (more) tight. Second, ϕ can be interpreted as the ratio of the parties' perceived risk that the other party will leave the bargaining table (Binmore et al., 1986, McDonald and Suen, 1992 and Teulings and Hartog, 1998). More specifically, the relative bargaining power of the union and the firm is related to the costs or benefits of both parties in delaying an agreement (Layard et al., 1991 and Smith, 1996)⁷. If a bargaining partner receives extra income in case of a disagreement, this partner is more willing to tolerate disagreement and hence bargains for a larger share of the 'pie'. In some studies (see e.g. Doiron, 1992), these costs are interpreted as strike costs in case the negotiating parties use strikes as a dispute resolution mechanism. Among others, higher inventories, more liquid assets and lower capital intensity are shown to be positively related to a firm's strike costs and hence its bargaining power (see e.g. Clark, 1991; 1993 and Doiron, 1992). For workers, these strike costs could be related to the availability of strike funds or temporary jobs elsewhere. Other family members' income could also form an alternative in case of disagreement during wage negotiations and it is even the case that these members are more motivated to apply for more temporary employment in case of disagreement. The chance that the workers or other family members obtain alternative employment in case of a disagreement depends on the probability of obtaining this alternative employment. This probability is inversely related to the rate of unemployment in the economy. Therefore, higher unemployment lowers the unions' bargaining power. Other factors, such as globalisation, are therefore also able to affect the union's bargaining power as these might have an impact on the rate of unemployment.

⁵ These axioms are invariance, Pareto efficiency, independence or irrelevant alternatives and anonymity or symmetry.

⁶ Gibbons (1992, p. 68) refers to the parties' discount rate as the time-value of money, i.e. a dollar received at the beginning of one period that can be put in the bank to earn interest.

⁷ As discussed by Smith (1996), these costs or benefits can have an effect on the workers' bargaining power through changes in their relative time preference.

An informal theory regarding the determinants of the union's bargaining power is given in the paper of McDonald and Suen (1992). The authors argue that the bargaining power of the workers is related to the amount of support workers are prepared to give to a wage claim. One factor influencing this support is union leadership but it is difficult to find a statistical measure for this determinant. Another factor is the workers' feeling about the fairness of the claim. If workers feel that the claim is unreasonable, they are less eager to support the wage claim. In other words, restricting wages is felt to be important in periods of unfavourable economic conditions as large wage increases are considered to be dangerous to economic activity in general and jobs in particular. One direct indicator of the economic climate is the level of unemployment. It is also in this context that increased globalisation can have an impact on the economic situation as e.g. higher import competition (export competition) can increase (decrease) unemployment and hence influence workers' bargaining power. As pointed out by McDonald and Suen (1992), the impact of unemployment on workers' bargaining power is not about the reduction in alternative job prospects or about the decline in the demand for labour but is instead related to the will of workers to press for a wage claim⁸.

As one of the first, Rodrik (1997) has pointed out that increased globalisation has lowered the workers' bargaining power. More specifically, he argues that the more substitutable domestic workers are with foreign workers due to e.g. international trade, outsourcing and foreign direct investment (FDI), the lower the enterprise surplus ending up with workers. He also points out that as a consequence, unions have become weaker. For the US, Baldwin (2003) finds that between 1977 and 1997, the share of workers with median education who were represented by a trade union declined from 29 to 14 percent. For workers with above median education and with basic education, the decline has been from 19 to 13% and from 58 to 51% respectively. However, a slight increase from 18 to 19% has been observed for the higher-educated workers. Baldwin (2003) finds that international trade has in general a very small impact on the decline in unionisation, except for the decline in unionisation for workers with less education. Rodrik (1997) also mentions that the link between globalisation and the nature of bargaining between workers and employers has received little attention in the academic literature. Indirect empirical evidence for weaker unions is given by the study of Slaughter (2001) who investigates the hypothesis that trade liberalisation has contributed to increased labour demand elasticities. Using sectoral-level data, his empirical results are mixed and show that mainly time effects determine changes in labour demand elasticities. However, a number of trade-related variables (such as outsourcing, net exports, etc.) are found to have the predicted effect on the labour demand elasticity of especially non-production workers⁹. As pointed out by Slaughter (2001) and Rodrik (1997), finding increased labour demand elasticities in the case of increased foreign competition could be consistent with a story of a shift from labour towards capital bargaining power over rent distribution in firms enjoying extra-normal profits.

⁸ McDonald and Suen (1992) argue that union density may be an indicator of the justness of union wage claims.

Work more directly related to the impact of increased globalisation on workers' bargaining power is the study of Budd and Slaughter (2003). This paper focuses on Canada and investigates whether profits are shared across international borders. More specifically, Canadian wages are regressed on Canadian and US profits, both interacted with several variables related to international linkages such as multinational ownership, union type and tariffs and transportation costs. The empirical results regarding the profits of Canadian firms reveal that rent-sharing is less present when the Canadian firm is part of a US multinational and/or international union. Budd and Slaughter argue that the standard profit-sharing situation is tempered because of additional complexities of multinational ownership and that US parents might feel competitive pressure when Canadian industry profits are high and hence try to restrain wages. When the Canadian profits are interacted with Canadian tariffs on US imports and transportation costs, the results reveal that higher Canadian profits are related to higher wages but there is no variation in rent-sharing across tariff levels and transport costs.

In this paper, we further investigate whether globalisation has indeed an effect on the workers' bargaining power as first pointed out by Rodrik (1997). We use a broad range of globalisation measures such as trade, outsourcing, tariffs and measures related to foreign direct investment. While this is the focus of this paper, we also pay some attention to the second mechanism of how international trade can affect wages in a collective bargaining framework. More specifically, we also analyse whether Belgian manufacturing wages are affected by international trade through changes in the firm's profits per worker. In the next section, we proceed with the stage-one regressions where we estimate the workers' relative bargaining power parameters. Subsequently, we relate these parameters to several globalisation measures.

3. STAGE-ONE REGRESSIONS: ESTIMATING WORKERS' (RELATIVE) BARGAINING POWER

To identify the effect of international trade on the workers' bargaining power, our estimation strategy consists of two stages. In the first stage, we estimate the workers' relative bargaining power $\left(\frac{\phi}{1-\phi}\right)$ for 15 sectors in the Belgian manufacturing industry over the period 1987-1995. In the second stage, we regress the estimated workers' relative bargaining power coefficients on several measures of trade, technology and many control variables. These stage-two regressions try to identify the factors explaining the workers' relative bargaining power.

⁹ Among others, other papers such as Krishna et al. (2001) for Chile, Bruno et al. (2001) for several OECD countries have also investigated this issue.

3.1. Specification and Data Description

The econometric specification that acts as the basis for the stage-one regressions is derived from Eq. (1.2) and is given by:

$$\ln w_{ijt} = \alpha_0 + \delta_1 \ln w_{jt}^0 + \delta_2 \ln U_{jt} + \frac{\phi}{1-\phi} \ln \left(\frac{\pi}{N} \right)_{ijt} + \alpha_i + \alpha_t + \varepsilon_{ijt} \quad (1.4)$$

with $\left(\frac{\phi}{1-\phi} \right)$ the workers' relative bargaining power. Index ijt stands for firm i in sector j at time t .

To estimate Eq. (1.4), we use an unbalanced panel of the entire population of Belgian firms in the manufacturing industry over the period 1987-1995. All variables are taken from annual company accounts which are collected by the National Bank of Belgium (NBB). The dependent variable is the natural logarithm of the average real annual wage in firm i . The workers' outside option (w_a in Eq. (1.2)) is proxied by the sector-average real annual wage per worker (w_{jt}^0) and the sectoral unemployment rate (U_{jt}). To capture the firm's financial conditions, we use accounting profits, which are taken directly from the company accounts database. In the analysis, we exclude loss-making firms. All annual wages are expressed as real wages, i.e. nominal wages divided by the consumer price index with 1990 as reference year. Consumer price indexes were drawn from the Belgostat source of the NBB¹⁰. Average profits are also expressed in real terms, i.e. nominal profits divided by the producer price index. The producer price index is obtained from the Ministry of Economic Affairs¹¹. Average wages and profits are constructed by dividing annual labour costs and profits by the average number of employees in each firm for each year respectively. ε_{ijt} represents a white noise error term. We also include time dummies to capture possible unobservable aggregate shocks common to all firms in a given year (α_t). By taking the first (logarithmic) difference of Eq. (1.2), we control for individual firm effects (α_i). As a consequence, our parameter estimates are consistent even if α_i were correlated with regressors. Table 1 includes some summary statistics of the key explanatory variables for the period 1987-1995.

