



Faculty of Economics and Business Administration  
2003-2004

**AN ANALYSIS OF  
UNION BEHAVIOUR AND WAGE FORMATION  
IN A GLOBALISED WORLD**

Dissertation

Submitted at Ghent University,  
to the Faculty of Economics and Business Administration,  
in Fulfilment of the Requirements for the Degree of Doctor in Economics

by

**SABIEN DOBBELAERE**

Promotor: Prof. dr. F. Heylen, Ghent University

Co-Promotor: Prof. dr. J. Konings, K.U.Leuven

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## ACKNOWLEDGEMENT

Since the autumn of 2000 I have been overwhelmed by some sneaking urge to challenge the parameters of my small world. Life is meant to be lived fully, so I decided to fulfill one of my innermost aspirations: climbing high, meaning for me daring peaks above 16 400 ft. I started my physical and mental training and pursued my first goal to climb one of the *Seven Summits*, Mount Kilimanjaro [19 335.6 ft], in the winter of 2001. Our team planned to take the Machame route, probably the most scenic and most beautiful route but also one of the physically most demanding ones to the summit of the tallest free-standing mountain known to man.

During that same autumn, I embarked on the interesting intellectual journey that would hopefully bring me to another successful summit bid. I believe there are several ways to summit Mount Ph.D., and a climber's preferences are determined by her or his personality and the experiences the climber has had on the mountain. Being non-experienced, I could only take my own route. My climbing plan was split up in three stages, giving me enough time to acclimatise. I truly hoped to set foot on the summit before the summer of 2004.

As time passed, I realised that both summit bids share many similarities. Like climbing, writing a doctoral dissertation is undoubtedly a team effort under the guidance of experienced expedition leaders and Sherpas. This dissertation would have been impossible without the leadership of my charismatic promotor, Prof. dr. Freddy Heylen. He meticulously read and re-read many versions of my papers. His invaluable and constructive (sometimes last-minute) comments, questions and insight improved my dissertation in many ways. He also gave me the climbing permit to follow my own way in many respects and even encouraged that. I am extremely grateful to him for his enthusiasm, criticism and friendship.

The equally important guide of this expedition was unmistakably my enthusiastic co-promotor, Prof. dr. Joep Konings. As a true economist, he taught me how to perform scientific research efficiently, compete at a high level and discover gaps in the economic literature. I highly appreciate his aptitude for creating a team spirit, notably visible at the LICOS research centre which I joined during my journey.

I am deeply indebted to the other highly experienced expedition members, the external members of my doctoral jury who are all top-academics in the field of economics: Prof. dr. Alison Booth, Prof. dr. Jacques Mairesse and Prof. dr. Torben Andersen. On the road to the summit, Prof. dr. Alison Booth sharpened my interest in the trade union literature. Being the editor of *Labour Economics*, she accepted my third paper for publication which highly encouraged me. Her acceptance to become a member of my doctoral jury pushed me towards the ultimate summit bid.

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Sabien Dobbelaere

May 4, 2004.

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# NON-TECHNICAL SUMMARY AND CONCLUSIONS

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## **1. ORIENTATION**

During the last decades, three important evolutions have been occurring in European countries.

First, there is the process of globalisation, defined as the increasing integration of markets for products, factors and technology. Whereas there has been a steady increase in capital mobility since the 1970s, the process of worldwide product market integration has mainly started since the 1990s, pushed within Europe by the Single Market Initiative of the European Union (1992) (Blanchard and Philippon, 2003). One of the main economic aims of the European integration process is to foster growth through the benefits of increased competition. The abolition of trade and non-trade barriers would allow firms from different member countries to compete on equal grounds and promote product and process innovation.

Second, the opening up of Central and East European countries can be considered as part of the globalisation process. These emerging economies have been confronted with an unseen economic, political and institutional transition since the late 1980s. From the beginning of the 1990s onwards, product and labour market regulations have started to become more in line with European standards (Flanagan, 1998). These countries have become favourite destinations for foreign direct investment from western European companies.

Third, the process of product market deregulation has been accompanied by a process of labour market deregulation, although at a different speed (see e.g. Boeri et al., 2000; Booth et al., 2001). While the process of product market deregulation has been widespread, labour market reforms have been more piecemeal.

One of the most debated issues related to worldwide product market integration concerns the influence of integration on the labour market. In recent years, increased market integration has been advocated by politicians and economists because it proves beneficial in the long run. By eliminating static efficiency losses deriving from non-competitive behaviour, it results in higher total welfare. The transition to this new equilibrium, however, comes with both distribution and dynamic effects. As pointed out by Blanchard and Giavazzi (2003), “[product market] deregulation is fundamentally about reducing and redistributing rents, leading economic players to adjust in turn to this new distribution”. There is indeed a growing concern that the economic threats and opportunities created by integration are not equally shared across different groups.

Should globalisation be held responsible for the changing labour market performance in industrial countries? Should globalisation be blamed for the deteriorating fortunes of unskilled workers? Should growing competition from low-wage countries and labour outsourcing be considered as threats for jobs in relatively advanced countries? Should outsourcing of production be seen as an explanatory factor for the weakening power of unions and for falling wages? Do workers in host countries of foreign direct investment benefit from the globalisation process? Are institutional and policy interventions required to mitigate the (possibly adverse) effects of worldwide product market integration in advanced countries?

These questions -which are of exceptional social relevance- have been raised frequently, not only in academic and policy circles but also among the public. Since the Battle of Seattle in November 1999, the world has seen a wave of anti-globalisation protests surrounding the WTO, IMF and World Bank meetings. These protests reveal that many people fear that globalisation may aggravate labour market conditions. At the same time, proponents of globalisation have emphasised the gains in efficiency, dynamism and economic welfare that open markets bring.

This dissertation focuses on labour market and product market performance in an international context. To this end, our research relies on a rent-sharing framework to investigate different aspects of increased product market integration and labour market deregulation. Starting from the general equilibrium model of Blanchard and Giavazzi (2003), we discuss the specific research questions addressed in this dissertation in section 2. Section 3 outlines briefly the related existing literature, our empirical approach and summarises our scientific and policy conclusions. In section 4, we present some paths of future research.

## 2. BROAD THEORETICAL FRAMEWORK AND RESEARCH QUESTIONS

The testable hypotheses developed in this dissertation can broadly be inferred from the general equilibrium macroeconomic model of Blanchard and Giavazzi (2003). In this section, we discuss first intuitively the model<sup>1</sup> and then specify the research questions that we derive from it.

### 2.1. The Model of Blanchard and Giavazzi (2003)

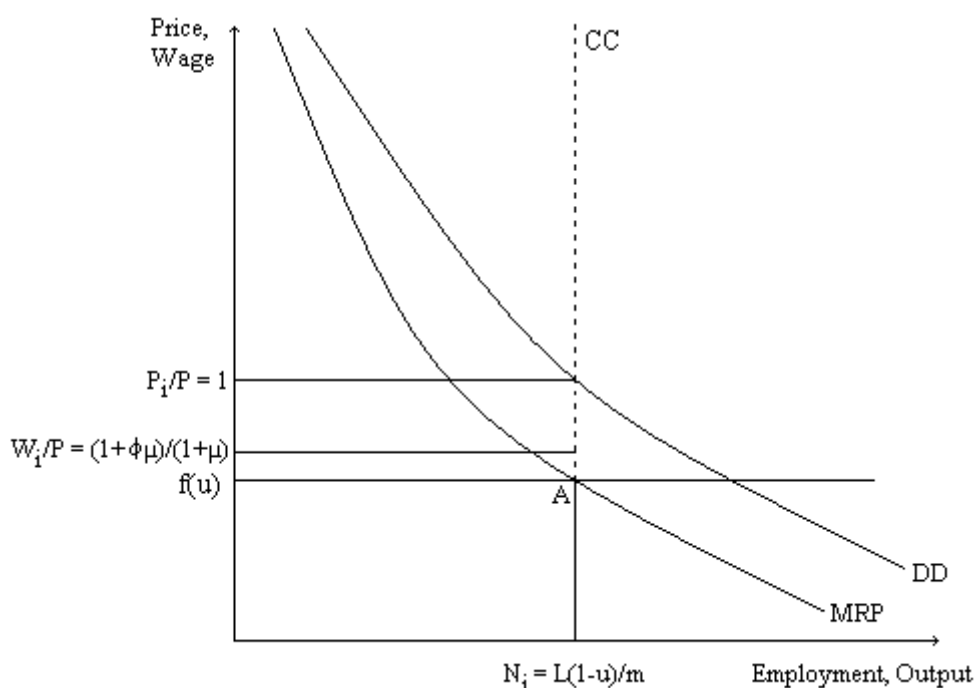
*The Model.* The model is built on two central assumptions: monopolistic competition in the product market, determining the *size* of the rents that can be shared between the workers (union) and the firm, and Efficient Bargaining in the labour market, determining the *distribution* of the rents. Figure 1 contains a graphical representation of the short-run general equilibrium. Imperfect competition in the product market is captured by the parameter  $\mu$ , which is the mark-up of the relative price  $\frac{P_i}{P}$  (with the aggregate price index  $P$  being exogenous) over the alternative wage (depending on the unemployment rate  $u$  and represented by the horizontal line).  $\mu$  depends negatively on the price elasticity of demand which is itself determined by the number of products/firms as well as by general government regulation. Imperfect competition in the labour market is captured by the parameter  $\phi$ , which represents the bargaining power of the workers.

In the short run, the economy consists of  $m$  firms and  $L$  workers. Each firm  $i$  produces a differentiated product. Labour is the only input of the firm. For the sake of simplicity, real output is equal to employment ( $Y_i = N_i$ ). Each period, the firm bargains with  $\frac{L}{m}$  workers over nominal wages and employment. Assuming risk-neutral workers, the contact curve  $CC$  is vertical (represented by the dashed line). For given bargaining power of the workers  $\phi$ , equilibrium is at point  $A$  where the marginal revenue product of labour ( $MRP$ ) equals the alternative wage. The associated employment level is  $N_i$ . Corresponding output determines the relative price  $\frac{P_i}{P}$  on the demand curve  $DD$ . Under symmetric conditions, the relative price must be equal to 1 in equilibrium.

---

<sup>1</sup> For technical details, we refer to Blanchard and Giavazzi (2003).

Figure 1 Short-Run General Equilibrium



Source: Blanchard and Giavazzi (2003)

Given a relative price equal to 1, total rents per unit of output are given by  $\left(\frac{P_i}{P} - f(u)\right) = \frac{\mu}{1 + \mu}$ . The workers get a proportion  $\phi$  of those rents. Hence, the real wage  $\frac{W_i}{P}$ ,

which plays no allocative role under Efficient Bargaining in the short run, is equal to  $\frac{(1 + \phi\mu)}{(1 + \mu)}$ .

This expression shows that bargained real wages depend on both product market imperfections ( $\mu$ ) and labour market imperfections ( $\phi$ ). The firm obtains a proportion  $(1 - \phi)$  of the total rents per unit of output, so profits per unit of output are equal to  $\frac{\mu(1 - \phi)}{(1 + \mu)}$ . This short-run distribution of

rents between the workers and the firm determines the number of firms/ products in the long run.

**Theoretical Conclusions.** From the model, the theoretical effects of product market deregulation (a decrease in  $\mu$ ) and labour market deregulation (a decrease in  $\phi$ ) on the real wage and unemployment can be summarised as follows. In the context of worldwide product market integration, product market deregulation may come from e.g. the elimination of tariff barriers or

barriers to entry and standardisation measures making it easier to sell domestic products abroad. Labour market deregulation results from factors decreasing the bargaining power of the workers.

The direct effect of product market deregulation is to raise the price elasticity of demand for a given number of firms. This will decrease the size of the rents and hence the rents going to the workers. When deregulation takes place on a macroeconomic scale, however, there is an indirect effect resulting from the fact that consumers pay now less for the goods they buy. Because workers only get a proportion  $\phi$  of the rents, workers gain more as consumers than they lose as workers.

Consequently, the real wage  $\frac{(1+\phi\mu)}{(1+\mu)}$  rises. In the long run, product market deregulation may also

affect the number of firms. The lower entry cost coming from product market deregulation makes entry more attractive. As firms enter, the mark-up decreases again, leading to higher real wages and to lower unemployment. Hence, workers gain in the short as well as in the long run.

Labour market deregulation, however, comes with a strong intertemporal trade-off. In the short run, workers give up rents, resulting in lower real wages. Since real wages play no allocative role in the short run, unemployment is unaffected. Hence, workers lose in the short run. In the long run, however, the larger rents left to the firm make entry more attractive. The entry of firms leads ultimately to a decrease in the unemployment rate in the long run. The real wage will recover.

## 2.2. Research Questions

The aim of this dissertation is to investigate empirically several aspects of the model of Blanchard and Giavazzi (2003) at the micro level. In this section, we discuss the research questions which are related to Blanchard and Giavazzi (2003).

***(R1) How serious are product and labour market imperfections in advanced economies? Do these imperfections vary among sectors?*** This question addresses the magnitude and the heterogeneity of monopoly power in the product market ( $\mu$ ) and workers' bargaining power in the labour market ( $\phi$ ). In this dissertation, we will concentrate on the Belgian manufacturing industry.

***(R2) Are labour market and product market imperfections related? Are these imperfections likely to go hand in hand or -at the other extreme- are they mutually exclusive?*** This question focuses on the possible relationship between price-cost mark-ups ( $\mu$ ) and workers' bargaining power ( $\phi$ ). Again, we will investigate the case of the Belgian manufacturing industry. In the model, there is no direct relationship between labour market (de)regulation and product market

(de)regulation. The mark-up  $\mu$  is not directly related to the bargaining power  $\phi$ . However, thinking about reality, we can imagine several reasons for such a relationship to exist.

(i) A first reason follows from the long-run implications of the model of Blanchard and Giavazzi (2003). Given a fixed mark-up  $\mu$ , labour market deregulation (decreasing the bargaining power of the workers  $\phi$ ) decreases the proportion of the rents going to the workers and increases the proportion going to the firm in the short run. This short-run re-distribution of rents will then affect the degree of competition in the product market ( $\mu$ ) by changing the number of firms in the long run. Firms enter the market, competition increases and the mark-up decreases.

(ii) A second reason results from the fact that unions are most likely to be created in firms where rents can be extracted. This is most likely to happen if there is imperfect competition in the product market.

(iii) A third reason follows from the fact that firms with higher price-cost margins may employ high-skilled workers who are harder to replace than low-skilled workers.

**(R3) Has increased international trade affected the size of the rents, the workers' bargaining power and the reservation wage in the Belgian manufacturing industry?** One might expect that increased foreign competition lowers the size of the rents that can be shared between the workers

and the firm  $\left(\frac{\mu}{1+\mu}\right)$ . The reason is that fierce foreign competition changes the price elasticity of

demand and induces a shift in the rents from domestic to foreign firms, shifting the demand curve  $DD$ . According to the model, the workers' bargaining power does not directly depend on product market characteristics. As we have mentioned in our discussion of (R2), there may however be a relationship. In the context of the globalisation debate, a reduction of workers' bargaining power (a decrease in  $\phi$ ) could be driven by fiercer import competition, increased labour outsourcing or increased foreign direct investment. Question (R3) also concentrates on the effect of globalisation on the reservation wage (represented by the horizontal line in Figure 1). This captures one of the biggest fears related to globalisation: the fact that increased competition might lower employment opportunities considerably and raise unemployment.

**(R4) Workers' bargaining power might be eroded by increased foreign direct investment in OECD countries like Belgium. Transition countries are favourite destinations for FDI. Does that imply that workers in these host countries benefit from the globalisation process? Are workers' wages in foreign-owned firms higher than in domestically-owned firms?** In our dissertation, we answer these questions, focusing on the Bulgarian manufacturing industry.

### 3. EMPIRICAL APPROACH AND MAIN RESULTS

This dissertation contributes to various topics in the empirical labour economics literature. It contains three papers. In this section, we first point briefly to related existing literature, then we discuss our empirical approach and finally conclude.

For Europe, it has been shown that labour market consequences of worldwide product market integration do not derive primarily from increased mobility of labour but from interactions between imperfectly competitive labour and product markets (Andersen and Skaksen, 2003; OECD, 1999, 2000). To capture this situation, we relate labour market imperfections to product market imperfections in the *first paper*, titled “JOINT ESTIMATION OF PRICE-COST MARGINS AND UNION BARGAINING POWER FOR BELGIAN MANUFACTURING”.

Whereas we concentrate exclusively on imperfect competition in the domestic product market in *paper 1*, we move to worldwide product market integration in *paper 2*, titled “HAS INTERNATIONAL TRADE AFFECTED WORKERS’ BARGAINING POWER?”. We investigate the fear that globalisation may lead to lower wages and reduced union power in OECD countries.

One of the factors affecting union power is foreign direct investment. Transition countries have been favourite destinations for western companies. Does that mean that workers in these host countries gain from this process? This brings us to the *third paper*, titled “OWNERSHIP, FIRM SIZE AND RENT SHARING IN BULGARIA” where the focus is on deviations from perfect competition in the labour market in a transition country.

#### 3.1. Existing Literature

***Labour Market and Product Market Imperfections.*** One criticism applying to standard rent-sharing studies is that they solely concentrate on imperfections in the labour market, assuming perfect competition in the product market. Empirical research in the industrial relations literature has devoted much effort to evaluate price-setting behaviour of firms in various environments (see Brehnahan, 1989 and Schmalensee, 1989). A weakness of these studies is that they only focus on product market imperfections, ignoring the possibility that inputs are not priced competitively. The presence of rent sharing necessitates the integration of labour market variables in econometric tests of product market power. So far, only few studies have bridged the gap between the two econometric literatures and have considered imperfect competition in both output and input markets (Bughin, 1996; Crépon et al., 2002; Neven et al., 2002; Schroeter, 1988). These studies

have been able to answer our research question (*R1*) at the aggregate level or for one sector. Question (*R2*) has remained unanswered.

***Trade-Labour Literature.*** One strand of the trade-labour literature has focused on factor revenues to evaluate the impact of international trade on labour market outcomes. A favourite framework of trade economists to study this issue is the Hecksher-Ohlin-Samuelson theory (HOS) in which the Stolper-Samuelson (SS) theorem is an important building block. In this framework, changes in product prices are linked to changes in factor prices. Labour economists have mainly used the Factor Content of Trade (FCT) approach. In this approach, the amount of labour embodied in a country's exports and imports is calculated. To assess the impact of international trade on wages, changes in labour flows are linked to estimates of labour demand elasticities. Both approaches, however, find only a small impact of international trade on workers' wages.

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 this setting, worldwide product market integration induces a shift in the rents from domestic to foreign firms. The profit change in the domestic firm translates in wage changes in the domestic market (Abowd and Lemieux, 1993; Borjas and Ramey, 1995; Kramarz, 2003). Kramarz (2003) shows that international trade also affects wages through changes in the workers' and the firm's outside option. Budd and Slaughter (2004) and Budd et al. (2004) investigate indirectly the impact of increased international trade on the worker's bargaining power. They provide evidence of rent sharing extending across national borders. Although existing literature has provided some answers to some of the questions involved in (*R3*), the direct effect of globalisation on the workers' bargaining power in a rent-sharing framework has not been analysed before.