<Insert Table 1 about here>

¹⁰ These data can be downloaded from <http://www.nbb.be/belgostat/>.

¹¹ These data can be downloaded from <http://ecodata.mineco.fgov.be>.

3.2. Estimation Strategy

Four Approaches to Balancing Time-series and Cross-section Pooling

To exploit fully the data's panel aspect, we report results of Eq. (1.4) for four different approaches to balancing time-series and cross-sectional pooling. The first approach pools all 15 sectors over all the years. This yields one manufacturing-wide rent-sharing parameter $\left(\frac{\phi}{1-\phi}\right)$ over the period 1987-1995. The second approach pools all 15 sectors in each year, hence, stressing the time-series dimension. This gives us annual manufacturing-wide rent-sharing parameters but it restricts all sectors to share the same rent-sharing parameter. To allow some variation within manufacturing, the third and the fourth approach provide estimates of $\left(\frac{\phi}{1-\phi}\right)$ for each sector separately. The third approach gives sector-specific rent-sharing parameters for the whole period, hence, focusing on the cross-section dimension. The fourth approach allows the rent-sharing parameter to vary over time and over sector, i.e. $\left(\frac{\phi}{1-\phi}\right)$ is estimated for each sector separately year by year. These latter estimates will be used in the second-stage regression when we try to explain the determinants of the workers' relative bargaining power.

Econometric Problems

Ordinary least squares estimates of Eq. (1.4) will be biased for basically two reasons. First, our dependent variable, wages per worker, is negatively related to profits per worker by construction. Second, the estimates of $\left(\frac{\phi}{1-\phi}\right)$ will be biased if rents per worker were measured with error. Measurement error can be present since both our wage and profit variable are divided by employment (Van Reenen, 1996, among others for a discussion). In other words, performing an OLS regression on Eq. (1.4) would lead to an endogeneity bias. Therefore, we try to find appropriate instruments.

Instrumentation Strategy

The econometric problems described above show that instrumentation is a necessary strategy to obtain consistent estimates of the rent-sharing parameter. Valid instruments must reflect changes in

product market conditions inducing movements in rents per worker but they must be uncorrelated with the error term in the wage equation.

Our instrumentation strategy consists of two steps. In a first step, we use lagged levels of profits as instruments to estimate the rent-sharing parameters for the four approaches described above. For sake of comparison, we also report the OLS results. Our second step aims at introducing one of the channels through which international trade might affect bargained wages, i.e. through movements in rents. More specifically, we use instruments representing exogenous demand shocks that enter the wage equation only through the profits per worker variable.

First, inspired by Abowd and Lemieux (1993) for Canada and Abowd and Allain (1996) and Kramarz (2003) for France, we use the prices of imports and exports in the industry as a source of exogenous variation in the firm's product market conditions. The fact that Belgium is a small open economy justifies treating changes in international prices as exogenous demand shocks since international prices are determined on the world market and are hence out of reach for Belgian firms. More specifically, we construct unit value indices for Belgian imports and exports based on the OECD International Trade by Commodities database¹². Following Kramarz (2003) but in contrast to Abowd and Lemieux (1993), we use prices expressed in US dollars as exchange rates reflect, to some extent, exogenous changes. Moreover, since exchange rates fluctuate quite a lot, their effect on the Belgian economy is difficult to determine and hence we have avoided converting the international prices in terms of Belgian francs.

Second, in line with Bertrand (1999) and Budd and Slaughter (2003), sector-specific exchange rates are also used as valid instruments. The reason is that in case there is imperfect competition in certain sectors, using export and import prices could no longer be a valid strategy (see also Revenga, 1992, for a discussion). Following Kramarz (2003), we could however have used US export prices since these variables might be exogenous to the Belgian economy. However, we were not able to do this because of data limitations, as there are no reliable data available for our period under study in the OECD Trade by Commodities database¹³. Moreover, using only US export prices makes it difficult to distinguish between the impact of import versus export competition on the firms' rents. Following Budd and Slaughter (2003), we have computed trade-weighted multilateral Belgian exchange rates for each sector and each year where we also weigh bilateral exchange rates with import shares¹⁴.

Since the international prices and the exchange rates are defined at the sectoral level, they cannot be used as instruments when estimating sector-specific rent-sharing parameters, as there is no cross-sectional variation in that case. Therefore, we only report the results at the most aggregated level, i.e. pooled over sectors and over years. Using the export and the import prices at the one hand and the sector-specific exchange rates at the other hand as instruments in our regression equations also

¹² The base year is 1990. Using this database to construct unit values as a proxy for import and export prices is frequently done in the literature (see e.g. Brenton and Pinna, 2000, among others).

¹³ Kramarz (2003) however uses the same OECD dataset but uses a different time period.

¹⁴ We only took the trade flows of those countries for which their share in the Belgian imports exceeds 2 percent.

serves as a consistency check for our estimations where we use the lags of the profit variable as instruments.

3.3. Empirical Results

In this section, we report the empirical results of the four approaches.

First Approach: Pooling over Sectors and over Years

In this section, we provide manufacturing-wide estimates of the rent-sharing parameter over the period 1991-1995. The first part of Table 2 presents the Ordinary Least Squares estimates of Eq. (1.4). Controlling for year-, sector- and firm-level effects, the estimated wages-profits elasticity amounts to 0.09 and is strongly significant. This point estimate is somewhat higher than the one of Goos and Konings (2001) who find an elasticity of 0.06. This point estimate also clearly shows that symmetric Nash bargaining, in case we would have a coefficient of the relative bargaining power equal to one, could easily be rejected.

<Insert Table 2 about here>

However, as discussed above, OLS estimates are likely to be affected by endogeneity biases. Therefore, we test the endogeneity of profits per worker in two ways. First, we use the Durbin-Wu-Hausman test. From Table 2, this test indicates that the OLS specification is rejected. Second, as suggested by Davidson and MacKinnon (1993), we perform an augmented regression test. More specifically, we regress the endogenous variable (profits per worker) on the set of instruments and the exogenous variables in the wage equation. We recuperate the residual of this regression and augment the wage equation with this residual. The exogeneity test amounts to testing whether the coefficient of the residual equals zero in the wage equation. In line with the Durbin-Hausman-Wu test, this augmented regression test indicates that OLS is not consistent¹⁵.

In the second column of Table 2, we use the 2-period and the 4-period lagged value of profits per worker as instruments. The exogeneity of the instruments with respect to the error term is tested by the Hansen-Sargan test statistic, which is distributed as chi-squared. The specification test does not show evidence against our estimates: the Hansen-Sargan test does not reject the null hypothesis that our instruments are valid. Taking into account endogeneity, we find a wages-profit elasticity of 0.06. From the OLS as well as the TSLS estimates, outside forces do not seem to play an important role in the wage determination process.

To check the robustness of the results, we now present the two consistency checks, which also capture the effect of international trade on bargained wages through shifts in the size of the rents. The

¹⁵ Results not reported but available upon request.

third column of Table 2 reports the results) using the exchange rates from period t until period $(t-5)$ as instruments. The point estimate of the average manufacturing-wide wages-profits elasticity is 0.09. Again, we cannot reject the null hypothesis that the overidentifying restrictions are correct. The fourth column of Table 2 reports the estimate of the rent-sharing parameter using international prices as instruments. Before discussing the results, we first test whether these foreign competition shocks present pure demand shocks. We follow Abowd and Lemieux (1993) and Kramarz (2003) and compare least squares estimates of supply equations (quantities as a function of prices) to instrumental variables estimates of the same supply equation in which the output price is instrumented with the price of imports and the price of exports. Least squares estimates of the elasticity of supply with respect to the output price could be either negative or positive, depending on the variance of demand and supply shocks and on demand and supply elasticities (see Abowd and Lemieux, 1993). Once these output prices are instrumented using international prices, however, the elasticity should become positive if international prices are exogenous demand shocks that trace down the supply curve. In the first column of Table 3, we estimate the relation between firm-level real sales and sector-level value-added prices, sector-level wages and a time trend in the cross-section dimension. In the second column, we control for firm-level fixed effects. In the third column, we instrument value-added prices using 4-period lagged import and export prices. The estimated supply elasticity using the OLS and the fixed-effects estimation methods is negative and statistically significant, reflecting that supply shocks dominate demand shocks. On the other hand, the IV estimate points to positive and significant supply elasticity. The elasticity is equal to 0.543, which is slightly above the one estimated by Abowd and Lemieux (1993) and very well in line with the one estimated by Kramarz (2003). The Hansen-Sargan test does not reject the joint validity of the instruments. Our findings are hence consistent with the fact that international prices represent exogenous demand shocks that increase product market competition in Belgium.