***Rent Sharing in Transition Countries.*** The question of how and why wages are above their opportunity cost is an issue of central policy importance in an economy. Following Sumner Slichter (1950), labour economists have investigated intensively imperfect competition in labour markets in the US, Canada and Western Europe (for references, see *paper 3*). In contrast, testing for labour market imperfections and rent sharing in post-communist Europe has remained a largely unexplored field. Only very partial answers to our research question (*R4*) have been provided. The few existing studies compare mainly rent-sharing behaviour before and during the transition process (Basu et al., 1997a; Basu et al., 1997b; Grosfeld and Nivet, 1997). Commander and Dhar (1998) and Köllö (1997) analyse differences in rent-sharing behaviour between firms with increasing and decreasing real sales.



### 3.2. Empirical Approach

*Paper 1.* In *paper 1*, we analyse price-setting behaviour in both the product and the labour market of Belgian manufacturing firms over the period 1988-1995. By embedding an Efficient Bargaining model into Hall's (1988) framework, our analysis takes into account both labour market and product market imperfections. The presence of wage negotiations between employers and their workers at the national, the sectoral and the firm level makes a rent-sharing framework very valid to explain wages in the Belgian economy.

We test (1) the heterogeneity in the price-cost mark-up and the workers' bargaining power among 18 sectors within the manufacturing industry over the period 1988-1995 and (2) the relationship between both parameters. We identify both parameters from a reduced-form equation. Intuitively, we analyse how the distribution of the rents available for sharing between the workers and the firm as well as the size of the surplus is related to the workers' bargaining power. The main contribution of this paper is to shed light on these relationships for Belgium.

*Paper 2.* In *paper 1*, we concentrate exclusively on imperfect competition in the domestic product market. In *paper 2*, we link again product market performance to labour market performance, be it in an international context. We investigate more specifically how globalisation has affected workers' wages in general and their bargaining power in particular in the Belgian manufacturing industry over the period 1987-1995. Since Belgium is one of the most open economies in the world, we expect to find significant labour market effects from trade.

In our analysis, we test three channels through which international trade can influence bargained wages in an Efficient Bargaining framework. First, we test whether increased international trade has changed workers' wages through movements in the workers' outside option. By doing so, we capture the fear that increased competition might lower employment opportunities considerably. Given that imports of goods are potential substitutes for labour, higher import shares may lower employment opportunities and decrease the reservation wage. Second, we test the standard effect of product market competition on wages in a rent-sharing framework, i.e. the effect of globalisation through changing the size of the rents that can be shared between the workers and the firm. We use exogenous demand shocks that affect the firm's price and hence its product market conditions. The main contribution of the paper lies in the third channel through which globalisation might influence wages: through changing the bargaining power of the workers. In light of the globalisation debate, we test whether product market deregulation and labour market deregulation move together. As mentioned in section 2.1., labour market deregulation has only a redistributive effect in the short run. The decrease in the bargaining power of the workers simply

redistributes rents from the workers to the firm. In this paper, we solely focus on this short-run effect.

*Paper 3.* In *paper 3*, we basically test whether the rent-sharing framework applies to a transition country, in our case Bulgaria, during the period 1997-1998. We focus solely on imperfect competition in the labour market, ignoring imperfect competition in the product market.

We assume that the firm and the workers only bargain over the wage level (Right-to-Manage model). We contribute to the rent-sharing literature by concentrating on the heterogeneous character of the rent-sharing coefficient. To be specific, we test whether the workers' bargaining power depends on (1) the ownership status of the firm (state-, private domestic- of foreign-owned) and (2) the size of the firm. We expect to find a strong rent-sharing effect in state firms and a small one in foreign firms. The idea is that foreign firms are concentrated in sectors with a high-value added profile. Therefore, workers in these firms need to cream off only a small portion of the rents to secure an acceptable wage. In addition, workers in foreign firms might reduce their wage demands because of the footloose nature of foreign firms. During the 1990s, Bulgaria has experienced a considerable inflow of inward foreign direct investment. In that context, we investigate whether that particular aspect of globalisation has affected wage formation significantly. Besides, we test the positive firm-size wage hypothesis and the multinational wage premium in firms with a different ownership status.

### 3.3. Conclusions

In this section, we first summarise the main scientific conclusions of our dissertation, starting from the research questions raised in section 2.2. Then we briefly reflect on their policy implications.

*(R1) How serious are product and labour market imperfections in advanced economies? Do these imperfections vary among sectors?* The results in *paper 1* show clear evidence of labour market and product market imperfections in the Belgian manufacturing industry. The hypothesis of perfect competition is strongly rejected. An important finding is that wages should not be considered exogenous when price-setting behaviour in the product market is evaluated. At the general manufacturing level as well as at the sectoral level, we provide strong evidence of price-cost margins -and hence the degree of product market imperfection- being underestimated when labour market imperfections are ignored.

**(R2) *Are labour market and product market imperfections related? Are these imperfections likely to go hand in hand or -at the other extreme- are they mutually exclusive?*** Studying the heterogeneity in price-cost mark-up and union bargaining power parameters among sectors is the main contribution of paper 1. Focusing on the cross-section dimension enables us to draw conclusions about interdependencies between estimated price-cost mark-ups and estimated union bargaining power. A new result concerns the remarkable positive relationship that we observe among sectors between these parameters. The stronger the union, the higher the price-cost margin at the sectoral level. In other words, the more powerful the union, the larger the proportion of the rents going to the workers and the larger the size of the rents that can be shared. The first relationship, pointing to the link between the workers' bargaining power and the share of rents going to the workers, shows how labour market (de)regulation changes the factor income distribution in an Efficient Bargaining framework. This is the standard short-run effect. The second relationship, showing the link between the workers' bargaining power and the size of the rents that can be shared, suggests that labour market and product market imperfections are likely to go hand in hand.

As we have indicated in section 2.2., this observed positive correlation can be interpreted in more than one way. One interpretation runs from labour market to product market imperfections and follows from the long-run implications of the model of Blanchard and Giavazzi (2003). The intuition is that strong unions imply higher wage rents and a smaller proportion of rents left to the firms. This change in factor income distribution leads to exit of firms, which decreases the degree of product market competition and generates more unemployment. The workers' reservation wage will fall, price-cost mark-ups will rise. In some sense, our findings can be considered as an indirect empirical validation of the model of Blanchard and Giavazzi (2003) in the long run.

The results can also be interpreted in terms of product market imperfections affecting labour market imperfections. The idea is that workers are less likely to join unions unless they are able to extract some surplus from the firms and this is most likely to happen where there is imperfect competition in the product market. This is a standard interpretation in the trade union literature. Another explanation going from product market imperfections to labour market imperfections is that firms with higher price-cost margins may employ high-skilled workers who are harder to replace than low-skilled workers and therefore more powerful.

**(R3) *Has increased international trade affected the size of the rents, the workers' bargaining power and the reservation wage in the Belgian manufacturing industry?*** In paper 2, we identify three channels through which increased international trade has affected workers' wages in the Belgian manufacturing industry. In the first part of this paper, we show that globalisation influences wages through changing the size of the firms' rents and changing the workers' outside

option. Besides supporting the rent-sharing hypothesis, our results reveal that increased foreign competition in the form of lower export prices reduces both wages and rents per worker. We find that the higher the import share, the lower the workers' outside option (and hence workers' wages) while the opposite is true for the export share. The mechanism at work is that imports of goods are potential substitutes for labour. Hence, the higher the import share, the lower the employment opportunities. To check the importance of the country of destination/ origin, we have split up international trade flows. We consider OECD, CEE, Newly Industrialising countries (NICs) and other NON-OECD countries. Our results reveal that imports from OECD countries and NICs exert a significantly negative effect on the workers' outside option whereas the opposite holds for exports to CEE countries.

The main contribution of the paper lies in the second part, where we provide direct evidence of increased international trade affecting the bargaining power of the workers. We have explored the relationship between globalisation and workers' bargaining power through a broad range of measures such as trade, outsourcing, tariffs and inward foreign direct investment. Our results suggest that in sectors with fierce import competition, the proportion of rents going to the workers is squeezed. In contrast, in sectors that are shielded from competition by higher tariff levels, workers are able to cream off a larger share of the rents. Consistent with the results of *paper 3*, we find that foreign ownership reduces the workers' bargaining power.

***(R4) Do workers in host countries of foreign direct investment benefit from the globalisation process? Are workers' wages in foreign-owned firms higher than in domestically-owned firms?***

The main conclusion of *paper 3* is that ownership status is an important determinant of both the wage level (for given productivity) and the degree of rent sharing in Bulgaria. The overall effect of foreign ownership on workers' wages is positive. This suggests that workers in host countries of foreign direct investment benefit in terms of remuneration as a consequence of globalisation. The results strongly confirm the existence of a multinational wage premium in Bulgaria. Rent sharing, however, is far less pronounced in private domestic and foreign firms. It is much more prevailing in state-owned firms. In addition, we find weak evidence of a positive firm size-wage effect and a positive effect of firm size on the degree of rent sharing, often more pronounced in private domestic firms.

We point to technological superiority and international rent sharing as two valid explanations for the significant multinational wage premium in Bulgaria. The resulting high wage level in foreign firms may explain that the proportion of the rents taken by the workers in these firms is lower than in state firms. Two other explanations for the differences in rent-sharing behaviour across ownership categories are the concentration of foreign ownership in firms with a high value-added profile and the footloose nature of foreign firms. The high value-added profile implies that

workers in these firms need to capture only a small fraction of the rents to secure an acceptable wage. The possible outsourcing of production decreases the bargaining power of the workers in favour of the bargaining power of the firm.

The main contribution of this paper to the empirical rent-sharing literature is allowing the rent-sharing parameter to vary across firms according to ownership type.

The general conclusion to be drawn from this dissertation is that labour market and product market performance are intrinsically connected. Factors changing the degree of competition in one market affect price-setting behaviour in the other. The most important contribution of this dissertation is the strong empirical finding that labour market and product market imperfections are positively correlated. In other words, product market deregulation and labour market deregulation are found to move in the same direction. Increased competition in the product market involves more competitive labour markets. A natural question arising from this conclusion is who loses and who gains from deregulation and globalisation. Will globalisation indeed prove beneficial in the long run? Who loses and who benefits from labour market deregulation?

The model of Blanchard and Giavazzi (2003) is a macro model. Their general conclusion is that product market deregulation, increasing competition in the product market, proves beneficial for workers both in the short and the long run. Labour market deregulation affects workers negatively in the short run but positively in the long run. Furthermore, since it contributes to product and labour market deregulation, their model provides strong arguments in favour of globalisation. However, reality may be different.

Globalisation does not affect all sectors equally. In sectors which have to cope most with increasing international competition, there will be downward pressure on rents, prices and wages. In these sectors firms may be forced to exit the market, which negatively affects jobs. Real wages may fall. The favourable aggregate price effect that in the end leads to higher real wages in the model of Blanchard and Giavazzi (2003) may be too small when not all sectors are affected. The partial equilibrium effect then dominates the general equilibrium effect. In sectors which are less affected by globalisation, the decline in prices may more than compensate workers for the decrease in rents. Real wages increase. The general equilibrium effect on prices will then be dominant. As a policy implication, we derive from this result that -complementary to globalisation- aggregate product market deregulation should be at the forefront. Conducting such policy would strengthen the favourable macroeconomic price effect and induce real wage increases and job creation at the aggregate level. The potential role for product market deregulation to increase long-term employment levels has recently been shown empirically by OECD (2002).

Sectors which are mostly affected by globalisation, are likely to employ low-skilled workers. Labour market policies, directed to training and education, should be given priority. As emphasised by OECD (2002), labour market policies and institutions appear to be equally important

determinants of employment rates than product market deregulation. To conclude, regulatory reforms in both the labour and the product market are needed to raise significantly employment levels in many OECD countries.

## **4. DIRECTIONS FOR FUTURE RESEARCH**

The literature on the mutual effects of product and labour market imperfections in general and part of this dissertation in particular leave several paths for future research. This section aims at outlining some of these directions.

### **4.1. Objectives**

As pointed out by OECD (2002), best-practice policies in the labour and the product markets have been the subject of intense research but little focus has been on the cross-effects of these policies. When considering the existing literature on these cross-effects (see e.g. Andersen and Skaksen, 2003; Blanchard and Giavazzi, 2003; OECD, 2002) and part of this dissertation, some important unresolved questions arise.

First, the causality issue has to be addressed more extensively. An important research question is whether causality between product and labour market imperfections runs in both directions. Also, the precise causal mechanisms at work have to be clarified further.

Second, empirical evidence on the robustness of interactions between product and labour market performance in countries with different institutional and structural characteristics is needed.

Third, the effect of product market integration on different segments in the labour market and the consecutive policy implications deserve more attention. So far, existing evidence on the impact of globalisation on wage inequality between high- and low-skilled workers has concentrated mainly on the US (except Cuyvers et al., 2003; Lücke, 1998; Oscarsson, 2002). The dispersion in the unemployment rates according to educational attainment in different OECD countries suggests that the (possible adverse) effects of integration depend on country characteristics (OECD, 2002).

Fourth, the impact of worldwide product market integration on the union's degree of risk aversion and the intra-union bargaining weight has not been analysed before. Following two papers of this dissertation, future research aims at filling part of the gap in the literature on the interdependence between labour and product market imperfections.

## 4.2. Design

Existing literature on the effect of unions on economic performance has so far concentrated on the impact of unions on productivity, firm profitability and investment (see *paper 1* for an extensive survey). In *paper 1*, we focus on the relationship between the degree of labour market imperfections and the size of the surplus available for sharing between the workers and the firm. This research can be extended both theoretically and empirically. On the theoretical side, the causality question has to be investigated rigorously. In *paper 1*, we rely on an extension of Hall's (1988) approach which boils down to estimating a reduced-form equation. As indicated above, the results can be interpreted as labour market imperfections affecting product market imperfections, or the other way around. It is difficult to disentangle the causal impact of labour and product market policies from estimated coefficients of reduced-form regressions (OECD, 2002). Therefore, we aim at relying on a structural approach in which the interdependence between product and labour market competition is explicitly accounted for (see Neven et al., 2002 for a related issue). This theoretical framework will allow us to investigate how the degree of labour market imperfections affects the size as well as the distribution of the surplus. Based on the estimates of the structural model, simulation exercises will enable us to assess the impact of strong unions on the size of the surplus as well as on the part of that surplus going to the workers and the firm respectively. This will shed light on the discussion whether the negative effects of unions through rent-seeking behaviour dominate their potential positive effects through collective voice/ institutional response mechanisms.

Future research also aims at analysing the interactions between product and labour market performance in an international context. Furthermore, more attention should be paid to different skill-segments of the labour market. In *paper 2*, we investigate three channels through which international trade has affected workers' wages in the Belgian manufacturing industry. We aim at extending this research in several directions.

So far, we have concentrated on Belgium, a typical European unionised country characterised by a well-developed social security system and a relatively rigid labour market which prevents relative wage adjustments. These characteristics explain largely the fact that the negative effects of globalisation and the lower relative demand for unskilled workers have translated in higher relative unemployment rates for unskilled workers. In 1998, the ratio of the unemployment of low-qualified versus high-qualified workers was highest in Belgium compared to other European countries (OECD, 2000). A first extension will investigate more rigorously how globalisation has affected labour market outcomes of different skill-segments in the Belgian labour market.

Second, to shed light on the role of different labour market institutions and policies (e.g. rigid versus flexible labour markets, degree of unionisation, differences in the generosity of the social security system, active labour market policies), we will investigate the labour market consequences of increased integration for a number of countries and sectors (panel study). It would be interesting to compare the results for Belgium to e.g. the ones for the UK, characterised by a flexible labour market and Denmark, characterised by a low unemployment rate (also for low-skilled workers).

As most papers in the rent-sharing literature (except Bughin, 1991; Carruth and Oswald, 1985 and Svejnar, 1986), we assume in *paper 2* risk-neutral unions. Under risk neutrality, unions give equal weight to wages and employment in their preferences. They do not care about the distribution of revenues among their members but act as pure rent-maximisers. Their effect can be interpreted as a pure redistribution of rents from the firm to its workers. A third straightforward extension is relaxing the risk-neutrality assumption. A first testable hypothesis is whether unions have become more risk-averse as a consequence of globalisation. Put differently, do unions care more about the employment consequences of their wage policies? A second testable hypothesis is whether globalisation has affected the trade-off between wages and employment. In other words, has globalisation influenced the intra-union bargaining weight, i.e. the degree of wage orientation? This will shed light on whether increased international trade has reduced wage demands in exchange for employment security. To our knowledge, the direct effect of increased international trade on the constant relative risk aversion parameter and the intra-union bargaining weight has not been analysed before.

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**JOINT ESTIMATION OF PRICE-COST MARGINS AND  
UNION BARGAINING POWER  
FOR BELGIAN MANUFACTURING\***

**ABSTRACT**

This paper extends Hall's (1988) methodology to analyse imperfections in both the product and the labour market for firms in the Belgian manufacturing industry over the period 1988-1995. We investigate the heterogeneity in price-cost mark-up and workers' bargaining power parameters among 18 sectors within the manufacturing industry as well as the relationship between both parameters. Using a sample of more than 7 000 firms, our GMM results indicate that ignoring imperfection in the labour market leads to an underestimation in the price-cost margin evaluated at perfect competition in the labour market. These findings are confirmed in the sectoral analysis. Sectors with higher workers' bargaining power typically show higher price-cost margins.

*JEL Classification* : C23, D21, J50, L13.

*Key Words* : Efficient Bargaining, Bargaining Power, Market Power, Price-Cost Margins.

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## 1. INTRODUCTION

Intense research in industrial organisation has led to the design of more and more refined methods to assess price-setting behaviour of firms in various environments (see Bresnahan, 1989 and Schmalensee, 1989 for surveys). However, the approach has generally remained restrictive, in the sense that it has ignored the possibility that inputs, and particularly labour, are not priced competitively. The fact that unions bargain over wages and hence over a share of the firm's non-competitive rents, necessitates the integration of labour market variables when investigating profit margins. Labour economists on the other hand have devoted effort to test for imperfect competition in the labour market. Most papers deal with the determination of wages and employment in the presence of trade unions. The broad body of papers examines the effect of industry or firm performance on wages within a collective bargaining framework<sup>1</sup> and strongly supports the rent-sharing hypothesis. But a similar criticism applies to these studies, i.e. they solely focus on imperfections in the labour market, assuming perfect competition in the product market.<sup>2</sup> Only a few studies (Bughin, 1996; Crépon et al., 2002; Neven et al., 2002; Schroeter, 1988) have considered the possibility of imperfections in both product and factor markets, thereby taking into account that wages are no longer exogenous in econometric tests of product market power.

In this paper, we investigate the relationship between the degree of labour market imperfections and the price-cost margin<sup>3</sup> of firms in the Belgian manufacturing industry over the period 1988-1995. We analyse how the *distribution* of the surplus available for sharing between the workers and the firm as well as the *size* of that surplus are related to union bargaining power.

Methodologically, we follow Crépon et al. (2002). Their methodology is a natural extension of Hall's (1988) approach, which in turn originated from Solow's (1957) well-known article on estimating total factor productivity as a measure of technical change. Besides deviating from perfect competition in the product market, we allow for the possibility that wages are bargained off the labour demand curve, according to an Efficient Bargaining model. Relaxing the condition that labour is priced competitively has important implications for the derivation of the Solow residual. More precisely, it can be shown that the Solow residual can be decomposed into four components: (1) a mark-up of price over marginal cost component, (2) a scale factor, (3) a factor reflecting

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<sup>1</sup> See e.g. Blanchflower et al. (1996), Dobbelaere (2004), Goos and Konings (2001), Hildreth and Oswald (1997) and Teulings and Hartog (1998).

<sup>2</sup> The necessary conditions for a union to be able to appropriate any rents in a perfectly competitive product market without driving the firm out of existence are (1) that the union acts as a monopolist in the supply of labour and (2) that there is a fixed number of firms in the perfectly competitive industry (Booth, 1995).

<sup>3</sup> Throughout the paper, the price-cost margin refers to the 'hypothetical' price-cost margin, i.e. the price-cost margin evaluated at perfect competition in the labour market (for technical details, see section 2).

union bargaining power and (4) the rate of technical change. This extended approach has the advantage that no measurement of the user cost of capital is needed to estimate the firms' price-cost mark-up. Neither is a measurement of the alternative wage required to estimate the bargaining power of the union. In addition to testing simultaneously for imperfections in the product and the labour market, this approach provides an alternative test, based on the labour share, of the Right-To-Manage versus the Efficient Bargaining model.

We take advantage of a rich firm-level dataset covering the entire Belgian manufacturing industry over the period 1988-1995. Our analysis allows us to make various contributions to the literature. First, whereas the analysis of Crépon et al. (2002) is limited to the manufacturing industry as a whole, our large sample enables us to examine the important issue of heterogeneity in both price-cost mark-up and union bargaining power parameters. More specifically, we (1) study the heterogeneity among sectors and (2) investigate the relationship between union bargaining power and price-cost mark-ups. To our knowledge, the interaction between product market and labour market imperfections at the sectoral level has not been investigated before. Second, in contrast to most of the literature following Hall (1988), we estimate market power using a firm-level dataset. In addition to increasing the reliability and the efficiency of the estimates and to taking into account firm-heterogeneity within sectors, the use of firm-level data allows us to construct good instruments. We apply the Arellano and Bond (1991) Generalised Method of Moments (GMM) technique. Our main findings are the following. First, our results confirm the conclusion of Crépon et al. (2002) that ignoring imperfect competition in the labour market leads to an underestimation of the price-cost margin at the manufacturing industry level. Our sectoral analysis shows that this conclusion also holds at the sectoral level. Second, focusing on the cross-section dimension enables us to reach conclusions in terms of interdependencies between the estimated price-cost margins and the estimated union bargaining power. We find that sectors with higher union bargaining power typically show higher price-cost margins. The positive correlation between the two estimated parameters can be interpreted in two ways. One interpretation is that labour market imperfections affect product market imperfections in the long run. The reason is that strong unions reduce the share of the rents left to the firm, thereby driving firms out of the market and reducing the degree of product market competition. According to this interpretation, more powerful unions do not only increase the fraction of product rents going to labour but also the size of total rents available for sharing between the workers and the firm. Another interpretation runs from product market to labour market characteristics, capturing a standard effect in the trade union literature. According to this interpretation, unions are most likely to be created in firms where rents can be extracted. This is most likely to happen if there is imperfect competition in the product market.

In the remainder, we first describe our theoretical framework (section 2). Section 3 surveys the existing literature on the effect of unions on economic performance. In section 4, we outline our empirical model. Section 5 presents the dataset and some summary statistics. Section 6 discusses the estimation method and confronts the theoretical hypotheses with Belgian firm-level data. Section 7 summarises and interprets the results.

## 2. THEORETICAL FRAMEWORK

### 2.1. Imperfection in the Output Market, Perfect Competition in the Labour Market

We start from a standard production function  $Q_{it} = \Theta_{it} F(N_{it}, M_{it}, K_{it})$  where  $i$  is a firm index,  $t$  a time index,  $N$  is labour,  $M$  is material input and  $K$  is capital.  $\Theta$  is an index of total factor productivity which is allowed to vary across firms and over time. This shift variable is modelled as the sum of a deterministic component and a random component, i.e.  $\Theta_{it} = A e^{a_i + a_t + u_{it}}$ , where  $a_i$  is a firm-specific time-invariant component,  $a_t$  represents productivity shocks common to all firms in a given year and  $u_{it}$  is a random component with mean zero capturing transitory and idiosyncratic differences in productivity.

Letting  $q_{it}, n_{it}, m_{it}, k_{it}$  and  $\theta_{it}$  be the logarithms of  $Q_{it}, N_{it}, M_{it}, K_{it}$  and  $\Theta_{it}$ , we can write the logarithmic differentiation of the production function as:

$$\Delta q_{it} = \varepsilon_{it}^{Q,N} \Delta n_{it} + \varepsilon_{it}^{Q,M} \Delta m_{it} + \varepsilon_{it}^{Q,K} \Delta k_{it} + \Delta \theta_{it} \quad (1)$$

where, using the Tornquist approximation, the time log-derivatives  $\Delta x$  ( $x = q, n, m, k, \theta$ ) are replaced by the year to year log-changes ( $x_t - x_{t-1}$ ) and the production function log-derivatives, i.e. the elasticities  $\varepsilon_{it}^{Q,J} = \partial q_{it} / \partial j_{it}$  ( $j = n, m, k$ ), by their averages over adjacent years  $\varepsilon_{it}^{Q,J} = \frac{1}{2} [\partial q_{i,t-1} / \partial j_{i,t-1} + \partial q_{it} / \partial j_{it}]$ .

Under perfect competition, it is well known since Solow that  $\Delta q_{it}$  can be decomposed as follows:

$$\Delta q_{it} = \alpha_{N_{it}} \Delta n_{it} + \alpha_{M_{it}} \Delta m_{it} + \alpha_{K_{it}} \Delta k_{it} + \Delta \theta_{it} \quad (2)$$

where  $\alpha_{Jit} = \frac{P_{Jit} J_{it}}{P_{it} Q_{it}}$  ( $J = N, M, K$ ) is the share of inputs in total revenue. Consistent with the

Tornquist approximation, these shares are computed as the averages over adjacent years.

Under imperfect competition in the product market and perfect competition in the input markets, Eq. (2) becomes (Hall, 1988):

$$\Delta q_{it} = \mu_{it} (\alpha_{Nit} \Delta n_{it} + \alpha_{Mit} \Delta m_{it} + \alpha_{Kit} \Delta k_{it}) + \Delta \theta_{it} \quad (3)$$

where  $\mu_{it} = \frac{P_{it}}{C_{Qit}}$  is the mark-up of price over marginal cost evaluated at the competitive wage level.

Assuming constant returns to scale, i.e.  $\mu_{it} (\alpha_{Nit} + \alpha_{Mit} + \alpha_{Kit}) = 1$ , and rearranging terms, another way to write Eq. (3) is:

$$\begin{aligned} & \Delta q_{it} - \alpha_{Nit} \Delta n_{it} - \alpha_{Mit} \Delta m_{it} - (1 - \alpha_{Nit} - \alpha_{Mit}) \Delta k_{it} \\ &= (\mu_{it} - 1) [\alpha_{Nit} (\Delta n_{it} - \Delta k_{it}) + \alpha_{Mit} (\Delta m_{it} - \Delta k_{it})] + \Delta \theta_{it} \\ &= \beta_{it} (\Delta q_{it} - \Delta k_{it}) + (1 - \beta_{it}) \Delta \theta_{it} \end{aligned} \quad (4)$$

where  $\beta_{it} = \frac{P_{it} - C_{Qit}}{P_{it}} = \frac{\mu_{it} - 1}{\mu_{it}}$  is the price-cost margin.

Under increasing or decreasing returns to scale,

$$\frac{w_{it} N_{it}}{C_{Qit} Q_{it}} + \frac{P_{Mit} M_{it}}{C_{Qit} Q_{it}} + \frac{r_{it} K_{it}}{C_{Qit} Q_{it}} = 1 + \gamma_{it} \quad \text{or} \quad \mu_{it} (\alpha_{Nit} + \alpha_{Mit} + \alpha_{Kit}) = 1 + \gamma_{it}$$

where  $\gamma$  can be higher than 0 (increasing returns to scale) or lower than 0 (decreasing returns to scale) and  $1 + \gamma$  is the local scale elasticity measure.

Eq. (4) can therefore easily be generalised as:

$$\begin{aligned} & \Delta q_{it} - \alpha_{Nit} \Delta n_{it} - \alpha_{Mit} \Delta m_{it} - (1 - \alpha_{Nit} - \alpha_{Mit}) \Delta k_{it} \\ &= (\mu_{it} - 1) [\alpha_{Nit} (\Delta n_{it} - \Delta k_{it}) + \alpha_{Mit} (\Delta m_{it} - \Delta k_{it})] + \gamma_{it} \Delta k_{it} + \Delta \theta_{it} \\ &= \beta_{it} (\Delta q_{it} - \Delta k_{it}) + \frac{\gamma_{it}}{\mu_{it}} \Delta k_{it} + (1 - \beta_{it}) \Delta \theta_{it} \end{aligned} \quad (5)$$

This equation shows that the Solow Residual can be decomposed into (1) a price-cost mark-up component, (2) a scale factor and (3) a technological term or true total factor productivity growth ( $\Delta \theta_{it} = \Delta a_{it} + \Delta u_{it}$ ).

## 2.2. Imperfection in both the Output and the Labour Market

Relaxing the assumption that labour is priced competitively has important implications for the derivation of the Solow residual. To see this, assume that the union and the firm are involved in an Efficient Bargaining procedure, with both wages ( $w$ ) and employment ( $N$ ) as the subject of agreement (McDonald and Solow, 1981). Both parties maximise their respective utility during the bargaining process. The union is risk neutral 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  $\pi$ , 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 that union preferences do not depend on those inputs (Bughin, 1996). Moreover, we normalise for the present by assuming that  $Q = N$ .

The bounds of the bargaining range are given by the minimum acceptable utility levels for both parties. The threat point for the union is the alternative wage  $w_a$ . If no revenue accrues to the firm when negotiation breaks down, the firm's fall-back utility equals  $-F$ . The outcome of the bargaining is the asymmetric generalised Nash solution to:

$$\max_{w, N} \Omega = \left\{ Nw + (\bar{N} - N)w_a - \bar{N}w_a \right\}^\phi \{R - wN\}^{1-\phi} \quad (6)$$

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

Maximisation of Eq. (6) with respect to the wage rate ( $w$ ) gives the following equation:

$$w = (1 - \phi)w_a + \phi \frac{R}{N} \quad (7)$$

Maximising Eq. (6) with respect to employment ( $N$ ) leads to the following first-order condition:

$$w = R_N + \frac{\phi}{1 - \phi} \left[ \frac{R - wN}{N} \right] \Leftrightarrow w = R_N + \phi \left[ \frac{R - R_N N}{N} \right] \quad (8)$$



From Eq. (8), 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 ( $w$ ) (Andersen and Sorensen, 2004; Blanchard and Giavazzi, 2003; Brown and Ashenfelter, 1986). 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. (8)] shows the extent to which the bargaining outcome is off the labour demand curve.

In section 2.1, we defined  $\beta$  as the price-cost margin evaluated at the competitive wage level, i.e.  $\beta = \frac{P - C_o}{P}$ . Using the contract curve outcome, we can also write  $\beta$  in this setting as:

$\beta = \frac{R/N - w_a}{R/N} = \frac{R - R_N N}{R}$ . Hence, Eq. (8) can be rewritten as:

$$w = R_N + \phi \frac{R}{N} \beta \quad (9)$$

Eq. (9) shows that the union premium is part of the price-cost margin ( $\beta$ ), set by a profit-maximising firm facing an exogenously determined wage equal to  $R_N$  ( $= w_a$  in our case).<sup>4</sup> Hence, wage rents under Efficient Bargaining depend on the imperfect market structure in both the output market (as reflected by the firm's price-cost margin  $\beta$ ) and the labour market (as reflected by the union's bargaining power  $\phi$ ). In other words, the positive union wage premium depends on the *size* of the surplus available for sharing between the workers and the firm as well as on the *fraction* of the surplus going to the workers. Both these factors are in turn related to the collective bargaining structure, the market structure and the technology of the firm.

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<sup>4</sup> Since in the Efficient Bargaining model, marginal revenue ( $R_o$ ) equals marginal cost ( $C_o$ ) evaluated at the competitive levels of output and wages, the mark-up has to be interpreted as a mark-up of prices over marginal costs evaluated at the competitive wage level,

i.e.  $\mu = \frac{P}{C_o(Q, w_a)}$  with  $w_a$  the competitive wage and  $\bar{Q}$  the competitive output level (see also Blanchard and Giavazzi, 2003).

Dropping the normalisation assumption ( $Q = N$ ) and defining the mark-up parameter  $\mu$  as the inverse of the elasticity of revenue with respect to output, i.e.  $\mu = \left[ R_Q \frac{Q}{R} \right]^{-1}$  where  $R_Q$  is the marginal revenue, we can express the marginal revenue of labour as:  $R_N = \frac{PQ_N}{\mu}$  with  $Q_N$  the physical marginal product of labour. Using this expression for  $R_N$  in Eq. (8), the efficient bargaining labour share is written as:

$$\frac{wN}{PQ} = \alpha_N = \phi + (1 - \phi) \frac{\varepsilon^{Q,N}}{\mu} \quad (10)$$

Under the generalised Nash solution, the equilibrium labour share ( $\alpha_N$ ) is hence a linear function of the elasticity of output with respect to labour ( $\varepsilon^{Q,N}$ ). The efficient bargaining labour share equals unity if  $\phi = 1$ , i.e. if the union has all the power to capture the firm's product rents.

Rewriting Eq. (10) as:  $\varepsilon^{Q,N} = \mu\alpha_N + \mu \frac{\phi}{1 - \phi} (\alpha_N - 1)$ , an extra term can be added to Eq. (5):

$$\begin{aligned} & \Delta q_{it} - \alpha_{Nit} \Delta n_{it} - \alpha_{Mit} \Delta m_{it} - (1 - \alpha_{Nit} - \alpha_{Mit}) \Delta k_{it} \\ &= (\mu_{it} - 1) \left[ \alpha_{Nit} (\Delta n_{it} - \Delta k_{it}) + \alpha_{Mit} (\Delta m_{it} - \Delta k_{it}) \right] + \\ & \quad \gamma_{it} \Delta k_{it} + \mu_{it} \frac{\phi_{it}}{1 - \phi_{it}} (\alpha_{Nit} - 1) (\Delta n_{it} - \Delta k_{it}) + \Delta \theta_{it} \\ &= \beta_{it} (\Delta q_{it} - \Delta k_{it}) + \frac{\gamma_{it}}{\mu_{it}} \Delta k_{it} + \frac{\phi_{it}}{1 - \phi_{it}} (\alpha_{Nit} - 1) (\Delta n_{it} - \Delta k_{it}) + (1 - \beta_{it}) \Delta \theta_{it} \end{aligned} \quad (11)$$

From Eq. (11), it follows that the Solow residual can now be decomposed into four components: (1) a mark-up of price over marginal cost component, (2) a scale factor, (3) a factor reflecting union bargaining power and (4) the rate of technical change. Remember that the mark-up has to be interpreted as a mark-up of prices over marginal costs evaluated at the competitive wage level.

### 3. EXISTING LITERATURE

The estimation of equations (5) and (11) allows us to shed light on the relationship between the degree of labour market imperfections and the price-cost margins of firms, evaluated at perfect competition in the labour market. This enables us to conclude whether labour market and product market characteristics are correlated and -more specifically- whether imperfections in both markets are likely to go hand in hand. Before elaborating on that issue, we survey the existing theoretical and empirical literature on the effect of labour market imperfections on product market performance in this section. First, we discuss the union-productivity effect. Second, the impact of unions on firm profitability is considered. Finally, we focus on the effect of unions on dynamic efficiency, such as R&D investment and innovative activity. The resulting hypotheses will be our point of reference for some of the interpretations of our empirical results in section 7.

#### 3.1. Impact of Unions on Productivity

Productivity changes occur through technological changes, changes in technical efficiency and changes in scale efficiency. Theoretically, unions can raise productivity through various channels. First, firms may respond to the increased labour costs by increasing the capital intensity and employing better-quality labour, hence increasing labour productivity. Second, productivity improvements can result from the fact that unions can cause a 'shock effect', inducing managers to change production methods and to adopt more efficient personnel policies (Slichter et al., 1960). Third, unions can reduce staff turnover (Addison and Barnett, 1982; Freeman, 1976). Fourth, unions can stress seniority rules (Rees, 1989). Fifth, unions can improve worker morale and motivation (Leibenstein, 1966). Sixth, unions can improve communication between workers and management (Dworkin and Ahlburg, 1985). In the literature, the first channel is called the monopoly union effect. Note that the gain in productivity resulting from this effect is socially harmful because it is caused by inefficient allocation of resources. The other channels are called the union voice/ institutional response effects. The gain in productivity resulting from these effects is socially desirable because it is induced by improved efficiency (DeFina, 1983; Freeman and Medoff, 1979). Negative productivity effects can arise from strike activity and non-cooperative behaviour (Caves, 1980; Flaherty, 1987). Second, unions may decrease productivity by discouraging investment in physical and intangible assets (Grout, 1984). Third, unions may force firms to adopt inefficient work practices (Pencavel, 1977).

Using various datasets for a number of sectors and countries and different econometric techniques, the empirical literature has produced mixed results. Following Brown and Medoff

(1978) [US], evidence in favour of positive union-productivity effects has been derived in several studies.<sup>5</sup> Other studies however provide evidence of a negative union-productivity effect.<sup>6</sup> Recent empirical evidence for the UK shows no differences in productivity of union compared to non-union workplaces (Pencavel, 2002).

A separate part of the empirical literature has focused on the effect of unions on productivity growth.<sup>7</sup> Using US data, Kendrick and Grossman (1980) find a negative union-productivity growth effect from 1948 to 1966 but a positive effect from 1967 to 1976. Several studies provide evidence of a negative effect of unions on productivity growth (see Hirsch and Link, 1984 and Mansfield, 1980 for the US; and Maki, 1983 for Canada). A positive impact of unions on productivity growth has been found by Gregg et al. (1993) [UK] and Phipps and Sheen (1994) [Australia].

The empirical studies mentioned above follow the traditional production function approach, i.e. they investigate the effect of unions on productivity assuming that there is technical efficiency in the production process. Only a few studies have assessed the union-productivity effect by estimating a stochastic production frontier, hence allowing for technical inefficiency. Among them, Byrnes et al. (1988) and Cavalluzzo and Baldwin (1993) find a positive union-productivity effect using US data whereas Doucouliagos and Laroche (2002) show a negative union-productivity effect for France.<sup>8</sup>

### 3.2. Impact of Unions on Profitability

Theoretically, the rent-seeking view of unions focuses on the increased labour costs and the associated impact on labour allocations (Lewis, 1963). If there is no offsetting productivity effect, unions will depress profitability.

Whereas empirically, no robust conclusion can be reached concerning the union-productivity effect, the empirical studies on the effect of unions on profitability conclude that unions decrease profitability on average (see Addison and Hirsch, 1989; Becker and Olson, 1992 and Kleiner, 2001 for good surveys for the US; Benson, 1994 and Tachibanaki and Noda, 2000 for Japan; Machin and Stewart, 1996; Menezes-Filho, 1997; Metcalf, 1993 and Stewart, 1990 for the UK). This conclusion is invariant to the profit measure used, to the use of sectors or firms as the unit of observation and to the time period under investigation. The studies differ, however, in their conclusions about the

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<sup>5</sup> See Allen (1984, 1986, 1988), Clark (1980a, 1980b), Freeman and Medoff (1983) and Schuster (1983) for the US; Coutrot (1996) for France; Huebler and Jirjahn (2001) for Germany; Maki (1983) for Canada; and Benson (1994), Morishima (1991) and Muramatsu (1984) for Japan.