<Insert Table 3 about here>

Before turning to the IV estimates of the rent-sharing parameter using international prices as instruments, we present the reduced-form equations for bargained wages and profits per worker in Table 4. All the estimated specifications are in first-differences and all variables are expressed as natural logarithms. They all include the price of imports and exports, the sector-average wage and the sector unemployment rate as explanatory variables. The specifications in columns (1) and (3) also include a time trend. As expected, the price of exports has a positive and statistically significant effect on real wages per worker and real profits per worker in all specifications. This means that increased foreign competition in the form of lower export prices reduces both wages per worker and profits per worker. The estimated effect on rents per worker is larger than the estimated effect on wages per worker, implying that workers do not capture all the rents created by changes in the price of exports. A

rather unexpected result is that the price of imports affects both wages per worker and profits per worker significantly negatively.

<Insert Table 4 about here>

From the last column of Table 3, it follows that the estimated wages-profits elasticity is considerably higher using international prices as instruments than the ones using lagged profit values and exchange rates as instruments. The point estimate is about 0.17.

Second Approach: Pooling over Sectors per Year

Table 5 reports manufacturing-wide rent-sharing parameters for the years 1991 until 1995. We present both the OLS and the TSLS estimates using lagged values of profits per worker as instruments. For all years, the Hansen-Sargan Test does not reject the joint validity of the instruments. For the years 1991, 1992 and 1993, the TSLS estimate is considerably larger than the OLS estimate while the opposite is true for the years 1994 and 1995. Focusing on the TSLS estimates, we can conclude that the manufacturing-wide wages-profits elasticity is highly stable over time and amounts to 0.12 on average.

<Insert Table 5 about here>

Third Approach: Pooling over Years per Sector

So far, we restricted all sectors to share the same rent-sharing parameter. To address the important issue of heterogeneity in workers' (relative) bargaining power across sectors, we now split up the manufacturing industry into 15 sectors. An overview of the different sectors is given in Table A.1 of Appendix A. The sectoral classification is based on the availability of the sectoral classification of the variables used in the second stage and the availability of the number of firms within each of these sectors. Table 6 reports rent-sharing estimates for each of the 15 sectors over the whole period. As the Durbin-Wu-Hausman test does not reject the OLS estimates in favour of the TSLS estimates, we only report the OLS estimates in Table 6. All estimated wages-profits elasticities are highly significant and range from 0.04 (sector 5, which stands for the printing and allied industries) to 0.27 (sector 14, representing the industry of other transport equipment). The results point to considerable variation in rent-sharing behaviour within the manufacturing industry. Moreover, we performed F-tests to investigate whether the rent-sharing parameters differ across sectors. The results reject the poolability across the different sectors.

<Insert Table 6 about here>

Fourth Approach: Per Sector, per Year

In the fourth approach, we allow the workers' (relative) bargaining power to vary over time and over sector. In Table 7, we present both the OLS and the TSLS estimates for each sector separately year by year. Focusing on the OLS estimates, we find that 85% of the estimated wages-profits elasticities are statistically significant at the 1% level. As far as the TSLS estimates are concerned, the results show that 65% of the estimates are statistically significant at the 1% level, 8% at the 5% level and 24% are not significant. For almost all specifications, we find that the TSLS point estimates exceed the OLS point estimates. It is also clear that the wages-profits elasticities vary considerably over time and over sector. For 10 out of the 15 sectors, our results show that the estimated rent-sharing parameter is higher in 1995 compared to 1991. Focusing on the TSLS estimates, the mean of the estimated wages-profits elasticities amounts to 0.11 and the standard deviation to 0.06. All sector-specific elasticities vary between 0.01 and 0.09.

<Insert Table 7 about here>

4. STAGE-TWO REGRESSIONS: DETERMINING THE WORKERS' (RELATIVE) BARGAINING POWER

4.1 Specification and Data Description

The empirical methodology for the stage-two regressions borrows from Slaughter (2001) who investigates the impact of international trade on labour demand elasticities following a two-stage approach. As pointed out by Svejnar (1986), no literature exists on an appropriate functional form of the determinants of the workers' relative bargaining power. In other words, we could not estimate one or more structural equations based on a general equilibrium model. Therefore, we estimate a reduced-form equation of estimated workers' relative bargaining power parameters $\left(\frac{\square\phi}{1-\phi}\right)$ on several explanatory variables derived from an implicit structural model. More specifically, we use the following reduced-form regression:

$$\frac{\square\phi_{jt}}{1-\phi_{jt}} = X_{jtk+1}\beta_{k+1} + \lambda_j + \lambda_t + \zeta_{jt} \quad (1.5)$$

With $\left(\frac{\square\phi_{jt}}{1-\phi_{jt}}\right)$ a set of estimated rent-sharing parameters obtained from the first-stage regressions with subscripts j and t denoting sector and year respectively. X_{jkt+1} refers to a vector of explanatory variables that vary by sector-year, with K the total number of explanatory variables. λ_j refers to a sector-specific dummy for sector j , λ_t to a time dummy for year t and ζ_{jt} represent the error term. The sector dummies capture variables that are sector-specific and time-invariant such as differences in job type and the type of product in a certain industry, differences in unions' utility functions as some unions might care relatively more about employment than about wages, union density, the firms' holdings of inventories, the capital utilisation rate, etc. (see e.g. McDonald and Suen, 1992; Smith, 1996 and Doiron, 1992 for a further discussion on these issues). The time dummies control for factors that change workers' relative bargaining power over time such as e.g. changes in the consumer price index, the national unemployment rate, taxes, interest rates, etc. (see e.g. Svejnar, 1986 and Doiron, 1992 for a discussion).

Table 8 provides summary statistics for our explanatory variables. These variables are constructed such that they match the sectoral classification of the fourth approach of the first-stage analysis. Table A.1 in Appendix A gives an overview of the sectoral classification used to determine the workers' relative bargaining power per sector each year. More specifically, we have five variables related to international trade, three variables related to foreign direct investment, three technology variables and three control variables. Some of these variables have been used in earlier studies on the determinants of workers' bargaining power (see e.g. Veugelers, 1989 and Svejnar, 1986). The international trade and foreign direct investment variables, however, have not been related directly to workers' bargaining power before. As argued before, we further analyse this issue and introduce a richer specification such that we are able to investigate whether globalisation has an effect on the workers' relative bargaining power. In what follows, we describe the explanatory variables of Eq. (1.5) together with their expected effect on the workers' relative bargaining power. This effect is also shown in the last column of Table 8.

<Insert Table 8 about here>

- **Trade variable 1:** the ratio of imports to production. We expect that the higher this measure is in a certain sector, the lower the workers' bargaining power will be because increased import

competition leads to less favourable labour market conditions or firms' profit conditions such that workers might end up with a smaller share of the rents.

- **Trade variable 2:** the ratio of exports to production. In the case of export expansion, the opposite result hold: workers are expected to be able to extract a larger share of the rents in sectors with a strong export performance.
- **Trade variable 3:** narrow outsourcing divided by production. Feenstra and Hanson (1999) refer to narrow outsourcing as outsourcing within the same industry as the importer. We expect this variable to have a negative effect on the workers' bargaining power. Like a lot of other OECD countries, Belgium is confronted with quite a lot of outsourcing, mostly of standardised products. As pointed out by a survey of the Federal Planning Office (2000), lower labour costs in the host country are the main motive for outsourcing. A priori, we however expect that outsourcing is accompanied with less favourable labour market conditions for Belgian employees as outsourcing will induce wage restraints. Consequently, workers' relative bargaining power is expected to be lower.
- **Trade variable 4:** broad outsourcing divided by production. In contrast to narrow outsourcing, this measure also includes intermediate imports coming from other sectors. The expected effect of this variable on the workers' bargaining power is the same as for the narrow outsourcing variable.
- **Trade variable 5** refers to tariffs. As discussed in Budd and Slaughter (2003), tariffs are able to shield domestic markets from foreign competition. More specifically, we expect a positive link between tariffs and the workers' relative bargaining power as they feel more eager to press for a larger share of the 'pie'.
- **Foreign direct investment variable 1:** the number of foreign-owned firms relative to the total number of firms. We have experimented with several variables related to inward foreign direct investment¹⁶. The effect on the workers' relative bargaining power is expected to be negative. In a related context, Budd and Slaughter (2003) and Dobbelaere (2003) investigate whether rent-sharing is dependent on the firm's ownership structure. The empirical results of the former reveal that rent-sharing is not higher in multinational enterprises. They argue that this result stems from additional complexities of multinational ownership and that parent companies might feel competitive pressure when Canadian industry profits are high. These companies may respond by restraining wages. In other words, labour cost considerations might play a role such that firms are more aggressive during wage negotiations since they want to resist to wage increases. An alternative explanation for the finding that rent-sharing is less pronounced in multinational firms is given by the footloose nature of multinationals firms. The idea is that multinationals can shift their production partly or entirely to another country

¹⁶ Because of data availability, we are not able to test for the effect of outward foreign direct investment on the workers' relative bargaining power. As pointed out by Slaughter (2001), this measure can be used as an alternative proxy for outsourcing.

in case the present circumstances are unfavourable (Caves, 1996). Focusing on Bulgaria, Dobbelaere (2003) finds that rent-sharing is far less pronounced in foreign firms compared to state-owned firms. The author points to the high value-added profile of foreign firms and their footloose nature as potential explanations.

The footloose nature of multinational companies is further documented by Bernard and Jensen (2002) for the US, Fabbri et al. (2002) for the UK and Gorg and Strobl (2003) for Ireland. These authors basically find that multinational companies are more likely to shut down operations compared to domestic firms or non-multinationals. The resulting atmosphere of uncertainty may prevent workers from translating productivity gains into wage increases. In this context, Schreve and Slaughter (2002) investigate whether foreign direct investment has an effect on the workers' feeling of insecurity. On the one hand, multinational presence can increase the workers' economic insecurity by raising the volatility of wages and employment. On the other hand, the authors argue that workers in foreign-owned firms might get compensated more because they are facing a higher risk of plant shut down. Therefore, the impact of foreign direct investment on the workers' economic insecurity is unclear. When the authors test their hypothesis, foreign direct investment is found to increase the workers' perception of economic insecurity measured as a person's stress/anxiety about one's economic misfortune.

While direct evidence of the footloose nature of multinationals in the Belgian economy is lacking, De Backer and Sleuwaegen (2003) find that inward foreign direct investment discourages entry and stimulates exit of Belgian domestic entrepreneurs. However, this crowding-out effect might be moderated or even reversed in the long term because of learning, demonstration, networking and linkage effects between foreign and domestic firms. Therefore, these results might add to the workers' feeling of insecurity and hence influence their bargaining power.

- **Foreign direct investment variable 2 (and 3)** refers to the employment (value added) of foreign-owned firms relative to the total employment (value added). The expected effect on the workers' bargaining power is the same as that for the first foreign direct investment variable.
- **Technology variable 1:** Research and Development (R&D) divided by production, used as a measure for innovative input. It is often argued that technological change, instead of international trade, lies at the basis of changes in the labour market (see e.g. Berman et al., 1994 and Krugman and Lawrence, 1996). The effect of technological change on the workers' bargaining power is ex-ante unclear. As discussed in Betcherman (1991), technological change can have an effect on the distribution of the 'pie' between employers and employees

by affecting the nature of the production process¹⁷. First, Betcherman (1991) argues that workers will have more bargaining power in case labour costs do not constitute a large part of the firm's total costs. The reason is that when labour costs are less important, an increase in the price of labour will not induce a large increase in the production price and hence will not exert a strongly negative effect on the firm's product demand. The author states that the impact of technological change on the importance of labour costs is a priori unclear and depends on the type of technological change. Second, he points out that the workers' essentiality in terms of their indispensability in the production process, is another channel through which the impact of technological change on the workers' bargaining power can be explained. When employees are essential to production, they have strong bargaining power during wage negotiations. The essentiality of workers in the production process depends on how critical their skills and their knowledge are and how costly a strike would be for the firm. Technological change can affect the workers' essentiality although the direction of the effect is again not clear. On the one hand, technological change can be labour-augmenting in the sense that the introduction of new production processes and technologies might necessitate more labour input. On the other hand, technological change can also be labour-saving when investment in new technology requires less labour input. The latter mechanism could be very important in Europe in general and Belgium in particular where high labour costs prevail (Abraham and Verret, 1996). The empirical results of Betcherman (1991) reveal that the bargaining strength of blue-collar workers is lower in firms which introduced process computerisation¹⁸. Skilled workers also lose bargaining power but general manual occupations strengthen their bargaining position in case of process computerisation.

- **Technology variable 2:** patents divided by production. This measure is also related to innovative output. The expected effect of this variable on the workers' relative bargaining power equals the one of the first technology variable.
- **Technology variable 3:** the percentage change in Total Factor Productivity (TFP), used as a measure of technological change. Again, we expect a priori the same effect on the workers' relative bargaining power like for technology variables 1 and 2.
- **Control variable 1:** the unemployment rate. This variable has also been used by other authors investigating the determinants of workers' bargaining power (see among others, McDonald and Suen, 1992, Svejnar, 1986 and Veugelers, 1989). As already discussed in Section 2.2, we expect a negative coefficient for this variable.
- **Control variable 2:** the C5-concentration ratio, representing the sales of the top 5 firms divided by the total sales. A higher C5-concentration ratio is consistent with less fierce product market competition. As discussed in Veugelers (1989), higher output market

¹⁷ These authors however proxy the workers' bargaining power by the union/non-union wage differential. Moreover, they use a story of shifts in labour demand elasticities to explain the effect of technological change on the workers' bargaining power.

concentration enables non-competitive pricing behaviour. Therefore, producers are less sensitive to wage increase since they can shift cost increases to consumers. In other words, a higher C5-concentration ratio is expected to exert a positive impact on the workers' bargaining power. However, Veugelers (1989) also argues that more market power in the product market could also be transferred to power positions in the input market such that the workers' bargaining power would be eroded. Therefore, the effect of the C5-concentration ratio on the workers' bargaining power can be in both directions and depends on which of the two mechanisms prevail.

- **Control variable 3:** the capacity utilisation ratio. This variable captures the general state of the economy. A higher capacity utilisation ratio reflects a better economic situation and hence should allow workers to press for higher wages. We therefore expect a positive coefficient for this variable.

4.2 Estimation strategy

As indicated earlier, our estimation strategy closely follows the empirical methodology of Slaughter (2001) who investigates the effect of international trade on labour demand elasticities. While other authors investigating the determinants of the union's (relative) bargaining power have estimated one single equation (see Doiron, 1992, Svejnar, 1986 and Veugelers, 1989, among others), we preferred to estimate Eq. (1.5) where we use each of the 14 explanatory variables separately. As pointed above, this is because there is no formal theory explaining the workers' relative bargaining power. In what follows, we discuss three important issues regarding our estimation strategy.

The first issue deals with the exogeneity of the regressors. Variables related to outsourcing and technology are endogenously determined input variables. As documented in other work (see e.g. Abowd and Lemieux, 1993), import and export quantities are -in contrast to export and import prices in a small open economy- not fully exogenous since they depend on domestic demand and supply conditions. Regarding the trade variables, we expect our tariff measure to be the most exogenous variable (see also Haskel and Slaughter, 2002 for a discussion). As a consistency check, we have used lags of the trade and technology variables instead of their contemporaneous values¹⁹. The results indicate that when the fixed effects and the fixed effects together with the time dummies are used, some variables are no longer statistically significant.