<sup>6</sup> See Bemmels (1987), Grady and Hall (1985), Hirsch and Addison (1986) for the US; Schnabel (1991) for Germany; Brunello (1992) and Tachibanaki and Noda (2000) for Japan; Davis and Caves (1987), Edwards (1987), Metcalf (1993), Moreton (1999) and Pencavel (1977) for the UK; and Crockett et al. (1992), Phipps and Sheen (1994) and Wooden (1990) for Australia.

<sup>7</sup> Unions may have a positive effect on productivity while inducing lower productivity growth. This could arise, for example, when unions increase efficiency but at the same time have a negative impact on technical change by retarding investment.

<sup>8</sup> For France, the negative effect is reversed, however, for firms that adopt many Human Resources Management practices (HRM).

magnitude of the negative union-profitability effect (Hirsch, 1997).<sup>9</sup> Recent evidence for the US, however, shows a positive relationship between unionisation and profitability (Batt and Welbourne, 2002). Using UK data, Machin and Stewart (1996) and Menezes-Filho (1997) show that the negative union-profitability effect has weakened considerably over the 1980s.<sup>10</sup> Recent empirical work for the UK finds no overall relationship between union presence and profitability by the end of the 1990s (Addison and Belfield, 2000; Bryson and Wilkinson, 2002 and McNabb and Whitfield, 2000).<sup>11</sup>

### 3.3. Impact of Unions on Innovative Investment Activity

Theoretically, unions can influence investment both positively and negatively. In the traditional model, higher union wages induce firms to move up and along their labour demand curve by decreasing employment, hiring high-quality workers and increasing the capital-to-labour ratio. Investment in (in)tangible capital can either decrease or increase depending on the magnitude of positive substitution versus negative scale effects.<sup>12</sup> The first new generation of theories focusing on the impact of unionisation on investment highlights union rent-seeking behaviour which depresses R&D spending and investment. In this setting, unions appropriate some of the quasi-rents earned on long-lived capital. Hence, union wage increases act as a tax on capital that lowers the net rate of return on investment (hold-up problem). In response, firms reduce investment in innovative and physical capital (Baldwin, 1983; Grout, 1984; Hirsch and Link, 1987; Hirsch and Prasad, 1995 and Malcomson, 1997). The second new generation of theories has qualified the underinvestment outcome by considering oligopolistic competition between firms in the final goods market (Tauman and Weiss, 1987; Ulph and Ulph, 1994; 1998; 2001). In this setting, R&D is undertaken for strategic reasons by firms that are competing with each other. Tauman and Weis (1987) consider a duopoly where only one firm is unionised. In their model the unionised firm, facing a higher wage level, can have more incentives to invest. Using an efficient bargaining model, Ulph and Ulph (1998, 2001) show that the relationship between union strength and R&D is inverse U-shaped if the union cares a lot about employment.

The earliest empirical evidence supporting the union tax model has been provided by Connolly et al. (1986) for the US. Hirsch (1991) distinguishes direct and indirect effects of unions on investment. The direct effect arises from the union tax on returns to capital. The indirect effect

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<sup>9</sup> Almost all the studies treat union density as exogenous. The few studies that take into account that unionisation and profitability should in fact be determined simultaneously, find larger estimates of the impact of unions on profitability (Hirsch, 1991; Voos and Michel, 1986). This is because unions are most likely to organise and survive in firms that are most profitable.

<sup>10</sup> The authors conclude that the negative union-profitability effect only survives if unions are strong and if there is weak competition in the product market.

<sup>11</sup> Metcalf (2003) also argues that the union-profitability effect is highly dependent on the degree of competition in the product market. In case of monopolistic competition, unions still have a negative effect on profitability.

<sup>12</sup> Note that the traditional on-the-demand curve approach is, however, inadequate for two reasons. First, both the union and the firm prefer settlements off the labour demand curve. Second, the union wage increase is considered as an independent increase in the cost of labour relative to capital (Hirsch, 1997).

stems from the increased financing costs owing to depressed profits. For the US, he finds a negative effect of unions on capital investment which is doubled when the profit effect is taken into account. These findings are confirmed for R&D investment although the indirect effect is only modest in that case. Similar conclusions are provided by Allen (1988), Bronars and Deere (1993), Bronars et al. (1994) for the US; Betts and Odgers (1997) for Canada; Addison et al. (1993) for Germany and Denny and Nickell (1992) for the UK. In contrast, Benson (1994) provides evidence in favour of the traditional model, i.e. unionisation seems to increase capital investment in Japan. Schedlitzki (2002) concludes that there is no relationship between unionisation and investment in capital and R&D in Germany. Using British data, Ulph and Ulph (1988) find that unionisation has a positive effect on R&D investment in low-tech industries but a negative effect in high-tech industries. Addison and Wagner (1994) provide evidence of a positive impact of unions on R&D investment in British low-tech industries. They argue, however, that the positive effect is due to endogeneity of unionisation. Menezes-Filho et al. (1998) find a negative effect of unions on R&D spending in the UK but this effect basically disappears when they control for technological opportunities in the industry and cohort effects. Moreover, using an ex-post efficient bargaining model<sup>13</sup> they provide evidence of a quadratic relationship between R&D expenditure and union density, i.e. R&D rises with union density up to a threshold and then falls. This empirical finding supports the second new generation of theories investigating the effect of unions on investment.

#### 4. EMPIRICAL MODEL

Rewriting: 
$$\Delta q_{it} - \alpha_{Nit} \Delta n_{it} - \alpha_{Mit} \Delta m_{it} - (1 - \alpha_{Nit} - \alpha_{Mit}) \Delta k_{it}$$

as  $SR_{it}$  and imposing that  $\beta_{it} = \beta = 1 - \frac{1}{\mu}$ ,  $\mu_{it} = \mu$ ,  $\gamma_{it} = \gamma$  and  $\phi_{it} = \phi$ , we are able to estimate four different specifications.

Model 1 : constant returns to scale and no bargaining ( $\gamma = 0$ ,  $\phi = 0$ )

$$SR_{it} = \beta(\Delta q_{it} - \Delta k_{it}) + (1 - \beta)\Delta\theta_{it} \quad (12)$$

Model 2 : increasing or decreasing returns to scale and no bargaining ( $\phi = 0$ )

$$SR_{it} = \beta(\Delta q_{it} - \Delta k_{it}) + \left(\frac{\gamma}{\mu}\right)\Delta k_{it} + (1 - \beta)\Delta\theta_{it} \quad (13)$$

<sup>13</sup> An ex-post efficient bargaining model refers to the case where the firm and the union bargain over wages and employment in the second stage conditional on the R&D decision which is taken by the firm in the first stage.

Model 3 : constant returns to scale and bargaining ( $\gamma = 0$ )

$$SR_{it} = \beta(\Delta q_{it} - \Delta k_{it}) + \frac{\phi}{1-\phi}(\alpha_{Nit} - 1)(\Delta n_{it} - \Delta k_{it}) + (1-\beta)\Delta\theta_{it} \quad (14)$$

Model 4 : increasing or decreasing returns to scale and bargaining

$$SR_{it} = \beta(\Delta q_{it} - \Delta k_{it}) + \left(\frac{\gamma}{\mu}\right)\Delta k_{it} + \frac{\phi}{1-\phi}(\alpha_{Nit} - 1)(\Delta n_{it} - \Delta k_{it}) + (1-\beta)\Delta\theta_{it} \quad (15)$$

where  $\Delta\theta_{it} = \Delta a_t + \Delta u_{it}$ . In the estimations,  $\Delta a_t$  is captured by year dummies and  $\Delta u_{it}$  represents the stochastic element of productivity growth.

## 5. DATA

We use an unbalanced panel of the entire population of Belgian firms in the manufacturing industry over the period 1988-1995. All variables are taken from annual company accounts which are collected by the National Bank of Belgium (NBB). We use real gross sales as a proxy for production ( $Q$ ). Labour ( $N$ ) refers to the average number of employees in each firm for each year and material input ( $M$ ) refers to the quantity of materials employed. The capital stock ( $K$ ) is proxied by tangible fixed assets at historic cost minus depreciation. Nominal variables are deflated by the three-digit producer price index which we have drawn from the National Statistical Office (NIS).

In the initial dataset, the number of firms is approximately 19 000 per year. For the estimates, we only include firms for which we have at least three consecutive observations for all variables, ending up with 7 086 firms. Table 1 reports the means, standard deviations and first and third quartiles of the included data for our main variables. The average growth rate of real firm output for the overall sample is 2.9% per year over the period 1988-1995 whereas the corresponding average manufacturing industry real output growth rate amounts to 4.2%. Capital has decreased at an average annual growth rate of 2.4%, materials have increased at an average annual growth rate of 3% and labour is stable over the period. The Solow residual or the conventional measure of total factor productivity has increased at an average annual growth rate of 1.2%. As expected for firm-level data, the dispersion of all these variables is considerably large. For example, TFP growth is smaller than -2.9% for the first quartile of firms and higher than 5.3% for the fourth quartile.

**Table 1** Summary Statistics

VARIABLES	1988-1995			
	Mean	St. Dev.	Q1	Q3
Real firm output growth rate $\Delta q$	0.029	0.173	-0.060	0.123
Real industry output growth rate $\Delta q_{ind}$	0.042	0.164	-0.028	0.107
Labour growth rate $\Delta n$	0.005	0.154	-0.029	0.041
Capital growth rate $\Delta k$	-0.024	0.214	-0.156	0.097
Materials growth rate $\Delta m$	0.030	0.198	-0.075	0.139
Labour share $\alpha_N$ in nominal output	0.272	0.153	0.158	0.361
Materials share $\alpha_M$ in nominal output	0.629	0.175	0.516	0.753
Solow residual SR (TFP)	0.012	0.093	-0.029	0.053
$\Delta(q - k)$	0.053	0.227	-0.092	0.210
$(\alpha_N - 1) \Delta(n - k)$	-0.020	0.170	-0.124	0.077

Note: (1) For all variables, the number of observations is 35518.

$$(2) SR = \Delta q - \alpha_N \Delta n - \alpha_M \Delta m - (1 - \alpha_N - \alpha_M) \Delta k.$$

## 6. ESTIMATION METHOD AND RESULTS

### 6.1. Estimation Technique

Since transitory productivity shocks ( $u_{it}$ ) might affect the level of factor inputs to the extent that the shock becomes part of the firm's information set before input choices are determined, Ordinary Least Squares (OLS) estimates would be inconsistent and biased. Moreover, the production price is endogenous to our models since the product market is imperfectly competitive and the production price depends on strategic quantity choices made by firms. Hence, we treat all current dated firm-specific variables as potentially endogenous.

To take into account the endogeneity problems, we estimate the models using the Generalised Method of Moments (GMM) technique for panel data as advocated by Arellano and Bond (1991). This estimation method is a more robust and efficient extension of the first-difference Instrumental Variable method suggested for dynamic fixed effects models by Anderson and Hsiao (1982). The reason is that it utilises the moment conditions around the error term to provide additional instruments.

Under the assumption that current random shocks are uncorrelated with past values of firm-level regressors, we use lagged values of  $\Delta n$ ,  $\Delta m$  and  $\Delta k$  from (t-2) and before as instruments.<sup>14,15</sup>

<sup>14</sup> Since all variables are expressed as growth rates, permanent shocks are not considered.

<sup>15</sup> Assuming that the idiosyncratic component of the productivity shock ( $u_{it}$ ) is white noise, taking first (logarithmic) differences introduces errors that have a moving average structure of order one. For this reason, legitimate instruments are dated (t-2) or earlier.



Crépon et al. (2002) and Klette and Griliches (1996) have adopted a similar approach. The validity of the use of 2-period lagged instruments depends critically on the errors in the level equation being serially uncorrelated. Absence of second-order serial correlation in the first-difference error term is hence needed. We therefore present tests of this null hypothesis using a statistic developed in Arellano and Bond (1991) which has a standard normal distribution. The exogeneity of the instruments with respect to the error term is further tested by the Sargan test statistic which is distributed as chi-squared. The GMM estimator is also robust to heteroskedasticity.<sup>16</sup> In addition to using IV estimation techniques, we also include time dummies to capture possible unobservable aggregate shocks and productivity shocks common to all firms in a given year ( $a_t$ ). By taking the first (logarithmic) difference of the production function, we control for individual firm effects ( $a_i$ ). As a consequence, our parameter estimates are consistent even if  $a_i$  were correlated with regressors.

Estimation is carried out using the Dynamic Panel Data program developed by Arellano and Bond (1988), which works with the GAUSS programming language.

## 6.2. General Results

First, we ignore potential heterogeneity in the price-cost mark-up and the bargaining power parameters among sectors and estimate equations (12)-(15) for the manufacturing industry as a whole over the period 1988-1995. The two-step estimates are reported in Table 2. The first part of Table 2 gives the estimated values of the coefficients for the regressors entering the models. Part 2 presents the structural parameters computed from the reduced form parameters and the third part provides specification tests.

The specification tests do not show evidence against our estimates. Absence of second-order serial correlation cannot be rejected, which justifies our use of twice lagged instruments. The Sargan test does not reject their joint validity. As to the estimated coefficients, our main findings can be summarised as follows. Focusing on the degree of market power, all estimated models show that the price to marginal cost ratio is significantly larger than one, hence supporting the hypothesis of imperfect competition in the output market. This result confirms the findings of Bughin (1996) and Konings et al. (2001) who provide evidence of non-competitive pricing strategies in the Belgian manufacturing industry. Our estimates of the price-cost mark-up range from 20 to 49 percent. The results of Model 1 are in line with those of Martins et al. (1996) who find that the average mark-up for Belgian manufacturing over the period 1980-1992 is about 18 percent.<sup>17</sup> They

<sup>16</sup> In the paper, we report the second-step (optimal) GMM estimates. Our first-step estimates affect the precision of the estimates but confirm our main conclusions about the signs and significance of the parameters.

<sup>17</sup> These authors apply Roeger's (1995) method, however, which uses the 'Solow residual' to estimate price-cost mark-ups.

also accord with the estimates of Konings et al. (2001) who point to a mark-up ratio of 1.27 for large firms in the Belgian manufacturing industry over the period 1994-1996.

As far as the nature of returns to scale is concerned, Model 2 and Model 4 support the hypothesis of increasing returns to scale: the coefficient on  $\Delta k$  is significantly larger than zero in both models (point estimates of 0.165 and 0.099 respectively). The estimated scale elasticity is 1.228 (Model 2) and 1.147 (Model 4).<sup>18</sup>

We now turn to discussing the potential relationship between labour market imperfections and product market imperfections, as implied by the estimates of Model 3 and Model 4. First of all, we notice that the new variable which accounts for union bargaining power, is strongly significant when entering the models. The estimates of Model 3 point to a significant union bargaining power of 0.285 on a scale going from 0 to 1. In Model 4 the estimated bargaining power parameter is 0.244. These results reject the hypothesis that workers have no influence over employment, which is consistent with the idea that wages are bargained off the conventional labour demand curve. Hence, our findings accord with stylised facts about Belgian industrial relations<sup>19</sup> and confirm those of Bughin (1993) who rejects the Right-To-Manage model in favour of the Efficient Bargaining model for Belgium. Our estimates are somewhat higher than the value of union power (0.1) obtained by Goos and Konings (2001) for Belgium during the period 1987-1994. However, their empirical analysis boils down to estimating a Right-To-Manage model in which the elasticity of wages with respect to profits per employee measures the bargaining strength of the workers. In contrast, our analysis rejects the fact that union power does not affect the labour share.

The price-cost mark-up parameter is significantly higher than the estimates obtained from Model 1 and Model 2. Model 3 implies a significant price to marginal cost ratio of 1.350 compared to an estimate of 1.196 when labour market imperfections are ignored. In Model 4, the price-cost ratio increases to 1.488 compared with 1.381 when ignoring union bargaining power. Our findings are hence qualitatively consistent with those of Crépon et al. (2002). Using a panel of 1026 French manufacturing firms over the period 1986-1992, price-cost mark-ups are found to be about 40 percent and union bargaining power is estimated at about 0.60. Ignoring imperfect competition in the labour market brings the price-cost mark-up estimate down to 10 percent.

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<sup>18</sup> Note that the finding of increasing returns to scale is not driven by the inclusion of many small firms in our sample. Restricting the analysis to firms with more than 50 employees or firms with more than 100 employees still supports the hypothesis of increasing returns to scale.

<sup>19</sup> 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).

Table 2 General Results

	Model 1	Model 2	Model 3	Model 4
<b>REDUCED FORM PARAMETERS</b>				
<b>Constant</b>	0.0002 (0.002)	-0.009** (0.004)	-0.002 (0.003)	-0.009** (0.004)
<b>Output per Capital</b> $\Delta(q - k)$	0.164*** (0.030)	0.276*** (0.049)	0.259*** (0.046)	0.328*** (0.050)
<b>Capital</b> $\Delta k$		0.165*** (0.032)		0.099*** (0.037)
<b>Share-weighted Labour per Capital</b> $(\alpha_N - 1) \Delta(n - k)$			0.398*** (0.066)	0.322*** (0.070)
<b>STRUCTURAL PARAMETERS</b>				
<b>Mark-up</b> $\mu$	1.196*** (0.043)	1.381*** (0.093)	1.350*** (0.084)	1.488*** (0.111)
<b>Scale Elasticity</b> $1 + \gamma$	1	1.228*** (0.044)	1	1.147*** (0.055)
<b>Workers' Barg. Power</b> $\phi$			0.285*** (0.034)	0.244*** (0.040)
<b>SPECIFICATION TESTS</b>				
<b>Sargan IV Test</b> $\sim \chi_{df}^2$	47.019	50.926	34.330	31.206
<b>df</b>	41	43	43	42
<b>p-value</b>	0.240	0.190	0.825	0.889
<b>SOC</b> $\sim N(0,1)$	0.209	0.159	-0.051	-0.200
<b># Obs.</b>	28132	28132	28132	28132
<b># Firms</b>	7086	7086	7086	7086

\*\*\*Significant at 1%; \*\*Significant at 5%; \*Significant at 10%. Standard errors in parentheses.

(1) Sample period: 1988-1995.

(2) Dependent variable: Solow Residual,  $SR = \Delta q_t - \alpha_{Nt} \Delta n_t - \alpha_{Mt} \Delta m_t - (1 - \alpha_{Nt} - \alpha_{Mt}) \Delta k_t$ .

(3) The equations are estimated in levels as the specifications are in differenced logs, i.e. growth rates.

(4) Sargan IV Test: two-step estimates Sargan test of correlation among instruments and residuals, asymptotically distributed as  $\chi_{df}^2$ .  
The null hypothesis is that the instruments are valid.

(5) SOC: test for 2<sup>nd</sup>-order serial correlation (SOC) in the first-difference error term. This test statistic is asymptotically distributed as  $N(0,1)$ . The null hypothesis is that there is no second order serial correlation in the first-difference error term.

(6) Instruments used are:  $\Delta n$ ,  $\Delta m$  and  $\Delta k$ , all dated (t-2) and earlier.

(7) Time dummies are included as regressors and instruments in all equations.