The second issue handles the fact that the dependent variable in Eq. (1.5) is estimated in the first stage. Therefore, the error term in this equation is heteroskedastic with zero mean and variance equal

¹⁸ In contrast to their analysis, we are not able to make a distinction between blue- and white-collar workers.

¹⁹ It was not possible to use the lags of the outsourcing variables as we don't have enough observations through time.

to the variance of the error term of the first-stage regression plus the variance of the estimated relative bargaining power of the workers $\left(\frac{\hat{\phi}}{1-\hat{\phi}}\right)$. Following Anderson (1993) and Slaughter (2001), we correct for this form of heteroskedasticity by weighing less heavily those observations for which the variance of the relative bargaining power is larger. More specifically, we perform an Ordinary Least Squares (OLS) regression on Eq. (1.5) from which we take the squared residuals. Subsequently, we regress these squared residuals on the variance of the relative bargaining power coefficients, together with these variances squared and cubed. Finally, we use the inverse of the predicted values of this regression as weights in a weighted least squares of Eq. (1.5).

The last issue is related to the fact that there is no real theoretical model predicting which variables to use in a regression equation explaining the workers' relative bargaining power. As a robustness check, we estimate Eq. (1.5) using several combinations of the independent variables. More specifically, we combine one trade variable or one foreign direct investment variable with one technology variable and one control variable. In general, our results are fairly robust to the use of different combinations²⁰. Moreover, we have also experimented with several combinations of the industry and time dummies and have tried four different combinations like in Slaughter (2001) who performs regressions with no controls, only industry dummies, only time dummies and a combination of both.

4.3 Empirical results

Table 9 reports the regression results of Eq. (1.5), using one single independent variable each time. In general, the regression results of this table reveal that -except for the control variables- the expected sign of the regression coefficients is obtained. However, in a number of cases, these regression coefficients are not always statistically significant as their significance depends on the inclusion of the industry and time fixed effects.

< Insert Table 9 here >

As far as the international trade variables are concerned, we find some evidence of international trade having an impact on the workers' relative bargaining power. In our estimations without controls, the export/production and the tariff variables have t-values exceeding one and the latter variable is even significant at the 1% level. Sectors characterised by strong export performance enable workers to cream off a larger share of the rents. The same is true in sectors where higher tariffs

²⁰ The results are available from the authors upon request.

apply which shield them from international competition. The regression coefficient of the imports/production variable shows the expected sign but is not statistically significant.

In the regressions with only the industry fixed effects, the import/production variable has now a statistically significant regression coefficient meaning that in those sectors with higher import competition the share of rents going to workers is squeezed. The variable for the import tariffs remains statistically significant and has the expected sign. If industry fixed effects are used, we are in fact concentrating on the intra-sectoral rather than on the inter-sectoral variation of the variables. In other words, the focus is on how the workers' relative bargaining power moves over time within each sector rather than on how the relative bargaining power moves over the different sectors.

When all controls are introduced, both the tariffs and the import variable stay statistically significant and have the correct sign. Moreover, our export variable becomes statistically significant, implying that workers are able to push for higher wages in firms that are exporting a lot.

In the regressions with only the time fixed effects, all trade variables lose their statistical significance. One explanation is that there is not much inter-sectoral variation over time of the independent variables such that the time fixed effects pick up a lot of the variation in the relative bargaining power parameters. Following Slaughter (2001), who also obtains this empirical result in his paper on the determinants of the labour demand elasticities, we have used plots by each sector of each independent variable against time to see whether these trade variables possess enough inter-sectoral variation over time. Inspection of the data shows that the import/production variable has increased in nearly all sectors, while the export/production variable has remained rather stable for most sectors. In order to test further whether our relative bargaining power parameters are driven by time, we have introduced a time trend in our regressions but we have not found a statistically significant effect for this variable. This result is also consistent with our finding of Section 3, which presented not much time variation in our estimations of the rent-sharing parameter. Table 9 also reveals that our outsourcing variables are never statistically significant.

Regarding the inward foreign direct investment variables, our results show that workers have lower relative bargaining power in those sectors with a lot of foreign-owned firms relative to the total number of firms. Before, we have put forward several explanations for this result. First, Budd and Slaughter (2003) have pointed out that this result could be consistent with the complex nature of multinational firms in the sense that parent companies might feel competitive pressure when affiliate profits are high and hence try to restrain wages. Second, the footloose nature of firms might induce workers to bargain for lower wages. Third, workers of incumbent firms could also feel less secure as inward foreign direct investment might crowd out domestic entrepreneurship and hence create a less favourable bargaining environment.

Strong statistically significant results emerge from our technology variables, especially for our variable of innovative input (R&D divided by output). In those sectors with more technological change, workers are more eager to press for higher wages as these workers might be essential in production and/or labour costs might become less important because of technological change. Statistically significant positive effects are also obtained for the TFP-variable but the regression coefficient of the variable for innovative output, patents divided by production, are negative.

We do not obtain the expected sign for the regression coefficients of our control variables. The regression coefficient for the unemployment (capacity utilisation) variable shows in some cases a positive (negative) statistically significant sign. This positive coefficient for the unemployment variable is consistent with the empirical results of other empirical work for Belgium (see e.g. Abraham and De Bruyne, 2000) who find that higher unemployment has not led to wage moderation²¹.

5. CONCLUSION

In this paper, we have investigated whether international trade has affected workers' wages and their bargaining power in particular in the Belgian manufacturing industry by using a rent-sharing framework. In the first part of our analysis, we have studied whether international trade affects wages through changes in the firms' rents. Similar to other papers considering rent-sharing in the Belgian economy, we find a positive relation between workers' wages and the firms' profits. Moreover, our regression result reveal that increased foreign competition in the form of lower export prices reduces both wages per worker and profits per worker. The estimated effect on rents per worker is larger than the estimated effect on wages per worker, implying that workers do not capture all the rents created by changes in the price of exports. A rather unexpected result is that the price of imports affects both wages per worker and profits per worker significantly negatively.

In the second part of our paper, we have studied whether globalisation has affected workers' bargaining power. As one of the first, Rodrik (1997) has pointed out that increased globalisation has eroded workers' bargaining power. Budd and Slaughter (2003) have further investigated this issue and have found that the effect of domestic profits on the workers' wages depends on variables related to foreign direct investment and tariffs. We have further explored the link between globalisation and the relative bargaining power by also introducing measures related to import and export competition, outsourcing, tariffs and foreign direct investment. Although technological change seems to exert an important effect on the workers' relative bargaining power, we have found that globalisation also matters. More specifically, import and export competition and tariffs seem to have the expected effect

²¹ This finding is consistent with results of other European studies pointing to a weak effect of unemployment on wages (see e.g. Eichengreen, 1993 and Layard et al., 1991).

on the workers' bargaining power for some of our regression specifications. Regarding inward foreign direct investment, we have found that more foreign-owned firms in a sector reduces the workers' bargaining power. This result is consistent with the results of Budd and Slaughter (2003). We have put forward several explanations such as the footloose nature of multinational companies and the crowding-out of domestic entrepreneurship.

This work leaves several paths open for future research. First, we considered the case of a typical European unionised country. Although rent-sharing is not only present in unionised countries (see Nickell, 1999 for a discussion), it could be interesting to see whether increased globalisation has affected workers' bargaining power in a non-unionised country such as the US. As documented by Baldwin (2003), unions have become less important in the US during the last decennia. Second, we did not distinguish between skilled and unskilled workers. As widely documented in the trade-wages literature, international trade and technological change have a different impact on skilled versus unskilled workers. A follow-up paper is forthcoming addressing these issues and investigating the impact of globalisation on workers' bargaining power for the US.

Table 1 First-Stage Regression: Summary Statistics.

VARIABLES	1987-1995		
	# Obs.	Sample Mean (x 100 000 BEF)	Sample Std. Dev.
Firm-average Real Wage per Worker	109 208	9.859	6.952
Firm-average Real Profits per Worker	108 153	4.242	20.247
Sector Unemployment Rate (%)	122 174	15.345	6.012
Sector-average Real Wage per Worker	123 421	8.722	0.963

Source: National Bank of Belgium (NBB).

Table 2 Wage Equation, 1991-1995.