In the specifications mentioned above, firm-level data are deflated by a common industry price index at the three-digit level of sectoral disaggregation. Output price differences between firms are hence not taken into account, they show up in the error term. This may give rise to downwardly biased and inconsistent estimates of price-cost mark-up and scale coefficients if output price differences between firms within an industry are endogenous and correlated with the explanatory variables in the model (changes in factor inputs and factor shares).<sup>20</sup> This problem might arise when firms compete in an environment with differentiated products. To address this issue, we have adopted the solution suggested by Klette and Griliches (1996) which amounts to adding the growth in industry output as an additional regressor. Theoretically, this solution relies on the assumption that the market power of firms originates from product differentiation. Intuitively, in the case of product differentiation, the demand for an individual firm's products is a function of its relative price within the industry. Relative price differences can then be expressed in terms of relative output growth differences in the industry. In contrast to Klette and Griliches (1996) and Crépon et al. (2002), we find that the growth of industry output is not statistically significant in the empirical specifications.<sup>21</sup> Moreover, its inclusion has no effect on the estimated values of the other coefficients. Our results hence suggest that the main source of the market power of Belgian manufacturing firms is not in product differentiation but rather corresponds to other forms of imperfect competition.

### 6.3. Sectoral Analysis

To take into account heterogeneity among sectors, we disaggregate the Belgian manufacturing industry into 20 two-digit sectors and estimate the four models for each sector. Due to data limitations and econometric problems, we had to restrict the analysis to 18 sectors. For all reported results, the test statistics cannot reject absence of second-order serial correlation in the differenced error term. Moreover, on the basis of the Sargan test we can never reject the null hypothesis that our instruments are valid. Table 3 and Table 4 report the results for Model 1 and Model 2 respectively. With the exception of the milk and dairy products sector (sector 11), the ratio of price over marginal cost is significantly larger than one at the 1% level for all sectors. The estimated mark-up ratio of Model 1 ranges from 0.992 to 1.471. This range seems plausible and is also in line with the findings of Martins et al. (1996) and Konings et al. (2001).

We can group sectors according to the magnitude of the estimated price-cost mark-ups. Relatively high mark-ups (22-47 percent) appear in sectors such as ferrous and non-ferrous ores

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<sup>20</sup> However, we argue that this downward bias is less severe in our estimations since we use a price index defined at the three-digit level of sectoral disaggregation as deflator (instead of an industry-wide deflator). In other words, we allow for a relatively high degree of price variability within the manufacturing industry as a whole as well as within the manufacturing sectors defined at the two-digit level of sectoral disaggregation.

<sup>21</sup> These results are not reported but available upon request.

and metals, non-metallic mineral products, agricultural and industrial machinery, office and data processing machines, precision and optical instruments, other transport equipment, beverages and rubber and plastic products. On the other hand, the estimated mark-up ratio is relatively low (0.992-1.156) in the sectors producing metal products except machinery and transport equipment, meat preparations and preserves, milk and dairy products, textiles and clothing, and other manufacturing products.

When taking into account the influence of returns to scale, the mark-up ratio ranges from 0.991 to 1.808. The scale elasticity varies from 1 to 1.734, pointing to constant and increasing returns to scale. The higher the scale elasticity, the larger the increase in and the level of the price over marginal cost ratio compared to Model 1. The ranking of sectors according to the estimated price over marginal cost ratio remains largely the same.

Although high price-cost mark-ups may be indicative of a lack of competition in the sector, they cannot be considered as persistent rents resulting from market power. In innovative sectors, for example, high mark-ups may be the result of temporary innovation rents. Sunk costs may also necessitate mark-up pricing.

**Table 3** Sector Analysis: Model 1

	Code	Name	# Obs. (# Firms)	Output per Capital $\Delta(q - k)$	Mark-up $\mu$
<b>Sec 1</b>	13	Ferrous and non-ferrous ores and metals, other than radioactive	331 (74)	0.217 <sup>***</sup> (0.004)	1.277 <sup>***</sup> (0.007)
<b>Sec 2</b>	15	Non-metallic mineral products	2359 (562)	0.183 <sup>***</sup> (0.031)	1.224 <sup>***</sup> (0.046)
<b>Sec 3</b>	17	Chemical products	1452 (319)	0.170 <sup>***</sup> (0.024)	1.205 <sup>***</sup> (0.035)
<b>Sec 4</b>	19	Metal products except machinery and transport equipment	3649 (1014)	0.135 <sup>***</sup> (0.051)	1.156 <sup>***</sup> (0.068)
<b>Sec 5</b>	21	Agricultural and industrial machinery	1504 (399)	0.185 <sup>***</sup> (0.028)	1.227 <sup>***</sup> (0.042)
<b>Sec 6</b>	23	Office and data processing machines, precision and optical instruments	448 (130)	0.198 <sup>***</sup> (0.030)	1.247 <sup>***</sup> (0.047)
<b>Sec 7</b>	25	Electrical goods	992 (267)	0.165 <sup>***</sup> (0.024)	1.198 <sup>***</sup> (0.034)
<b>Sec 8</b>	27	Motor vehicles	426 (111)	0.148 <sup>***</sup> (0.021)	1.174 <sup>***</sup> (0.029)
<b>Sec 9</b>	29	Other transport equipment	230 (64)	0.320 <sup>***</sup> (0.011)	1.471 <sup>***</sup> (0.024)
<b>Sec 10</b>	31	Meat preparations and preserves, other products from slaughtered animals	929 (214)	0.061 <sup>***</sup> (0.013)	1.065 <sup>***</sup> (0.015)
<b>Sec 11</b>	33	Milk and dairy products	264 (66)	-0.008 <sup>**</sup> (0.004)	0.992 <sup>***</sup> (0.004)
<b>Sec 12</b>	35	Other food products	3320 (834)	0.168 <sup>***</sup> (0.048)	1.202 <sup>***</sup> (0.069)
<b>Sec 13</b>	37	Beverages	397 (88)	0.227 <sup>***</sup> (0.006)	1.294 <sup>***</sup> (0.010)
<b>Sec 14</b>	39	Tobacco products		na	na
<b>Sec 15</b>	41	Textiles and clothing	3200 (783)	0.125 <sup>***</sup> (0.040)	1.143 <sup>***</sup> (0.052)
<b>Sec 16</b>	43	Leathers, leather and skin goods, footwear		na	na
<b>Sec 17</b>	45	Timber, wooden products and furniture	2641 (668)	0.147 <sup>***</sup> (0.030)	1.172 <sup>***</sup> (0.041)
<b>Sec 18</b>	47	Paper and printing products	3585 (926)	0.167 <sup>***</sup> (0.027)	1.200 <sup>***</sup> (0.039)
<b>Sec 19</b>	49	Rubber and plastic products	1337 (322)	0.239 <sup>***</sup> (0.021)	1.314 <sup>***</sup> (0.036)
<b>Sec 20</b>	51	Other manufacturing products	570 (163)	0.125 <sup>***</sup> (0.014)	1.143 <sup>***</sup> (0.018)

Time dummies are included but not reported. Standard errors in parentheses.

<sup>\*\*\*</sup>Significant at 1%; <sup>\*\*</sup>Significant at 5%; <sup>\*</sup>Significant at 10%.

Instruments:  $\Delta n$ ,  $\Delta m$  and  $\Delta k$ , all dated (t-2) and earlier.

Table 4 Sector Analysis: Model 2

	# Obs. (# Firms)	Output per Capital $\Delta(q - k)$	Capital $\Delta k$	Mark-up $\mu$	Scale Elasticity $1 + \gamma$
Sec 1	331 (74)	0.240*** (0.004)	0.041*** (0.006)	1.316*** (0.007)	1.054*** (0.008)
Sec 2	2359 (562)	0.329*** (0.043)	0.227*** (0.041)	1.490*** (0.096)	1.338*** (0.061)
Sec 3	1452 (319)	0.276*** (0.043)	0.116*** (0.041)	1.381*** (0.082)	1.160*** (0.057)
Sec 4	3649 (1014)	0.319*** (0.062)	0.203*** (0.045)	1.468*** (0.134)	1.298*** (0.066)
Sec 5	1504 (399)	0.388*** (0.034)	0.350*** (0.042)	1.634*** (0.091)	1.572*** (0.069)
Sec 6	448 (130)	0.330*** (0.053)	0.223*** (0.067)	1.493*** (0.118)	1.333*** (0.100)
Sec 7	992 (267)	0.285*** (0.031)	0.152*** (0.029)	1.399*** (0.061)	1.213*** (0.041)
Sec 8	426 (111)	0.173*** (0.026)	0.026 (0.031)	1.209*** (0.038)	1*** (0.037)
Sec 9	230 (64)	0.447*** (0.018)	0.406*** (0.032)	1.808*** (0.059)	1.734*** (0.058)
Sec 10	929 (214)	0.060*** (0.022)	-0.0003 (0.024)	1.064*** (0.027)	1*** (0.026)
Sec 11	264 (66)	-0.009** (0.004)	-0.003 (0.004)	0.991*** (0.004)	1*** (0.004)
Sec 12	3320 (834)	0.386*** (0.083)	0.256*** (0.080)	1.629*** (0.220)	1.417*** (0.130)
Sec 13	397 (88)	0.235*** (0.009)	0.016 (0.011)	1.307*** (0.015)	1*** (0.014)
Sec 14		na	na	na	na
Sec 15	3200 (783)	0.184*** (0.045)	0.127*** (0.040)	1.225*** (0.068)	1.156*** (0.049)
Sec 16		na	na	na	na
Sec 17	2641 (668)	0.354*** (0.053)	0.212*** (0.045)	1.548*** (0.127)	1.328*** (0.070)
Sec 18	3585 (926)	0.322*** (0.045)	0.172*** (0.042)	1.475*** (0.098)	1.254*** (0.062)
Sec 19	1337 (322)	0.369*** (0.034)	0.192*** (0.045)	1.585*** (0.085)	1.304*** (0.071)
Sec 20	570 (163)	0.209*** (0.020)	0.115*** (0.016)	1.264*** (0.032)	1.145*** (0.020)

Time dummies are included but not reported. Standard errors in parentheses.

\*\*\*Significant at 1%; \*\*Significant at 5%; \*Significant at 10%.

Instruments:  $\Delta n$ ,  $\Delta m$  and  $\Delta k$ , all dated (t-2) and earlier.

Focusing on the relationship between labour market imperfections and product market imperfections leads to following insights (see Table 5 and Table 6). In Model 3, the estimated mark-up ratio ranges from 1.017 to 2.088 and the bargaining power parameter varies from 0.042 to 0.394. Our estimates of union bargaining power accord with those of Vandebussche et al. (2001), who estimate bargaining power coefficients for NACE three-digit sectors over the period 1987-1994. Model 4 points to a range of 1-2.268 for the estimated mark-up ratio and 0.051-0.400 for union bargaining power.

For each sector, we find evidence of price-cost mark-ups being underestimated when imperfection in the labour market is ignored, hence, validating the findings of Bughin (1996). The

higher the bargaining power of the workers in a sector, the higher the level of and the increase in the estimated price over marginal cost ratio. This allows us again to split up sectors according to the magnitude of both the mark-up ratio and union bargaining power. Concentrating on Model 3, the correlation between the estimated mark-up ratio and the union bargaining power parameter is 0.872. Sectors such as metal products except machinery and transport equipment, office and data processing machines, precision and optical instruments, electrical goods, other transport equipment and rubber and plastic products are characterised by a relatively high mark-up ratio (range of 1.502-2.088) and relatively high union bargaining power (range of 0.260-0.394). The sector office and data processing machines, precision and optical instruments can be labelled as the sector with both the highest price-cost mark-up and the highest union bargaining power parameter. Sectors such as non-metallic mineral products, chemical products, motor vehicles, other food products, beverages, paper and printing products and other manufacturing products can be classified as sectors with moderate price-cost mark-ups (range of 1.282-1.493) and moderate union bargaining power (range of 0.094-0.237). Sectors producing meat preparations and preserves and milk and dairy products display a relatively low price over marginal cost ratio (range of 1.017-1.125) and relatively low union bargaining power (range of 0.042-0.050). The lowest mark-up ratio as well as the lowest union bargaining power parameter is found in the milk and dairy products sector. Model 4 produces similar results. The correlation between the estimated mark-up ratio and the union bargaining power parameter is 0.714.<sup>22</sup>

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<sup>22</sup> The highest estimated price-cost mark-up ratio equals 2.268 (sec 9). As mentioned before, sunk costs may explain part of this high estimate.



Table 5 Sector Analysis: Model 3

	# Obs. (# Firms)	Output per Capital $\Delta(q - k)$	Share-weighted Labour per Capital $(\alpha_N - 1) \Delta(n - k)$	Mark-up $\mu$	Workers' Barg. Power $\phi$
Sec 1	331 (74)	0.265*** (0.009)	0.104*** (0.016)	1.361*** (0.017)	0.094*** (0.013)
Sec 2	2359 (562)	0.305*** (0.034)	0.259*** (0.043)	1.439*** (0.070)	0.206*** (0.027)
Sec 3	1452 (319)	0.315*** (0.033)	0.221*** (0.045)	1.460*** (0.070)	0.181*** (0.030)
Sec 4	3649 (1014)	0.342*** (0.054)	0.359*** (0.059)	1.520*** (0.125)	0.264*** (0.032)
Sec 5	1504 (399)	0.312*** (0.024)	0.411*** (0.044)	1.453*** (0.051)	0.291*** (0.022)
Sec 6	448 (130)	0.521*** (0.043)	0.651*** (0.054)	2.088*** (0.187)	0.394*** (0.020)
Sec 7	992 (267)	0.334*** (0.019)	0.363*** (0.033)	1.502*** (0.043)	0.266*** (0.018)
Sec 8	426 (111)	0.243*** (0.021)	0.187*** (0.033)	1.321*** (0.037)	0.158*** (0.023)
Sec 9	230 (64)	0.502*** (0.019)	0.464*** (0.071)	2.008*** (0.077)	0.317*** (0.008)
Sec 10	929 (214)	0.088*** (0.020)	0.035** (0.018)	1.096*** (0.024)	0.034** (0.017)
Sec 11	264 (66)	0.017*** (0.005)	0.044*** (0.005)	1.017*** (0.005)	0.042*** (0.005)
Sec 12	3320 (834)	0.307*** (0.051)	0.284*** (0.062)	1.443*** (0.106)	0.221*** (0.038)
Sec 13	397 (88)	0.289*** (0.008)	0.154*** (0.009)	1.406*** (0.016)	0.133*** (0.007)
Sec 14		na	na	na	na
Sec 15	3200 (783)	0.260*** (0.045)	0.310*** (0.059)	1.351*** (0.082)	0.237*** (0.034)
Sec 16		na	na	na	na
Sec 17	2641 (668)	0.330*** (0.043)	0.264*** (0.049)	1.493*** (0.096)	0.209*** (0.031)
Sec 18	3585 (926)	0.306*** (0.038)	0.263*** (0.057)	1.441*** (0.079)	0.208*** (0.036)
Sec 19	1337 (322)	0.396*** (0.027)	0.351*** (0.048)	1.656*** (0.074)	0.260*** (0.026)
Sec 20	570 (163)	0.220*** (0.027)	0.206*** (0.030)	1.282*** (0.044)	0.171*** (0.021)

Time dummies are included but not reported. Standard errors in parentheses.

\*\*\*Significant at 1%; \*\*Significant at 5%; \*Significant at 10%.

Instruments:  $\Delta n$ ,  $\Delta m$  and  $\Delta k$ , all dated (t-2) and earlier.

Table 6 Sector Analysis: Model 4

	# Obs. (# Firms)	Output per Capital $\Delta(q - k)$	Capital $\Delta k$	Share-weighted Labour per Capital $(\alpha_N - 1) \Delta(n - k)$	Mark-up $\mu$	Scale Elasticity $1 + \gamma$	Workers' Barg. Power $\phi$
Sec 1	331 (74)	0.268*** (0.010)	-0.012 (0.012)	0.117*** (0.020)	1.366*** (0.019)	1*** (0.016)	0.105*** (0.016)
Sec 2	2359 (562)	0.356*** (0.039)	0.152*** (0.055)	0.156*** (0.060)	1.553*** (0.094)	1.236*** (0.085)	0.135*** (0.045)
Sec 3	1452 (319)	0.325*** (0.043)	0.017 (0.044)	0.213*** (0.050)	1.481*** (0.094)	1*** (0.065)	0.176*** (0.034)
Sec 4	3649 (1014)	0.387*** (0.058)	0.106** (0.051)	0.275*** (0.069)	1.631*** (0.154)	1.173*** (0.083)	0.216*** (0.042)
Sec 5	1504 (399)	0.386*** (0.029)	0.185*** (0.051)	0.272*** (0.062)	1.629*** (0.077)	1.301*** (0.083)	0.214*** (0.038)
Sec 6	448 (130)	0.521*** (0.047)	0.008 (0.046)	0.668*** (0.058)	2.088*** (0.204)	1*** (0.096)	0.400*** (0.021)
Sec 7	992 (267)	0.382*** (0.025)	0.101*** (0.033)	0.313*** (0.045)	1.618*** (0.065)	1.163*** (0.053)	0.238*** (0.026)
Sec 8	426 (111)	0.235*** (0.025)	-0.006 (0.029)	0.186*** (0.034)	1.307*** (0.043)	1*** (0.038)	0.157*** (0.024)
Sec 9	230 (64)	0.559*** (0.015)	0.311*** (0.034)	0.301*** (0.030)	2.268*** (0.077)	1.705*** (0.077)	0.231*** (0.018)
Sec 10	929 (214)	0.068*** (0.025)	-0.042 (0.029)	0.052** (0.024)	1.073*** (0.029)	1*** (0.031)	0.049** (0.022)
Sec 11	264 (66)	0.006 (0.004)	-0.028*** (0.007)	0.054*** (0.006)	1*** (0.004)	0.972*** (0.007)	0.051*** (0.005)
Sec 12	3320 (834)	0.359*** (0.073)	0.096 (0.095)	0.220*** (0.080)	1.560*** (0.178)	1*** (0.148)	0.180*** (0.060)
Sec 13	397 (88)	0.254*** (0.011)	-0.093*** (0.016)	0.213*** (0.012)	1.340*** (0.020)	0.875*** (0.021)	0.176*** (0.008)
Sec 14		na	na	na	na	na	na
Sec 15	3200 (783)	0.284*** (0.048)	0.057 (0.040)	0.285*** (0.064)	1.397*** (0.094)	1*** (0.056)	0.222*** (0.039)
Sec 16		na	na	na	na	na	na
Sec 17	2641 (668)	0.386*** (0.050)	0.130*** (0.052)	0.154*** (0.065)	1.629*** (0.133)	1.212*** (0.085)	0.133*** (0.050)
Sec 18	3585 (926)	0.340*** (0.044)	0.107** (0.047)	0.142** (0.070)	1.515*** (0.101)	1.162*** (0.071)	0.124*** (0.050)
Sec 19	1337 (322)	0.407*** (0.031)	0.042 (0.048)	0.319*** (0.059)	1.686*** (0.088)	1*** (0.081)	0.242*** (0.034)
Sec 20	570 (163)	0.226*** (0.031)	0.005 (0.026)	0.206*** (0.032)	1.292*** (0.052)	1*** (0.034)	0.171*** (0.022)

Time dummies are included but not reported. Standard errors in parentheses.

\*\*\*Significant at 1%; \*\*Significant at 5%; \*Significant at 10%.

Instruments:  $\Delta n$ ,  $\Delta m$  and  $\Delta k$ , all dated (t-2) and earlier.