First Approach: Pooling over Sectors and over Years .

ESTIMATION METHOD	OLS	TSLS ^a	TSLS ^b	TSLS ^c
Constant	0.031*** (0.003)	0.036*** (0.006)	0.026*** (0.005)	0.023*** (0.006)
Profits per Worker	0.095*** (0.005)	0.063* (0.036)	0.090* (0.051)	0.171* (0.092)
Sectoral Unempl.	-0.015 (0.018)	0.007 (0.035)	-0.016 (0.021)	-0.009 (0.023)
Sectoral av. Wage	0.159 (0.118)	0.080 (0.161)	0.159 (0.120)	0.153 (0.118)
Year dummies	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes
Durbin-Wu-Hausman Test (p-value)	0.0025			
Hansen-Sargan IV Test (p-value)		0.154	0.290	0.079
# Obs.	73 361	26 025	73 351	73 351
R ²	0.077	0.112	0.077	0.035

*** Significant at 1%; ** Significant at 5%; * Significant at 10%. Robust standard errors in parentheses.

The dependent variable is the firm-average real wage per worker. All variables are expressed as natural logarithms and are first-differenced. The instruments are in levels.

Durbin-Wu-Hausman Test: test of endogeneity of real profits per worker.

Hansen-Sargan Instrument Validity Test: tests of correlation among instruments and residuals, asymptotically distributed as χ^2_{df} .a: instruments: profits per worker $t-2$, profits per worker $t-4$.b: instruments: exchange rates $t, t-1, t-2, t-3, t-4, t-5$.c: instruments: export prices t , import prices t .

Table 3 Supply Equation, 1987-1995.

ESTIMATION METHOD	OLS	Firm Fixed Effects	TSLS ^a
Constant	19.386 ^{***} (6.481)	-48.951 ^{***} (1.705)	19.483 ^{***} (1.492)
Price of Value Added	-0.571 ^{***} (0.103)	-0.126 ^{***} (0.028)	0.543 ^{***} (0.205)
Sectoral av. Wage	2.775 ^{***} (0.075)	0.200 [*] (0.120)	0.351 ^{**} (0.164)
Time Trend	-0.010 ^{***} (0.003)	0.027 ^{***} (0.001)	-0.010 ^{***} (0.001)
# Obs.	71 594	71 594	45 390
R^2	0.022	0.026	.
Hansen-Sargan IV Test (p-value)	0.022	0.026	0.103

*** Significant at 1%; ** Significant at 5%; * Significant at 10%. Robust standard errors in parentheses.

The dependent variable is firm-level real sales. The prices and wages are measured at the industry level. All variables and instruments are expressed as natural logarithms. The price of value added and the wage are deflated by the CPI (1990=100), while sales are deflated by the producer price.

A full stop in the R^2 box indicates that the calculated R^2 was negative and hence is not reported.

a: instruments: import prices_{t-4}, export prices_{t-4}.

Table 4 OLS Estimates of the Reduced Forms for Wages and Profits per Worker, 1987-1995.

DEPENDENT VARIABLE	Firm-average Real Wage per Worker		Firm-av. Real Profits per Worker	
Constant	12.747 ^{***} (1.404)	0.007 ^{***} (0.002)	-0.763 (4.056)	-0.049 ^{***} (0.004)
Sectoral Unempl.	-0.039 ^{***} (0.013)	-0.043 ^{***} (0.015)	-0.125 ^{***} (0.040)	-0.122 ^{***} (0.037)
Sectoral av. Wage	0.123 (0.128)	0.118 (0.128)	-0.054 (0.370)	-0.048 [*] (0.368)
Import Price	-0.026 ^{***} (0.003)	-0.015 ^{***} (0.004)	-0.040 ^{***} (0.015)	-0.039 ^{***} (0.014)
Export Price	0.021 ^{***} (0.003)	0.019 ^{***} (0.004)	0.035 ^{***} (0.013)	0.034 ^{***} (0.012)
Time Trend	-0.006 ^{***} (0.001)		0.0004 (0.002)	
# Obs.	73 351	73 351	73 383	73 383
R^2	0.003	0.002	0.0003	0.0003

*** Significant at 1%; ** Significant at 5%; * Significant at 10%. Robust standard errors in parentheses.

The dependent variables are the firm-average real wage per worker and the firm-average real profits per worker. All variables are expressed as natural logarithms and are first-differenced.

Table 5 Wage Equation.

Second Approach: Pooling over Sectors, by Year.

ESTIMATION METHOD	OLS	TSLS ^a
1991		
Profits per Worker	0.068 ^{***} (0.004)	0.120 ^{***} (0.007)
Hansen-Sargan IV Test (p-value)		0.674
# Obs.	12 218	5 957
1992		
Profits per Worker	0.062 ^{***} (0.004)	0.124 ^{***} (0.009)
Hansen-Sargan IV Test (p-value)		0.872
# Obs.	12 627	6 053
1993		
Profits per Worker	0.081 ^{***} (0.006)	0.131 ^{***} (0.009)
Hansen-Sargan IV Test (p-value)		0.182
# Obs.	12 626	5 946
1994		
Profits per Worker	0.271 ^{***} (0.013)	0.102 ^{***} (0.014)
Hansen-Sargan IV Test (p-value)		0.806
# Obs.	12 719	5 958
1995		
Profits per Worker	0.282 ^{***} (0.013)	0.133 ^{***} (0.014)
Hansen-Sargan IV Test (p-value)		0.245
# Obs.	12 715	6 163

*** Significant at 1%; ** Significant at 5%; * Significant at 10%. Robust standard errors in parentheses.

The dependent variable is the firm-average real wage per worker. All variables are expressed as natural logarithms.

Hansen-Sargan Instrument Validity Test: tests of correlation among instruments and residuals,

asymptotically distributed as χ^2_{df} .

a: instruments: profits per worker_{t-3}, profits per worker_{t-4}.

Table 6 Wage Equation.

Third Approach: Pooling over Years, by Sector.

	Code NACE-70	Name	Wage-profits Elasticity (OLS)
Sec 1	41+42	Food, beverages and tobacco	0.104 ^{***} (0.003)
Sec 2	43	Textiles	0.090 ^{***} (0.005)
Sec 3	44+45	Wearing apparel and leather and products	0.083 ^{***} (0.004)
Sec 4	46	Wood products and furniture and fixtures	0.059 ^{***} (0.004)
Sec 5	471+472	Manufacture of pulp, paper and board	0.039 ^{***} (0.009)
Sec 6	473+474	Printing and allied industries	0.050 ^{***} (0.004)
Sec 7	25+26	Chemical industry and man-made fibres	0.122 ^{***} (0.008)
Sec 8	48	Rubber and plastic products	0.060 ^{***} (0.006)
Sec 9	24	Non-metallic mineral products	0.086 ^{***} (0.005)
Sec 10	22	Basic metal industries	0.072 ^{***} (0.023)
Sec 11	31	Metal products	0.214 ^{**} (0.011)
Sec 12	32	Non-electrical machinery	0.234 ^{***} (0.021)
Sec 13	33+34+37	Office and computing machinery, electrical machinery and professional goods	0.236 ^{***} (0.017)
Sec 14	35+36	Other transport equipment	0.268 ^{***} (0.027)
Sec 15	49	Other manufacturing	0.078 ^{***} (0.006)

*** Significant at 1%; ** Significant at 5%; * Significant at 10%. Robust standard errors in parentheses. The dependent variable is the firm-average real wage per worker. All variables are expressed as natural logarithms and are first-differenced.

Table 7 Wage Equation.

Fourth Approach: Per Sector, by Year.