## 7. CONCLUSIONS AND INTERPRETATION

This paper analyses price-setting behaviour in both the product and the labour market of Belgian manufacturing firms over the period 1988-1995. By embedding an Efficient Bargaining model into Hall's (1988) framework, we are able to estimate price-cost mark-up and union bargaining power parameters simultaneously. Applying the Generalised Method of Moments (GMM) technique for panel data, our results strongly reject perfect competition in both the output and the labour market. Assuming constant returns to scale, price-cost mark-ups are estimated at 35 percent and the union bargaining power parameter is found to be about 0.29. Ignoring labour market imperfections brings the estimated price-cost mark-up down to 20 percent. In this respect, our results qualitatively accord with the findings of Crépon et al. (2002).

To examine the important issue of heterogeneity in the price-cost mark-up and in union bargaining power, we have split up the sample into 18 sectors. For each sector separately, we find that neglecting imperfection in the labour market causes a significant underestimation in the price-cost mark-up. By focusing on the cross-section dimension, we are able to draw conclusions about the interdependencies between the two parameters. A new result in this paper concerns the remarkable positive relationship that we observe among sectors between estimated union bargaining power and estimated price-cost margins, evaluated at perfect competition in the labour market. In other words, labour market and product market imperfections are likely to go hand in hand. This observed positive correlation can be interpreted in two ways. We see it as a topic for further research to assess the relevance of each interpretation.

One interpretation runs from labour market to product market imperfections and follows from the long-run implications of the model of Blanchard and Giavazzi (2003). The intuition is that strong unions imply higher wage rents and a smaller proportion of rents left to the firms. This change in factor income distribution leads to exit of firms, which decreases the degree of product market competition and generates more unemployment. The workers' reservation wage will fall, resulting in higher price-cost mark-ups. In some sense, our findings can be considered as an indirect empirical validation of the model of Blanchard and Giavazzi (2003) in the long run. The more powerful the union, the larger the size of the surplus that can be shared and the larger the part of the surplus going to the workers. Our framework does not allow us, however, to evaluate the effect of strong unions on the size of the surplus accruing to the firm. Theoretically, our findings are hence consistent with the hypothesis that unions may depress profits as well as with the hypothesis that unions do not affect profitability or even increase profitability.<sup>23</sup>

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<sup>23</sup> Estimating a structural model, which endogenises wages, for the European airline industry over the period 1976-1994, Neven et al. (2002) find that unions exert a small but positive effect on prices and on the true price-cost mark-up. The small impact is due to the quantitatively small effect of rent sharing on marginal costs, suggesting that rent sharing is mostly about redistribution.

The results can also be interpreted in terms of product market imperfections affecting labour market imperfections. The idea is that workers are less likely to join unions unless they are able to extract some surplus from the firms and this is most likely to happen where there is imperfect competition in the product market. This is a standard interpretation in the trade union literature. Another explanation going from product market imperfections to labour market imperfections is that firms with higher price-cost margins may employ high-skilled workers who are harder to replace than low-skilled workers and therefore more powerful.<sup>24</sup> In that case, monopoly power in the product market would also be associated with higher union bargaining power.

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<sup>24</sup> In the next paper, our results do not provide evidence of skill-intensity exerting a positive effect on the workers' bargaining power. Note, however, that this result has to be interpreted with caution as our dataset did not allow us to estimate separate coefficients for the bargaining power of skilled versus unskilled workers.

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# HAS INTERNATIONAL TRADE AFFECTED WORKERS' BARGAINING POWER ?<sup>\*,\*\*</sup>

## ABSTRACT

In this paper, we investigate whether international trade has affected workers' wages in general and their bargaining power in particular in the Belgian manufacturing industry over the period 1987-1995. Using a sample of more than 12 000 firms, we provide evidence of three channels through which international trade has an impact on workers' wages in a bargaining framework. First, international trade has an effect on the workers' outside option. Our results show that in sectors actively importing goods, workers' wages have decreased while the opposite is true for sectors actively exporting goods. Second, international trade affects the size of the firms' profits. Our results reveal that increased foreign competition in the form of lower export prices reduces both wages per worker and profits per worker. Third, international trade has a direct effect on the workers' bargaining power. In sectors characterised by high tariffs, workers are able to cream off a larger share of the rents whereas the opposite holds for sectors with strong import competition.

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

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

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## 1. INTRODUCTION

### 1.1. Motivation

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

In this paper, we 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, 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.<sup>1</sup> Hence, this makes a rent-sharing framework very valid to explain wages in the Belgian economy. Second, 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 US.<sup>2</sup> 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.<sup>3</sup> As a first indication supporting this hypothesis, Table 1 contains reduced form equations of bargained wages and profits per worker in the Belgian manufacturing industry over the period 1987-1995. Explanatory variables are exogenous sector-specific prices of imported goods and exported goods expressed in US dollars, sector-specific effective exchange rates<sup>4</sup> and year dummies. As expected, the sector-specific price of exports has a positive and statistically significant effect on real wages per worker and real profits per worker. This means that increased foreign competition in the form of lower sector-specific export prices reduces both wages per worker and profits per worker. A rather unexpected result is that the price of imports affects both wages per worker and profits per worker significantly negatively. As expected, the sector-specific exchange rate has a positive and statistically significant effect on real wages per worker and on real profits per worker. The results in Table 1 suggest that international trade has a significant effect on both wages and profits per worker.

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<sup>1</sup> The most important level is the sectoral level, although in recent years there has been a sharp rise in the number of collective agreements concluded at the enterprise level (European Foundation, 2003).

<sup>2</sup> The data are obtained from the OECD International Trade Statistics and the OECD Main Economic Indicators (see <http://www.oecd.org>). Explanations for the high openness ratio in Belgium are the close proximity to its trading partners, low transport costs and a supportive financial structure (Johnson and Stafford, 1999).

<sup>3</sup> One may legitimately wonder whether these effects are to be found on unemployment or on wages. In Belgium, the unemployment rate is high. Among other things, high minimum wages and bargaining agreements covering all type of workers tend to generate wage rigidity. The public opinion seems to believe that globalisation is responsible for the high unemployment. However, evidence is virtually nonexistent. Compared to other European countries, Belgium is characterised by a medium level of wage rigidity (see e.g. Berthold et al., 1999; Layard et al., 1991; Vinals and Jimeno, 1997).

<sup>4</sup> An increase in the exchange rate means a depreciation of the Belgian franc.

**Table 1** OLS Estimates of the Reduced Forms for Wages and Profits per Worker, 1987-1995.

DEPENDENT VARIABLE	Firm-average Real Wage per Worker	Firm-average Real Profits per Worker
Constant	0.052*** (0.006)	-0.026 (0.018)
Import Price	-0.037*** (0.005)	-0.026** (0.011)
Export Price	0.039*** (0.005)	0.028*** (0.010)
Exchange Rate	0.007*** (0.002)	0.013** (0.007)
Year dummies	Yes	Yes
# Obs.	73354	73383
R <sup>2</sup>	0.01	0.001

\*\*\* 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. Real wages are constructed as nominal wages divided by the consumer price index with 1990 as reference year and real profits as nominal profits divided by the sector-specific producer price index. All variables are expressed as natural logarithms and are first-differenced.

Theoretically, there exist three channels through which globalisation can influence wages in a collective bargaining framework. International trade can affect the bargaining outcome through movements in the firm's financial conditions, the firm's and the workers' threat points and the workers' bargaining power (see Section 2.2.). To shed light on the mechanisms underlying the results in Table 1, we focus on the following issues. In the first part of the paper, we concentrate on the effect of international trade on bargained wages through changes in the firms' rents and changes in the workers' outside option. To our knowledge, these issues have not been taken up for the Belgian economy. Goos and Konings (2001) and Veugelers (1989) 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. Whereas our first part analyses among other things 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. Dobbelaere (2003), Vandebussche et al. (2001) and Veugelers (1989) for Belgium and Svejnar (1986) for the US point out that there is a lot of cross-industry variation in the relative bargaining power coefficient. Svejnar (1986) and Veugelers (1989) further examine the determinants of this cross-industry variation. Although a well-developed theory of the 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 sectoral unemployment rates and several variables capturing output market concentration. However, they do not relate the workers' bargaining power to globalisation. We contribute to the literature by studying whether the globalisation process has led to a shift in bargaining power from labour to capital. 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 in the manufacturing industry over the period 1987-1995 enables us to split up our data into several sectors.<sup>5</sup> 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.

We find that international trade has an effect on workers' wages through changes in the workers' outside option, the firms' profits and the workers' bargaining power. Our results show that in sectors actively importing goods, workers' outside options (and hence workers' wages) have decreased while the opposite is true for sectors actively exporting goods. Increased foreign competition in the form of lower export prices reduces profits per worker and hence workers' wages. Although technological change, in the form of high R&D expenditures, seems to exert an important effect on the workers' relative bargaining power, we find that globalisation also matters. A robust finding is that in sectors characterised by high tariffs, workers are able to cream off a larger share of the rents whereas the opposite holds for sectors with strong import competition.

## **1.2. Existing Trade-Labour Literature**

In this section, we survey very briefly the literature on the impact of international trade on the labour market.<sup>6</sup>

One strand of this literature 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.

A 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. This theory is based on perfect competition in the product and the labour market and is used to explain trade between countries with different factor endowments. Therefore, international trade is mainly of the inter-industry type. According to the Stolper-Samuelson 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

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<sup>5</sup> Our dataset has the advantage of being more exhaustive than the Amadeus firm-level dataset of Bureau van Dijk. The latter database only contains firms satisfying at least one of the following criteria: number of employees larger than 100, total assets and operating revenues exceeding 16 million and 8 million USD, respectively.

<sup>6</sup> It is not our intention to give an exhaustive overview but to outline the main developments in the trade-labour literature. For literature surveys, see among others, Brock (2003), Burtless (1995), Cline (1997), Deardorff and Hakura (1994), Gaston and Nelson (2000) and Greenaway and Nelson (2001).

using a lot of unskilled labour. However, a voluminous literature linking changes in product prices to changes in factor prices (see Haskel, 1999 and 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. Allowing for intra-industry trade, which has become more important during the past decades (Coppel and Durand, 1999), the New Trade Theory (Helpman and Krugman, 1985) provides a framework for studying the impact of international trade in imperfectly competitive product markets. Compared to the HOS-theory, the effect of international trade on the relative wages and employment of skilled versus unskilled workers is less clear-cut. In general, the New Trade Theory predicts that intra-industry trade has a rather small effect on the income distribution and may lead to welfare gains for all agents (Manasse and Turrini, 2000). It is even possible that a reverse Stolper Samuelson effect arises, i.e. that scarce production factors in developed countries (unskilled workers) gain from trade (see Helpman and Krugman, 1985; Krugman, 1981). The impact on the relative demand of skilled versus unskilled workers is vague as this depends on how international trade results in an expansion or contraction of certain sectors (see e.g. Gasiorek et al., 1991).

Labour economists have mainly used the so-called Factor Content of Trade (FCT) approach. This approach uses input-output analysis to evaluate the effect of international trade on the labour market. For given wages, the amount of labour (possibly split-up between skilled and unskilled workers) embodied in a country's exports and imports is calculated. The net employment effect is calculated as the difference between labour embodied in export flows versus labour embodied in import flows. To assess the impact of international trade on wages, the changes in labour flows are linked to estimates of labour demand elasticities. Except for Wood (1995),<sup>7</sup> most authors also find a small to moderate impact of international trade on workers' wages.<sup>8</sup>

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. 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

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<sup>7</sup> Wood (1995) argues that standard FCT-studies underestimate the impact of international trade on the labour market. Important reasons are the presence of non-competing imports and the fact that international trade not only directly affects the labour market but also exerts an indirect effect on wages and employment. The idea is that international trade leads to defensive innovation, inducing productivity changes by focusing on labour-saving, cost-reducing innovations in advanced countries. Firm-level studies investigating this indirect effect are Bernard and Jensen (1999, 2001) for the US and Bernard and Wagner (1997) for Germany. Studies at the sectoral level addressing this issue are Cortes and Jean (2001) for France, Germany and the US; and Lawrence (2000) for the US.

<sup>8</sup> See Borjas et al. (1992, 1997) for the US; Cortes et al. (1999) for France; De Grauwe et al. (1979) for Belgium; Messerlin (1995) for France and Schumacher (1984, 1989) for Belgium, France, Germany, Italy, the Netherlands and the UK.

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<sup>9</sup> and those in Latin America, similar rent-sharing effects are observed. However, these effects are not present in Asia. Besides taking into account the effect of globalisation through changes in the firm's rents, Kramarz (2003) provides evidence of international trade affecting bargained wages through changes in the workers' and the firm's threat points. Work related to the impact of increased globalisation on workers' bargaining power has been done by Budd and Slaughter (2004) and Budd et al. (2004). Their 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 organisation of the paper is as follows. In Section 2, we describe the theoretical framework and discuss three channels through which international trade can affect wages in a collective bargaining framework. Section 3 presents 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.

## **2. THEORETICAL FRAMEWORK**

The methodology in this paper borrows from the rent-sharing literature. Several 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.<sup>10</sup>

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

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<sup>9</sup> Encompassing Cyprus, Egypt, Malta, Morocco, Tunisia and Turkey.

<sup>10</sup> In the literature, three models predict a positive wages-profit correlation with firm profitability determining the level of pay: the modified competitive model, the optimal labour contract model and the rent-sharing bargaining model (Blanchflower et al., 1996). In accordance with the wage determination system in Belgium, our analysis relies on the rent-sharing bargaining model.

## 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). The motivation for relying on the Efficient Bargaining model is twofold. First, it accords with stylised facts about Belgian industrial relations. 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) and Dobbelaere (2003). Second, it captures the possibility that firms are not operating on their demand for labour. In other words, it allows for the fact that powerful unions may obtain a higher wage without suffering a decrease in employment, at least in the short run (Blanchard and Giavazzi, 2003).

The union is risk neutral.<sup>11</sup> Its objective function is specified in a utilitarian form:  $U(w, N) = Nw + (\bar{N} - N)w_a$ , where  $N$  is the employment level,  $\bar{N}$  is union membership ( $0 < N \leq \bar{N}$ ),  $w$  is the real wage and  $w_a \leq w$  is the alternative wage expressed in real terms.

The firm's utility equals its real profits  $\pi$ , with  $\pi(w, N) = R(N) - wN - F$ , where  $R = \theta Q$  stands for total real revenue ( $R_N'' < 0$ ),  $Q$  for real output,  $\theta$  for a revenue shifter which depends on product market conditions (product demand) 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 that union preferences do not depend on those inputs (Bughin, 1996).

The threat point for the union is assumed to equal the alternative wage  $w_a$ .<sup>12</sup> If no revenue accrues to the firm when negotiation breaks down, the firm's fall-back utility equals  $-F$ . The outcome of the bargaining is the asymmetric generalised Nash solution to:

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

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

<sup>11</sup> See Svejnar (1986) and Veugelers (1989) among others for the derivation in the case of a risk-averse union.

<sup>12</sup> According to the axiomatic approach, the threat point or disagreement payoff equals the inside option in the short run, i.e. income from strike funds for the union and profits while production is shut down for the firm. If the disagreement continues in the longer run, however, the threat point equals the outside option as the union and the firm will probably search for another bargaining partner (Booth,



Maximisation of Eq. (1) with respect to the wage rate ( $w$ ) gives the following equation:<sup>13</sup>

$$w = w_a + \frac{\phi}{1-\phi} \left[ \frac{R - wN}{N} \right] \quad (2)$$

Maximising Eq. (1) with respect to employment ( $N$ ) leads to the following first-order condition:

$$\begin{aligned} w &= R_N + \frac{\phi}{1-\phi} \left[ \frac{R - wN}{N} \right] \\ &\quad \Downarrow \\ w &= R_N + \phi \left[ \frac{R - R_N N}{N} \right] \end{aligned} \quad (3)$$

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 ( $w$ ) (Brown and Ashenfelter, 1986).

## 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. (2)).

First, international trade can induce movements in the firm's profitability through the revenue shifter  $\theta$ , affecting the *size* of the rents (or the 'pie') that can be shared between the workers and the firm.<sup>14</sup> 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 profitability on negotiated wages. The results of Abowd and Lemieux (1993) reveal that foreign competition in the form of lower import or export prices

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1995). Hence, it is not necessary for the union's threat point to be equal to the alternative wage (see e.g. Layard et al., 1991 and McDonald and Suen, 1992 for a discussion).

<sup>13</sup> Note that rents per worker  $\left( \frac{R - wN}{N} \right)$  do not depend on the revenue shifter  $\theta$  when the elasticity of output with respect to employment is constant, i.e. when  $Q(N)$  is Cobb-Douglas (McDonald and Solow, 1981).

<sup>14</sup> As mentioned above, the workers' bargaining power  $\phi$  cannot be identified from variations in the revenue shifter  $\theta$  if the production function is Cobb-Douglas.

decreases both wages per worker and quasi-rents per worker. Moreover, the effect on quasi-rents is larger than on 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 higher export prices of US firms to OECD countries increase French quasi-rents, meaning that French firms benefit from the higher prices. 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, affecting profits in France negatively.

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 for a discussion). The empirical results of Kramarz (2003) for France reveal that increased import competition not only affects wages through changes in quasi-rents but also through the workers' threat point, affecting their wages negatively.

The third channel through which international trade can affect wages in a collective bargaining framework is through the workers' bargaining power parameter  $\phi$ . 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).<sup>15</sup> 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 axiomatic or 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  $\phi$  (see Booth, 1995). In the interpretations given below, globalisation enters the story through its effect on the general economic climate and the unemployment level in particular.<sup>16</sup> 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 employers.<sup>17</sup> Reasoning in this way, Lindén (1995) defines  $\phi$  as a measure of labour market tightness, i.e. the ratio of the hiring rate from the unemployed to the sum of the hiring rate and the rate of filling vacancies 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. 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,  $\phi$  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 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).<sup>18</sup> 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 other things, higher inventories, more liquid assets and lower capital intensity are shown to reduce a firm's strike costs and hence to increase 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 probability of obtaining this alternative employment is inversely related to the rate of unemployment in the economy. Therefore, higher unemployment lowers the unions'

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<sup>15</sup> These axioms are invariance, Pareto efficiency, independence or irrelevant alternatives and anonymity or symmetry.

<sup>16</sup> Note that the unemployment level affects the workers' outside option as well as the workers' bargaining power in this setting.

<sup>17</sup> 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.

<sup>18</sup> 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.

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.

An informal theory regarding the determinants of the union's bargaining power is given by 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 an empirical proxy for this determinant. Another factor is the workers' feeling about the fairness of the claim. If workers feel that the wage claim is unreasonable, they are less eager to support it. 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 claim.<sup>19</sup>

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 closer substitutes domestic and foreign workers are, due to e.g. international trade, outsourcing and foreign direct investment (FDI), the lower the enterprise surplus ending up with workers. As a consequence, unions might have become weaker. 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 workers.<sup>20</sup> 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.

As mentioned in the introduction, Budd and Slaughter (2004) and Budd et al. (2004) analyse the impact of increased globalisation on workers' bargaining power in another context. They investigate whether rent sharing extends across national borders, conditioned by corporate or

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<sup>19</sup> McDonald and Suen (1992) argue that union density may be an indicator of the justness of union wage claims.

<sup>20</sup> Among others, Bruno et al. (2001) [several OECD countries], Fajnzylber and Maloney (2001) [Chile, Colombia and Mexico], Greenaway et al. (1999) [UK], Jean (2000) [France], Krishna et al. (2001) [Turkey], Levinsohn (1993) [Turkey] and Paes de Barros et al. (1999) [Brazil] have also investigated this issue.

labour organisational ties and/or by trade unions. Their empirical results provide strong evidence of international dimensions of rent sharing.

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 first and 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 and changes in the workers' outside option. 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, foreign direct investment, technology and control variables. These stage-two regressions try to identify the factors explaining the workers' relative bargaining power.

#### 3.1. Specification and Data Description

The econometric specification that acts as the basis for the stage-one regressions is derived from Eq. (2) and is given by:

$$\ln w_{ijt} = \alpha_0 + \delta_1 \ln w_{jt}^0 + \delta_2 \ln U_{jt} + \frac{\phi}{1-\phi} \ln \left( \frac{\pi}{N} \right)_{ijt} + \alpha_i + \alpha_t + \varepsilon_{ijt} \quad (4)$$

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. (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. (2)) is proxied by the sector-average real annual wage per worker ( $w_{jt}^0$ ) and the sectoral unemployment rate ( $U_{jt}$ ). The latter variable is obtained from the Rijksdienst voor Arbeidsvoorziening (RVA). 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.<sup>21</sup> All annual wages are expressed as real wages, i.e. nominal wages divided by the consumer price index with 1990 as reference year. The consumer price index has been drawn from the Belgostat source of the NBB.<sup>22</sup> Profits are also expressed in real terms, i.e. nominal profits divided by the sector-specific producer price index. The producer price index is obtained from the Ministry of Economic Affairs.<sup>23</sup> 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.  $\varepsilon_{ijt}$  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 ( $\alpha_t$ ). By taking the first difference of Eq. (4), we control for individual firm effects ( $\alpha_i$ ). As a consequence, our parameter estimates are consistent even if  $\alpha_i$  were correlated with regressors. Table 2 includes some summary statistics of the key explanatory variables for the period 1987-1995.

**Table 2** First-Stage Regression: Summary Statistics.

VARIABLES	1987-1995		
	# Obs.	Sample Mean	Sample St. Dev.
<b>Firm-average Real Wage per Worker (x 100 000 BEF)</b>	109208	9.859	6.952
<b>Firm-average Real Profits per Worker (x 100 000 BEF)</b>	108153	4.242	20.247
<b>Sector Unemployment Rate (%)</b>	122174	15.345	6.012
<b>Sector-average Real Wage per Worker (x 100 000 BEF)</b>	123421	8.722	0.963

Source: National Bank of Belgium (NBB).

<sup>21</sup> The reason is that for the sub-sample of loss-making firms, rent sharing is not an issue. By contrast, the wages-profit elasticity is found to be negative. Analysing wage setting behaviour of loss-making firms is beyond the scope of this paper.

<sup>22</sup> These data can be downloaded from <http://www.nbb.be/belgostat/>.

<sup>23</sup> These data can be downloaded from <http://ecodata.mineco.fgov.be>.

### 3.2. Estimation Strategy

#### *Two Approaches to Balancing Time-series and Cross-section Pooling*

To exploit fully the data's panel aspect, we report estimation results of Eq. (4) for two 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. However, since the Belgian economy is characterised by a high degree of industry-level bargaining between employer associations and unions that are strongly organised per sector, a cross-section study of bargaining power is appropriate. Therefore, to allow some variation within manufacturing and over time, the second approach provides estimates of  $\left(\frac{\phi}{1-\phi}\right)$  for each sector separately year by year.<sup>24</sup> The 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. (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 are 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. (4) would lead to an endogeneity bias. Therefore, we try to find appropriate instruments.

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<sup>24</sup> In Belgium, collective agreements are concluded in joint committees and subcommittees. There are about 95 joint committees and 72 joint subcommittees. In principle, each firm belongs to only one joint committee. In practice, however, firms belong to different joint committees. For example, joint committees can be different for blue collar and white collar workers. To be specific, collective agreements applying to white collar workers are negotiated in one coordinating joint committee (joint committee n° 218) which groups white collar workers of a large number of industrial and service sectors. For this reason we can not split up the manufacturing industry in different sectors according to joint committees. (FPS Employment, Labour and Social Dialogue, 2003) Instead, we group sectors according to the NACE classification. From 2005-2006 onwards, however, NACE-codes will be linked to joint committees. This will allow us to split up the manufacturing industry according to collective bargaining agreements and to add the Belgian institutional framework to the analysis.

### *Instrumentation Strategy*

The econometric problems described above show that instrumentation is a necessary strategy to obtain unbiased and 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 two approaches described above. For the 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 the firm's 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 sector-specific export and import prices 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 sector-specific international prices as exogenous demand shocks since these prices are determined on the world market and are hence out of reach for Belgian firms. More specifically, we construct sector-specific unit value indices for Belgian imports and exports based on the OECD International Trade by Commodities database.<sup>25</sup> Following Kramarz (2003) but in contrast to Abowd and Lemieux (1993), we use sector-specific prices expressed in US dollars. 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 (2004), 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 prices would 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 are exogenous to the Belgian economy. However, due to a lack of reliable data for our period under study in the OECD Trade by Commodities database, we were not able to do this.<sup>26</sup> 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

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<sup>25</sup> 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, 2002, among others).

<sup>26</sup> Kramarz (2003) however uses the same OECD dataset but uses a different time period.



Slaughter (2004), we have computed trade-weighted multilateral Belgian exchange rates for each sector and each year where we also weigh bilateral exchange rates with import shares.<sup>27</sup>

Since international prices and 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 sector-specific export and import prices on the one hand and sector-specific exchange rates on the other as instruments in our regression equations also 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 two approaches.

#### *First Approach: Pooling over Sectors and over Years*

In this section, we provide manufacturing-wide estimates of the rent-sharing parameter over the whole period. The first part of Table 3 presents the Ordinary Least Squares estimates of Eq. (4). Controlling for year-, sector- and firm-level effects, the estimated wages-profits elasticity amounts to 0.095 and is strongly significant. It is somewhat higher than the one obtained by Goos and Konings (2001) who find an elasticity of 0.06. This point estimate also clearly shows that symmetric Nash bargaining, in which case we would have a coefficient of the relative bargaining power equal to one, can easily be rejected.

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<sup>27</sup> We have only taken the trade flows of those countries for which their share in Belgian imports exceeds 2 percent.

**Table 3** Wage Equation.

First Approach: Pooling over Sectors and over Years.

ESTIMATION METHOD	OLS	TSLSa	TSLSb	TSLSc	TSLSD
<b>Constant</b>	0.022*** (0.005)	0.037*** (0.008)	0.040*** (0.007)	0.040*** (0.006)	0.026*** (0.005)
<b>Profits per Worker</b>	0.095*** (0.005)	0.087** (0.035)	0.220** (0.088)	0.220*** (0.058)	0.090* (0.051)
<b>Sectoral Unempl.</b>	-0.042* (0.024)	-0.055** (0.028)	-0.005 (0.023)	-0.005 (0.021)	-0.016 (0.021)
<b>Sectoral av. Wage</b>	0.132 (0.098)	0.170* (0.090)	0.150 (0.121)	0.150 (0.121)	0.159 (0.120)
<b>Year dummies</b>	Yes	Yes	Yes	Yes	Yes
<b>Sector dummies</b>	Yes	Yes	Yes	Yes	Yes
<b>Durbin-Wu-Hausman Test (p-value)</b>	0.0025				
<b>Hansen-Sargan IV Test (p-value)</b>		0.139	0.880	0.946	0.290
<b>Nullity of the Instruments (F-statistic)</b>		56.25	4.28	4.02	4.15
<b># Obs.</b>	73353	26078	73351	73351	73351
<b>R<sup>2</sup></b>	0.077	0.126	.	.	0.077

\*\*\* 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.

The instruments are in levels. Durbin-Wu-Hausman Test: test of endogeneity of real profits per worker.

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

distributed as  $\chi^2_{df}$ . Nullity of the Instruments (F-statistic): tests the nullity of the instruments for real profits per worker.A full stop in the R<sup>2</sup> box indicates that the calculated R<sup>2</sup> was negative and hence is not reported.a: instruments: profits per worker<sub>t-3</sub>, profits per worker<sub>t-4</sub>.b: instruments: export prices<sub>WORLD, t-2, t-3</sub>, import prices<sub>WORLD, t-2, t-3</sub>.c: instruments: export prices<sub>OECD, t-3</sub>, export prices<sub>CEE, t-3</sub>, export prices<sub>NICs, t-3</sub>, export prices<sub>other NON-OECD, t-3</sub>,  
import prices<sub>OECD, t-3</sub>, import prices<sub>CEE, t-3</sub>, import prices<sub>NICs, t-3</sub>, import prices<sub>other NON-OECD, t-3</sub>.d: instruments: exchange rates<sub>t, t-1, t-2, t-3, t-4, t-5</sub>.

However, as discussed above, OLS estimates are likely to be affected by endogeneity biases. We test the endogeneity of profits per worker in two ways. First, we use the Durbin-Wu-Hausman test. From Table 3, 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 consistent.<sup>28</sup>

In the second column of Table 3, we use the 3-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 Hausman-Sargan test does not reject the null hypothesis that our instruments are valid. To check the usefulness of the instruments, we report the F-statistic that tests the nullity of the instruments in the first-stage regression. This test statistic indicates that the nullity of the instruments in the first-stage regression is rejected. Taking into account endogeneity, we find a wages-profit elasticity of almost 0.09.

To check the robustness of the results, we now present three consistency checks, which also take into account the first and the second channel through which international trade can affect wages in a bargaining framework. The first two consistency checks are in line with the hypothesis that international trade has an effect on bargained wages through shifts in the size of rents (see last three columns of Table 3). The third consistency check investigates whether Belgian manufacturing wages are influenced by international trade through changes in the workers' outside option (see Table 4).

The third and the fourth column of Table 3 report the estimates of the rent-sharing parameter using sector-specific international prices as instruments. These sector-specific export and import prices represent exogenous demand shocks that increase product market competition in Belgium (for a proof see Appendix A). From these columns, it follows that the estimated wages-profits elasticity is considerably higher using sector-specific international prices as instruments than the ones using lagged profit values as instruments. In the third column, we use sector-specific international prices at the world level as instruments, in the fourth column we split up sector-specific international prices to various destinations/origins: OECD countries, CEE countries, NICs and other NON-OECD countries.<sup>29</sup> The point estimate of the rent-sharing parameter is in both cases 0.22. The specification tests do not reject the null hypothesis that our instruments are valid. The F-statistics reject the nullity of the instruments in the first-stage regression. The fifth column of Table 3 reports the results using sector-specific 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.

<sup>28</sup> Results not reported but available upon request.

<sup>29</sup> The 4 destinations/origins which sum up to the WORLD are: (1) OECD countries: Australia, Austria, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Mexico, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the US and the UK, (2) CEE countries: Albania, Bulgaria, the Czech Republic, the Slovak Republic, Romania, Poland and Hungary, (3) Newly Industrialising Countries (NICs): Hong Kong, Malaysia, Singapore, Taiwan, Thailand and Korea and (4) other NON-OECD countries: WORLD - OECD - CEE - NICs. Like other OECD countries, international trade of Belgium consists mainly of trade with other OECD countries. In 2002, the export/GDP (import/GDP) ratio is 69.06% (62.14%) when considering trade with other OECD countries while 1.76% (2.05%) when considering trade with NICs (<http://www.oecd.org>).

Again, we cannot reject the null hypothesis that the overidentifying restrictions are correct. The F-statistic indicates that the nullity of the instruments in the first-stage regression is rejected.

Our third consistency check is reported in Table 4. To control for the second channel through which international trade might affect bargained wages, i.e. through changes in the workers' outside option, we substitute the share of imports and the share of exports in total production at the sectoral level for the workers' outside option. The idea is that imports of goods are potential substitutes for labour. Hence, the higher the ratio of imports over production in a sector, the lower the employment opportunities and the lower the workers' outside option. The opposite reasoning holds for the ratio of exports over production. The OLS estimates are reported in the first column of Table 4. As expected, the higher the share of imports in total production in a sector, the lower the workers' wages and vice versa for the share of exports. As import and export quantities in a small open economy may not be fully exogenous since they depend on domestic demand and supply conditions, we test their exogeneity using the Davidson and MacKinnon (1993) test. This augmented regression test rejects the exogeneity of import and export quantities.<sup>30</sup> Therefore, we apply the same instrumentation idea as for profits per worker, i.e. sector-specific international prices defined at the world level as well as split up to various destinations/origins are used as instruments.<sup>31</sup> The second column of Table 4 shows the IV results with import and export as well as profits per worker instrumented by sector-specific international prices at the world level.<sup>32</sup> The point estimates of the share of imports and the share of exports are considerably larger compared to the OLS estimates but the direction of the effects is the same. The Hansen-Sargan IV test does not show evidence against our estimates. In column 3 of Table 4, the countries of destination/origin of exports and imports are distinguished. The results reveal that the destination/origin of exports and imports matters, even though the effects are not always precisely estimated. Workers' outside option and hence workers' wages are significantly negatively affected by imports of goods from OECD countries and NICs whereas workers benefit from exports to CEE countries. Contrasting OECD countries with the other groups of countries, we see that the coefficients on the share of imports from OECD countries and the share of exports to OECD countries are much larger than the ones of the other groups of countries. A possible explanation is that international trade of Belgium mainly consists of trade with other OECD countries (<http://www.oecd.org>).

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<sup>30</sup> Results not reported but available upon request.

<sup>31</sup> For all specifications, the F-statistics -testing the usefulness of the instruments for the profit per worker variable and for import and export quantities- reject the nullity of the instruments in the first-stage regression. For the sake of brevity, these test statistics are not reported but are available upon request.

<sup>32</sup> Note that we do not use all the sector-specific prices as instruments but only those that passed the exogeneity test. That explains why the instrument set used in Table 3 differs from the one in Table 4.

**Table 4** Wage Equation.

First Approach: Pooling over Sectors and over Years - Outside Option Channel.

ESTIMATION METHOD	OLS	TSLSa	TSLSb
Constant	0.035*** (0.007)	0.068*** (0.015)	0.034*** (0.011)
Profits per Worker	0.066*** (0.005)	0.147** (0.073)	0.180*** (0.057)
Import <sup>(WORLD)</sup> /Production	-0.083*** (0.028)	-0.646*** (0.197)	
Import <sup>(OECD)</sup> /Production			-0.291*** (0.089)
Import <sup>(CEE)</sup> /Production			-0.009 (0.011)
Import <sup>(NICs)</sup> /Production			-0.031** (0.013)
Import <sup>(other NON-OECD)</sup> /Production			0.020** (0.010)
Export <sup>(WORLD)</sup> /Production	0.038* (0.023)	0.478*** (0.133)	
Export <sup>(OECD)</sup> /Production			0.082 (0.081)
Export <sup>(CEE)</sup> /Production			0.016** (0.008)
Export <sup>(NICs)</sup> /Production			-0.007 (0.016)
Export <sup>(other NON-OECD)</sup> /Production			-0.023 (0.023)
Year dummies	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes
Hansen-Sargan IV Test (p-value)		0.401	0.091
# Obs.	41615	41615	41615
R <sup>2</sup>	0.046	.	.

\*\*\*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. The instruments are in levels.

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

asymptotically distributed as  $\chi^2_{df}$ . A full stop in the R<sup>2</sup> box indicates that the calculated R<sup>2</sup> was negative and hence is not reported.

a: Imports/Production, Exports/Production and Profits per Worker instrumented.

Instruments: export prices<sub>WORLD, t, t-1</sub>, import prices<sub>WORLD, t, t-1</sub>.

b: Imports/Production, Exports/Production and Profits per Worker instrumented. Instruments:

export prices<sub>OECD, t, t-3, t-4</sub>, export prices<sub>CEE, t, t-3, t-4</sub>, export prices<sub>NICs, t, t-3, t-4</sub>, export prices<sub>other NON-OECD, t, t-3, t-4</sub>,

import prices<sub>OECD, t, t-3, t-4</sub>, import prices<sub>CEE, t, t-3, t-4</sub>, import prices<sub>NICs, t, t-3, t-4</sub>, import prices<sub>other NON-OECD, t, t-3, t-4</sub>.

**Second Approach: Per Sector, per Year**

So far, we have restricted all sectors to share the same rent-sharing parameter. To investigate whether rent-sharing behaviour differs across sectors, we performed F-tests. These tests reject the poolability across sectors. The same result is obtained by Dobbelaere (2003). Therefore, 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 B.1 of Appendix B. 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.

For each sector-year, we regress firm-level wages per worker on firm-level profits per worker. In Table 5, we present both the OLS and the TSLS rent-sharing 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 than in 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.

**Table 5** Wage Equation.

Second Approach: Per Sector, by Year.