Sector	Year	Wage-profits Elasticity (OLS)	Wage-profits Elasticity (TSLS)
Sec1	1991	0.107*** (0.010)	0.151*** (0.018)
	1992	0.092*** (0.009)	0.154*** (0.020)
	1993	0.099*** (0.010)	0.131*** (0.018)
	1994	0.115*** (0.010)	0.148*** (0.016)
	1995	0.108*** (0.008)	0.182*** (0.016)
Sec2	1991	0.088*** (0.013)	0.128*** (0.020)
	1992	0.076*** (0.013)	0.118*** (0.023)
	1993	0.069*** (0.013)	0.136*** (0.025)
	1994	0.090*** (0.015)	0.119*** (0.027)
	1995	0.103*** (0.016)	0.145*** (0.030)
Sec3	1991	0.073*** (0.012)	0.118*** (0.023)
	1992	0.073*** (0.011)	0.115*** (0.022)
	1993	0.072*** (0.012)	0.109*** (0.025)
	1994	0.073*** (0.014)	0.116*** (0.024)
	1995	0.083*** (0.012)	0.111*** (0.026)
Sec4	1991	0.053*** (0.013)	0.081*** (0.021)
	1992	0.027*** (0.012)	0.125*** (0.022)
	1993	0.043*** (0.013)	0.112*** (0.023)
	1994	0.073*** (0.012)	0.103*** (0.023)
	1995	0.066*** (0.014)	0.076*** (0.021)
Sec5	1991	0.075*** (0.025)	0.035 (0.049)
	1992	0.076*** (0.027)	0.073 (0.056)
	1993	0.064** (0.034)	0.043 (0.031)
	1994	0.021 (0.025)	0.063** (0.031)
	1995	0.049** (0.024)	0.127*** (0.036)
Sec6	1991	0.041*** (0.013)	0.063 (0.023)

	1992	0.031 ^{***} (0.012)	0.051 ^{**} (0.027)
	1993	0.050 ^{***} (0.012)	0.075 ^{***} (0.029)
	1994	0.050 ^{***} (0.011)	0.099 ^{***} (0.024)
	1995	0.035 ^{***} (0.011)	0.111 ^{***} (0.023)
Sec7	1991	0.125 ^{***} (0.021)	0.192 ^{***} (0.035)
	1992	0.130 ^{***} (0.022)	0.292 ^{***} (0.051)
	1993	0.121 ^{***} (0.022)	0.262 ^{***} (0.051)
	1994	0.111 ^{***} (0.019)	0.203 ^{***} (0.039)
	1995	0.137 ^{***} (0.022)	0.201 ^{***} (0.034)
Sec8	1991	0.064 ^{***} (0.016)	0.055 ^{**} (0.030)
	1992	0.033 [*] (0.020)	0.056 (0.040)
	1993	0.072 ^{***} (0.019)	0.061 [*] (0.035)
	1994	0.051 ^{***} (0.014)	0.084 ^{***} (0.029)
	1995	0.102 ^{***} (0.019)	0.135 ^{***} (0.034)
Sec9	1991	0.082 ^{***} (0.014)	0.164 ^{***} (0.030)
	1992	0.062 ^{***} (0.014)	0.163 ^{***} (0.029)
	1993	0.101 ^{***} (0.015)	0.090 ^{***} (0.025)
	1994	0.091 ^{***} (0.012)	0.070 ^{***} (0.026)
	1995	0.081 ^{***} (0.014)	0.091 ^{***} (0.026)
Sec10	1991	0.004 (0.044)	0.062 (0.074)
	1992	0.004 (0.058)	0.085 (0.075)
	1993	0.112 [*] (0.062)	0.221 (0.116)
	1994	0.161 ^{***} (0.043)	0.112 (0.157)
	1995	0.171 ^{***} (0.041)	0.199 (0.165)
Sec11	1991	0.043 ^{***} (0.009)	0.087 ^{***} (0.016)
	1992	0.035 ^{***} (0.009)	0.084 ^{***} (0.018)
	1993	0.095 ^{***} (0.025)	0.079 ^{***} (0.024)
	1994	0.480 ^{***} (0.031)	0.136 (0.101)
	1995	0.496 ^{***} (0.028)	0.038 (0.072)

Sec12	1991	0.060 ^{***} (0.015)	0.068 ^{***} (0.028)
	1992	0.038 ^{***} (0.013)	0.063 ^{**} (0.031)
	1993	0.093 ^{**} (0.041)	0.166 ^{***} (0.044)
	1994	0.570 ^{***} (0.053)	0.110 (0.174)
	1995	0.554 ^{***} (0.048)	0.124 (0.267)
Sec13	1991	0.069 ^{***} (0.017)	0.158 ^{***} (0.031)
	1992	0.092 ^{***} (0.017)	0.136 ^{**} (0.031)
	1993	0.083 ^{**} (0.017)	0.127 ^{***} (0.039)
	1994	0.485 ^{***} (0.037)	0.191 (0.105)
	1995	0.504 ^{***} (0.037)	0.206 ^{***} (0.090)
Sec14	1991	0.006 (0.018)	0.014 (0.052)
	1992	0.048 ^{**} (0.024)	0.022 (0.022)
	1993	0.019 (0.020)	0.095 [*] (0.054)
	1994	0.575 ^{***} (0.046)	0.029 (0.310)
	1995	0.624 ^{***} (0.053)	0.057 (0.184)
Sec15	1991	0.092 ^{***} (0.017)	0.145 ^{***} (0.034)
	1992	0.077 ^{***} (0.019)	0.125 ^{***} (0.036)
	1993	0.061 ^{***} (0.018)	0.085 ^{***} (0.028)
	1994	0.092 ^{***} (0.023)	0.076 ^{**} (0.037)
	1995	0.093 ^{***} (0.021)	0.099 ^{***} (0.041)

*** Significant at 1%; ** Significant at 5%; * Significant at 10%. Robust standard errors in parentheses.

The dependent variable is the firm-average real wage per worker. All variables are expressed as natural logarithms.

Table 8 Second-Stage Regression: Summary Statistics.

EXPLANATORY VARIABLE	# Obs.	Sample Mean	Sample Std. Dev.	Sample Minimum	Sample Maximum	Effect on Bargaining Power
<i>Trade Variables</i>						
Import/production	75	1.05	1.20	0.17	5.76	B < 0
Export/production	75	0.47	0.61	0.02	2.26	B > 0
Outsourcing Narrow ^a	30	0.17	0.12	0.002	0.48	B < 0
Outsourcing Broad	30	0.36	0.10		0.60	B < 0
Tariffs	30					B > 0
<i>Inward Foreign Direct Investment Variables</i>						
Relative Number of Foreign-owned Firms	75	0.08	0.07	0.01	0.28	B > 0 or B < 0
Relative Employment of Foreign-owned Firms	75	0.40	0.22	0.05	0.77	B > 0 or B < 0
Relative Value-added of Foreign-owned Firms	75	0.44	0.23	0.05	0.84	B > 0 or B < 0
<i>Technology variables</i>						
R&D/output	75	0.08	0.07	0.01	0.28	B > 0 or B < 0
(Patents* mia)/output	75	0.40	0.22	0.05	0.77	B > 0 or B < 0
% Change in TFP	75	0.44	0.23	0.05	0.84	B > 0 or B < 0
<i>Control variables</i>						
Unemployment Rate	75	0.13	0.06	0.03	0.34	B < 0
C5- Concentration Ratio	75	0.34	0.17	0.12	0.77	B > 0 or B < 0
Capacity Utilisation ^b	70	0.77	0.03	0.70	0.86	B > 0

a: These data were only available for the years 1991 and 1995.

b: Sector 49 of the NACE-70 was dropped because of data limitations.

Source: Own computation based on data described in Appendix B.

Table 9 Second-Stage Regression Results: Determinants of the Workers' Relative Bargaining Power.

EXPLANATORY VARIABLE	Effect on Bargaining Power	No Controls	Industry Fixed Effects	Time Fixed Effects	Industry & time Fixed Effects	# Obs.
<i>Trade Variables</i>						
Import/production	B < 0	-0.002 (0.003)	-0.03*** (0.01)	-0.001 (0.003)	-0.03** (0.01)	75
Export/production	B > 0	0.01 (0.01)	0.08 (0.05)	0.01 (0.01)	0.16*** (0.05)	75
Outsourcing Narrow ^a	B < 0	0.05 (0.08)	0.20 (0.12)	0.04 (0.08)	0.04 (0.17)	30
Outsourcing Broad	B < 0	-0.05 (0.09)	0.03 (0.11)	-0.003 (0.01)	0.02 (0.16)	30
Tariffs	B > 0	0.55*** (0.16)	1.57* (0.80)	0.50 (0.10)	1.10 (1.78)	30
<i>Inward foreign direct investment variables</i>						
Relative Number of Foreign-owned Firms	B > 0 or B < 0	0.15 (0.09)	-1.83** (0.77)	0.15 (0.09)	-2.29*** (0.85)	75
Relative Employment of Foreign-owned Firms	B > 0 or B < 0	0.02 (0.02)	0.004 (0.43)	0.02 (0.02)	0.02 (0.43)	75
Relative Value-added of Foreign-owned Firms	B > 0 or B < 0	0.02 (0.02)	-0.12 (0.24)	0.02 (0.02)	-0.15 (0.22)	75
<i>Technology variables</i>						
R&D/output	B > 0 or B < 0	0.95*** (0.32)	4.73* (2.76)	0.97*** (0.30)	7.73* (4.14)	75
(Patents* mia)/output	B > 0 or B < 0	-0.23** (0.09)	-0.11 (0.10)	-0.22** (0.10)	-0.09 (0.13)	75
% Change in TFP	B > 0 or B < 0	0.06* (0.03)	0.02 (0.02)	0.07* (0.04)	0.03 (0.02)	75
<i>Control variables</i>						
Unemployment Rate	B < 0	0.14* (1.93)	0.02 (0.07)	0.14* (0.07)	-0.001 (0.22)	75
C5- Concentration Ratio	B > 0 or B < 0	0.001 (0.02)	-0.01 (0.01)	0.004 (0.02)	-0.01 (0.01)	75
Capacity Utilisation ^b	B > 0	-0.22** (0.12)	-0.01 (0.12)	-0.27** (0.13)	-0.01 (0.20)	70

*** Significant at 1%; ** Significant at 5%; * Significant at 10%. Robust standard errors in parentheses.

a: These data were only available for the years 1991 and 1995.

b: Sector 49 of the NACE-70 was dropped because of data limitations.

APPENDIX A

Table A.1. Sectoral Classification for the First-Stage Regressions.

	Sector	NACE-70	NACE-Bel
Sec 1	Food, beverages and tobacco	41+42	15+16
Sec 2	Textiles	43	17
Sec 3	Wearing apparel and leather and products	44+45	18+19
Sec 4	Wood products and furniture and fixtures	46	20 + 36.1
Sec 5	Manufacture of pulp, paper and board	471+472	21
Sec 6	Printing and allied industries	473+474	22
Sec 7	Chemical industry and man-made fibres	25+26	24
Sec 8	Rubber and plastic products	48	25
Sec 9	Non-metallic mineral products	24	26
Sec 10	Basic metal industries	22	27
Sec 11	Metal products	31	28
Sec 12	Non-electrical machinery	32	29
Sec 13	Office and computing machinery, electrical machinery and professional goods	33+34+37	30-33
Sec 14	Other transport equipment	35+36	34+35
Sec 15	Other manufacturing	49	36-36.1

APPENDIX B

The sectoral classification for the second-stage regressions is based on Table A.1 of Appendix A and covers the period 1991-1995, except for the tariff data and the outsourcing variables.

The data for the trade variables are obtained from the OECD International Trade by Commodities Statistics (ITCS). These data are in the Standard Industrial Trade Classification (SITC) and are converted to the NACE-70 classification with a correspondence table obtained from the OECD²². The production data are obtained from the OECD (1999) Stan Database for Industrial Analysis. Our narrow and broad outsourcing variables are derived from the 1990 and 1995 input-output tables for the Belgian economy²³. The data for 1990 are in the NACE-clio classification for which a conversion was used, while the data for 1995 are in the NACE-bel classification (see Table A.1 of Appendix A for a conversion to the NACE-70 classification). The tariff data are based on Messerlin (2001) and refer to the average Most Favoured Nation (MFN) tariffs of the European Union. These tariff data cover the years 1990 and 1995. For some sectors, the data are more disaggregated than the sectoral classification of Table A.1.. Hence, we used sectoral import shares as a weight to construct tariff data based on the classification of Table A.1..

Regarding inward foreign direct investment, we experiment with three variables: the number of foreign-owned companies relative to the total number of companies, the total employment of foreign-owned firms relative to the total Belgian employment and the total value-added of foreign-owned firms relative to the total Belgian value-added for each sector in the manufacturing industry. The Belgian Federal Planning gathers data on all multinationals firms in the Belgian economy. A multinational firm is defined as a firm that is at least 50% foreign-owned (see De Backer, 2002 and De Backer and Sleuwaegen, 2003 for a further description of this data set).

We experiment with three technology variables. We use the sectoral R&D intensity, which is defined as R&D expenditures divided by output, as a measure for innovative input. The R&D data are obtained from the Dienst voor Wetenschappelijke, Technische en Culturele Aangelegenheden (DWTC, Belgian Federal Science Policy Office)²⁴. For the years 1990 and 1991, missing observations are filled in with the aid of a spline interpolation technique. The data are in the NACE-Bel classification and are converted to the NACE-70 classification based on NIS (1997). The production data are obtained from the OECD (1999) Stan Database for Industrial Analysis. We also use granted patent data as a measure of innovative output. These patent data are obtained from the EPO (European Patent Office) and are converted to the NACE-70 classification based on the conversion table of Verspagen et al. (1994)²⁵. The patent variable used is patents divided by production times milliards. The third technology variable is Total Factor Productivity (TFP). This variable is expressed in indices

²² The data were first converted through the International Industrial Classification (ISIC) and subsequently converted to the NACE-70 based on Schumacher (1992).

²³ See <http://www.plan.be/>.

²⁴ See <http://www.belspo.be/>

where 1990 is the base year. The percentage change of Total Factor Productivity can be expressed as follows:

$$\hat{A} = (\hat{Q} - \hat{L}) - \alpha(\hat{K} - \hat{L}) \quad (\text{B.1.})$$

In this expression, the first term reflects the percentage change in the output-labour ratio. In the second term, α refers to the capital share in production. Therefore, $(1 - \alpha)$ is the labour share in production, which is calculated as the average share of labour costs in value-added. $(\hat{K} - \hat{L})$ refers to the percentage change in the capital-labour ratio. We construct our capital stock data starting from real investment data from the OECD (1999) Stan Database for Industrial Analysis and using a perpetual inventory method following Griliches (1979)²⁶. We first compute an initial capital stock for 1990. If we assume that both the depreciation rate (δ) and the annual growth rate (η) of investments prior to 1990 are constant, the initial capital stock K_{1990} equals:

$$\begin{aligned} K_{1990} &= I_{1990} + (1 - \delta)\lambda I_{1990} + (1 - \delta)^2 \lambda^2 I_{1990} + (1 - \delta)^3 \lambda^3 I_{1990} \\ &= I_{1990} \left(\frac{1}{1 - \lambda(1 - \delta)} \right) \end{aligned} \quad (\text{B.2})$$

where $\lambda = 1/(1 + \eta)$. The growth rate (η) is estimated as the mean annual growth rate of investments over the period 1985-1990. Like Maskus (1991), we use a depreciation rate of 13.33 percent. After having obtained the initial capital stock, deflated investment series are accumulated and depreciated from 1990 onwards. The deflators are calculated from the value-added series in the OECD (1999) Stan database.

The sectoral unemployment rate is a first control variable and is obtained from the Rijksdienst voor Arbeidsvoorziening (RVA). Another control variable is the C5- concentration ratio which refers to the five-firm concentration ratio. This ratio is computed with the aid of the Belgian National Bank Balance sheet data using the sales variable. As a last control variable, we use the capacity utilisation rate which is obtained from the Belgostat database of the Belgian National Bank²⁷. These data are provided quarterly and are disaggregated according to the different sectors in the manufacturing industry. For some sectors, the data are more disaggregated than the sectoral classification mentioned in Table A.1 of Appendix A. First, we compute the average utilisation rate in each sector²⁸. Some

²⁵ Again, the conversion has occurred through the ISIC-classification.

²⁶ A more complete description of how the capital series are constructed is available from the authors upon request.

²⁷ These data can be downloaded from <http://www.nbb.be/belgostat/>.

²⁸ Taking averages also filters out seasonal fluctuations. Another option would be to use a filtering technique such as the Census X-11 method.

sectors are aggregated up using the value of production as weights. The sector “Other Manufacturing” (sector 49 of the NACE-70) was lacking. Therefore we did not use this sector in our estimations.

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