Sector	Year	# Obs.	Wage-profits Elasticity (OLS)	# Obs.	Wage-profits Elasticity (TSLS*)
Sec1	1991	1894	0.107*** (0.010)	844	0.151*** (0.018)
	1992	2018	0.092*** (0.009)	865	0.154*** (0.020)
	1993	2072	0.099*** (0.010)	903	0.131*** (0.018)
	1994	2093	0.115*** (0.010)	965	0.148*** (0.016)
	1995	2107	0.108*** (0.008)	1055	0.182*** (0.016)
Sec2	1991	695	0.088*** (0.013)	407	0.128*** (0.020)
	1992	661	0.076*** (0.013)	378	0.118*** (0.023)
	1993	652	0.069*** (0.013)	353	0.136*** (0.025)
	1994	676	0.090*** (0.015)	348	0.119*** (0.027)
	1995	620	0.103*** (0.016)	329	0.145*** (0.030)
Sec3	1991	786	0.073*** (0.012)	390	0.118*** (0.023)
	1992	762	0.073*** (0.011)	379	0.115*** (0.022)
	1993	727	0.072*** (0.012)	356	0.109*** (0.025)
	1994	720	0.073*** (0.014)	339	0.116*** (0.024)
	1995	679	0.083*** (0.012)	304	0.111*** (0.026)
Sec4	1991	1254	0.053*** (0.013)	641	0.081*** (0.021)
	1992	1341	0.027*** (0.012)	641	0.125*** (0.022)
	1993	1360	0.043*** (0.013)	653	0.112*** (0.023)
	1994	1364	0.073*** (0.012)	639	0.103*** (0.023)
	1995	1331	0.066*** (0.014)	641	0.076*** (0.021)
Sec5	1991	210	0.075*** (0.025)	116	0.035 (0.049)
	1992	200	0.076*** (0.027)	113	0.073 (0.056)
	1993	213	0.064** (0.034)	107	0.043 (0.031)
	1994	212	0.021 (0.025)	105	0.063** (0.031)
	1995	207	0.049** (0.024)	111	0.127*** (0.036)

Sec6	1991	1501	0.041*** (0.013)	601	0.063 (0.023)
	1992	1620	0.031*** (0.012)	616	0.051*** (0.027)
	1993	1734	0.050*** (0.012)	648	0.075*** (0.029)
	1994	1803	0.050*** (0.011)	660	0.099*** (0.024)
	1995	1849	0.035*** (0.011)	764	0.111*** (0.023)
Sec7	1991	423	0.125*** (0.021)	236	0.192*** (0.035)
	1992	447	0.130*** (0.022)	252	0.292*** (0.051)
	1993	429	0.121*** (0.022)	215	0.262*** (0.051)
	1994	450	0.111*** (0.019)	227	0.203*** (0.039)
	1995	448	0.137*** (0.022)	238	0.201*** (0.034)
Sec8	1991	479	0.064*** (0.016)	258	0.055*** (0.030)
	1992	473	0.033* (0.020)	248	0.056 (0.040)
	1993	486	0.072*** (0.019)	242	0.061* (0.035)
	1994	505	0.051*** (0.014)	240	0.084*** (0.029)
	1995	463	0.102*** (0.019)	241	0.135*** (0.034)
Sec9	1991	732	0.082*** (0.014)	392	0.164*** (0.030)
	1992	758	0.062*** (0.014)	407	0.163*** (0.029)
	1993	746	0.101*** (0.015)	385	0.090*** (0.025)
	1994	465	0.091*** (0.012)	418	0.070*** (0.026)
	1995	801	0.081*** (0.014)	443	0.091*** (0.026)
Sec10	1991	73	0.004 (0.044)	39	0.062 (0.074)
	1992	74	0.004 (0.058)	31	0.085 (0.075)
	1993	63	0.112* (0.062)	23	0.244* (0.141)
	1994	97	0.161*** (0.043)	36	0.112 (0.157)
	1995	91	0.171*** (0.041)	26	0.199 (0.165)
Sec11	1991	2115	0.043*** (0.009)	1013	0.087*** (0.016)
	1992	2099	0.035*** (0.009)	989	0.084*** (0.018)
	1993	1995	0.095*** (0.025)	977	0.079*** (0.024)
	1994	2053	0.480*** (0.031)	977	0.136 (0.101)
	1995	2129	0.496*** (0.028)	1014	0.038 (0.072)
Sec12	1991	643	0.060*** (0.015)	354	0.068*** (0.028)
	1992	655	0.038*** (0.013)	339	0.063*** (0.031)
	1993	639	0.093** (0.041)	302	0.166*** (0.044)
	1994	586	0.570*** (0.053)	257	0.110 (0.174)
	1995	608	0.554*** (0.048)	259	0.124 (0.267)
Sec13	1991	782	0.069*** (0.017)	308	0.158*** (0.031)
	1992	823	0.092*** (0.017)	314	0.136*** (0.031)
	1993	826	0.083*** (0.017)	314	0.127*** (0.039)
	1994	755	0.485*** (0.037)	274	0.191 (0.105)
	1995	740	0.504*** (0.037)	276	0.206*** (0.090)
Sec14	1991	271	0.006 (0.018)	126	0.014 (0.052)
	1992	297	0.048** (0.024)	128	0.022 (0.022)
	1993	286	0.019 (0.020)	127	0.095* (0.054)
	1994	266	0.575*** (0.046)	115	0.029 (0.310)
	1995	262	0.624*** (0.053)	123	0.057 (0.184)
Sec15	1991	360	0.092*** (0.017)	146	0.145*** (0.034)
	1992	399	0.077*** (0.019)	163	0.125*** (0.036)
	1993	398	0.061*** (0.018)	154	0.085*** (0.028)
	1994	374	0.092*** (0.023)	121	0.076** (0.037)
	1995	380	0.093*** (0.021)	136	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.

a: instruments: profits per worker  $t-3$ , profits per worker  $t-4$ .

## 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. 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 theoretical model. Therefore, we estimate a reduced-form equation of

estimated workers' relative bargaining power parameters  $\left(\frac{\widehat{\phi}}{1-\widehat{\phi}}\right)$  on several explanatory variables derived from an implicit structural model.

More specifically, we use the following reduced-form regression:

$$\frac{\widehat{\phi}_{jt}}{1-\widehat{\phi}_{jt}} = X_{jtk+1}\beta_{k+1} + \lambda_j + \lambda_t + \zeta_{jt} \quad (5)$$

With  $\left(\frac{\widehat{\phi}_{jt}}{1-\widehat{\phi}_{jt}}\right)$  a set of estimated TSLS rent-sharing parameters obtained from the first-stage regressions with subscripts  $j$  and  $t$  denoting sector and year respectively.  $X_{jtk+1}$  refers to a vector of explanatory variables that vary by sector-year, with  $K$  the total number of explanatory variables.  $\lambda_j$  refers to a sector-specific dummy for sector  $j$ ,  $\lambda_t$  to a time dummy for year  $t$  and  $\zeta_{jt}$  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 sector, differences in union density, etc. (see e.g. Doiron, 1992; McDonald and Suen, 1992 and Smith, 1996 for a further discussion on these issues). The time dummies control for factors that change workers' relative bargaining power over time such as government measures<sup>33</sup>, the national unemployment rate, taxes, interest rates, etc. (see e.g. Doiron, 1992 and Svejnar, 1986 for a discussion).

Table 6 provides summary statistics for our explanatory variables. These variables are at the sectoral level and are constructed such that they match the sectoral classification of the second approach of the first-stage analysis. Table B.1 in Appendix B 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 five control variables. Some of these variables have been used in earlier studies of the determinants of workers' bargaining power (see e.g. Svejnar, 1986 and Veugelers, 1989). However, the use of international trade and foreign direct investment variables to explain directly workers' bargaining power is new. As argued before, we further analyse this issue and introduce a richer specification such that we are able to investigate

<sup>33</sup> In 1993 the Belgian Federal Government launched "Het Globaal Plan voor de Werkgelegenheid, het Concurrentievermogen en de Sociale Zekerheid" (Global plan on Employment, Competitiveness and Social Security). Principally, it deals with following measures: introduction of an adjusted consumer price index used for automatic wage indexation, wage freeze for the period 1995-1996 and structural reduction of social security contributions on low wages (CRB, 2003). For brevity, we do not report the regression coefficients for these time dummies in the regression results. Our results indicate that the coefficient for the 1994 time dummy is never statistically significant while the one for the 1995 time dummy is significantly negative in a number of cases, especially when both time and sector dummies are taken up in the regression equation.



whether globalisation has an effect on the workers' relative bargaining power. In what follows, we describe the explanatory variables of Eq. (5) together with their hypothesised effect on the workers' relative bargaining power. This effect is also shown in the last column of Table 6.

**Table 6** Second-Stage Regression: Summary Statistics.

EXPLANATORY VARIABLE	# Obs.	Sample Mean	Sample St. Dev.	Sample Minimum	Sample Maximum	Hypothesised Effect on Bargaining Power (B)
<i>Trade Variables</i>						
Import <sup>(WORLD)</sup> /Production	75	1.05	1.20	0.17	5.76	B < 0
Import <sup>(OECD)</sup> /Production	75	0.81	0.60	0.17	2.83	B < 0
Import <sup>(CEE)</sup> /Production	75	0.007	0.009	0.0003	0.05	B < 0
Import <sup>(NICs)</sup> /Production	75	0.03	0.09	0.009	0.46	B < 0
Import <sup>(other NON-OECD)</sup> /Production	75	0.22	0.66	0.001	3.04	B < 0
Export <sup>(WORLD)</sup> /Production	75	0.47	0.61	0.02	2.26	B > 0
Export <sup>(OECD)</sup> /Production	75	0.85	0.66	0.21	2.80	B > 0
Export <sup>(CEE)</sup> /Production	75	0.009	0.008	0.0009	0.03	B > 0
Export <sup>(NICs)</sup> /Production	75	0.05	0.15	0.0004	0.74	B > 0
Export <sup>(other NON-OECD)</sup> /Production	75	0.19	0.55	0.004	2.54	B > 0
Outsourcing Narrow <sup>a</sup>	30	0.17	0.12	0.002	0.48	B < 0
Outsourcing Broad <sup>a</sup>	30	0.36	0.10	0.14	0.60	B < 0
Tariffs <sup>a</sup>	30	7.42	3.17	4.1	17.47	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
Relative Employment of Foreign-owned Firms	75	0.40	0.22	0.05	0.77	B < 0
Relative Value-added of Foreign-owned Firms	75	0.44	0.23	0.05	0.84	B < 0
<i>Technology Variables</i>						
R&D/output	75	0.01	0.01	0.0008	0.07	B > 0 or B < 0
Patents/output	75	0.03	0.04	0	0.17	B > 0 or B < 0
% Change in TFP	75	0.05	0.12	-0.39	0.53	B > 0 or B < 0
<i>Control Variables</i>						
Unemployment Rate	75	0.13	0.06	0.03	0.34	B < 0
Short-term Unempl. Rate	75	0.07	0.03	0.02	0.20	B < 0
C5- Concentration Ratio	75	0.34	0.17	0.12	0.77	B > 0 or B < 0
Capacity Utilisation <sup>b</sup>	70	0.77	0.03	0.70	0.86	B > 0
Skill Intensity	75	0.15	0.07	0.05	0.36	B > 0

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

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.

- **Trade variable 1:** the ratio of imports to production. The imports consist of all merchandise trade (intermediate and final goods). 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 such that workers might end up with a smaller share of the rents.
- **Trade variable 2:** the ratio of exports to production. Exports also consist of all merchandise trade (intermediate and final goods). In the case of export expansion, the opposite result holds: workers are expected to be able to extract a larger share of the rents in sectors with a strong export performance. In our regression analysis, we again split up our export and import variable to various destinations/origins: OECD countries, CEE countries, NICs and other NON-OECD countries.
- **Trade variable 3:** narrow outsourcing divided by production. Our outsourcing variable is obtained from the Belgian input-output tables and is defined as intermediate imports (see Feenstra and Hanson, 1999). Narrow outsourcing refers to intermediate imports in a given sector coming from the same sector (corresponding to the diagonal elements of the import-use matrix). We expect this outsourcing variable to have a negative effect on the workers' bargaining power. Like in many other OECD countries, a lot of outsourcing takes place in Belgium, mostly of standardised products. As pointed out by a survey of the Federal Planning Bureau (2000), lower labour costs in the host country are the main motive for outsourcing. A priori, we however expect that outsourcing is accompanied by less favourable labour market conditions for Belgian workers. 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' (relative) bargaining power is the same as for the narrow outsourcing variable.
- **Trade variable 5** refers to tariffs. As discussed in Budd and Slaughter (2004), tariffs shield domestic markets from foreign competition. As a consequence, we expect a positive link between tariffs and the workers' relative bargaining power.
- **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 investment.<sup>34</sup> As pointed out by Boeri et al. (2001), the effect of FDI on the workers' bargaining power in Europe depends on the motives for FDI. If product market capture or market expansion is the main motive, workers might end up in a stronger bargaining position. If FDI is however motivated by labour market considerations,

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<sup>34</sup> 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.

workers' bargaining power might be diminished as firms can claim to shift production abroad. Since the Belgian domestic market is rather small, it is less likely that product market considerations will be the main motivation for inward FDI flows. Consequently, the effect on the workers' relative bargaining power is expected to be negative. In a related context, Budd and Slaughter (2004) and Dobbelaere (2004) investigate whether rent sharing is dependent on the firm's ownership structure. The empirical results of the former study reveal that rent sharing is not higher in multinational enterprises. The authors argue that this result stems from additional complexities of multinational ownership. An alternative explanation is given by the footloose nature of multinationals firms. As mentioned above, the idea is that multinationals can shift their production partly or entirely to another country in case the present circumstances are unfavourable (Caves, 1996).<sup>35</sup> Focusing on Bulgaria, Dobbelaere (2004) 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. Therefore, the footloose nature of foreign-owned firms is able to create a general atmosphere of uncertainty in which workers are less likely to press for higher wages in the form of obtaining a part of the firms' profits. 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

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<sup>35</sup> For Belgium, the loss of union power due to increased firm mobility is exemplified by the Renault case. In 1997, the Renault plant in Vilvoorde (Belgium) was closed at the same time as the plant in Valladolid (Spain) was expanded. Union reactions to the relocation

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:** investment in 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 process.<sup>36,37</sup> 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 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-demanding in the sense that the introduction of new production processes and technologies necessitates 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 computerisation. Skilled workers also lose bargaining power but general occupations strengthen their bargaining

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were fierce, partly because the closure was unanticipated and partly because of the globalisation aspect (Kuhlmann, 1998).

<sup>36</sup> This author however proxies the workers' bargaining power by the union/non-union wage differential. Moreover, he uses a story of shifts in labour demand elasticities to explain the effect of technological change on the workers' bargaining power.

position in case of process computerisation. The potential difference of technology effects for unskilled versus skilled workers is an issue that we will address later.

- **Technology variable 2:** patents divided by production, a measure 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 sectoral 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. We also experiment with the sectoral short-term unemployment rate as an alternative. During wage negotiations workers might be more concerned with short-term unemployment than with total unemployment. The reason is that short-term unemployed people are more readily employable, and therefore better alternatives for existing workers. Short-term unemployed people refer to those who became unemployed less than one year ago.
- **Control variable 2:** the C5-concentration ratio, representing the sales of the top 5 firms in the sector divided by total sales.<sup>38</sup> A higher C5-concentration ratio is consistent with less fierce product market competition. As discussed in Veugelers (1989), higher output market concentration enables non-competitive pricing behaviour. Therefore, producers are less sensitive to wage increases since they can shift cost increases to domestic 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 go in both directions and depends on which of the two mechanisms prevails.
- **Control variable 3:** the sectoral 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.
- **Control variable 4:** the skill intensity. This variable refers to the ratio of skilled versus total employment in a sector. Skilled workers are defined as those who obtained higher

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<sup>37</sup> A related study by Horn and Wolinsky (1988) develops the argument that the nature of the production process in terms of complementarities and substitutability of workers in production affects the workers' bargaining power.

<sup>38</sup> We also re-ran our regressions using the Herfindahl index. Our regression results are similar and hence we do not report them. However, these results are available upon request.

education. Following the results of Kramarz (2003) and Abowd and Kramarz (1993), we expect that the workers' bargaining power is increasing in education.

#### 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.<sup>39</sup> 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 prefer to estimate Eq. (5) using each of the explanatory variables separately. As pointed out above, the reason is that there is no formal theory explaining the workers' relative bargaining power. In what follows, we discuss four 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 inputs. As documented in other work (see e.g. Abowd and Lemieux, 1993) and as mentioned above, import and export quantities in a small open economy are -in contrast to export and import prices- not fully exogenous. Regarding the trade variables, we expect our tariff measure to be the most exogenous variable (see also Haskel and Slaughter, 2003 for a discussion). To tackle the endogeneity problem, we adopt several solutions such as (1) introducing lags of the trade and technology variables and (2) using Instrumental Variables (IV) where these variables are instrumented with their lags. The two estimation techniques produced similar results. We decided to report the estimates using the IV approach.<sup>40</sup>

The second issue handles the fact that the dependent variable in Eq. (5) is a parameter which is estimated in the first stage. Therefore, the error term in this equation is heteroskedastic with zero mean and variance equal to the variance of the error term from the true regression plus the variance

of the estimated relative bargaining power of the workers  $\left( \frac{\widehat{\phi}}{1 - \widehat{\phi}} \right)$ . Following Anderson (1993) and

Slaughter (2001), we correct for this form of heteroskedasticity by weighing less heavily those observations for which the estimated variance of the relative bargaining power is larger. More specifically, we perform an Instrumental Variables (IV) regression on Eq. (5) from which we take the squared residuals. Subsequently, we regress these squared residuals on the estimated variance

<sup>39</sup> Paes de Barros et al. (1999) also rely on the two-stage strategy to estimate the effect of international trade on labour demand elasticities.

<sup>40</sup> The regression results using the lags of the explanatory variables can be obtained from the authors upon request. Next to trade flows, we also included percentage changes in import and export prices. As argued earlier in this paper, these might be considered exogenous in a small open economy (see Section 3.2). More specifically, we expect that an increase (decrease) in import prices and export prices is associated with lower (higher) foreign competition. Hence, we expect a positive regression coefficient of these variables. Early OLS and

of the relative bargaining power coefficients, together with these estimated variances squared and cubed. Finally, we use the inverse of the predicted values of this regression as weights in a weighted Instrumental Variables regression of Eq. (5).<sup>41</sup>

The third 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 pointed above, we first perform univariate regressions. This avoids potential multicollinearity problems between the explanatory variables. As a robustness check, we also estimate Eq. (5) using various significant explanatory variables from the univariate regressions. Moreover, we have also experimented with several combinations of sector and time fixed effects and have tried four different combinations like in Slaughter (2001) who performs regressions with no sector and time dummies, only sector dummies, only time dummies and a combination of both.

The last issue deals with the fact that -as widely documented in the trade-wages literature- globalisation and technological change have a different impact on skilled versus unskilled workers. Our dataset did not allow us to estimate separate coefficients for the bargaining power of skilled versus unskilled workers. To shed some light on the issue of skill heterogeneity at the sectoral level, we split our sample according to the sectoral skill intensity. More specifically, we computed an average skill intensity for each sector and our cutting point occurs at the median.<sup>42</sup>

### 4.3 Empirical results

Table 7 reports the regression results of Eq. (5), using one single explanatory variable each time. The trade (except outsourcing and tariffs), technology and inward FDI variables are instrumented with their 1-period lagged values. To test for serial correlation, we performed the Woolridge test (Woolridge, 2002). Since the null hypothesis of no serial correlation cannot be rejected, the use of 1-period lagged values as instruments is justified.<sup>43</sup>

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IV regression results revealed that these variables were not statistically significant. Hence, we do not report these results but they can be obtained from the authors upon request.

<sup>41</sup> In the literature, there are two correction procedures for the use of estimated regressands in two-step equations. One method is proposed by Anderson (1993) and subsequently used by Slaughter (2001). Their correction is applicable if the second-stage regressand is a *parameter* which is estimated in the first stage. The other method is suggested by Feenstra and Hanson (1999) and adopted by Haskel and Slaughter (2001, 2003). Their correction is valid if the second-stage regressand is a *variable* which is estimated in the first stage. Given our empirical set-up, we follow completely the first method. The basic idea is that the errors in the stage-two regressions may be heteroskedastic due to the imprecision in the first-stage estimates. Since the source of heteroskedasticity is known, the estimated variance in the first-stage regressions can be used to create a weight for the weighted Instrumental Variables regression in the second stage.

<sup>42</sup> The skill-intensive sectors are: Printing and Allied Industries (Sector 6), Chemical Industry and Man-made Fibres (Sector 7), Rubber and Plastic (Sector 8), Non-Electrical Machinery (Sector 12), Office and Computing Machinery, Electrical Machinery and Professional Goods (Sector 13), Other Transport Equipment (Sector 14) and Other Manufacturing (Sector 15).

<sup>43</sup> The use of 2-period lagged values as instruments produces broadly the same results.

**Table 7** Second-Stage Univariate Regression Instrumental Variables Results:  
Determinants of the Workers' Relative Bargaining Power.

EXPLANATORY VARIABLE	Hypothesised Effect on Bargaining Power (B)	Time Fixed Effects	Sector & Time Fixed Effects	# Obs.
<i>Trade Variables</i>				
Import <sup>(WORLD)</sup> /Production	B < 0	-0.001 (0.003)	-0.01 (0.03)	75
Import <sup>(OECD)</sup> /Production	B < 0	0.004 (0.007)	0.24 (0.83)	75
Import <sup>(CEE)</sup> /Production	B < 0	1.30 (0.72)	2.52 (2.07)	75
Import <sup>(NICs)</sup> /Production	B < 0	-0.05 (0.03)	-0.71* (0.39)	75
Import <sup>(other NON-OECD)</sup> /Prod.	B < 0	-0.003 (0.005)	-0.07*** (0.01)	75
Export <sup>(WORLD)</sup> /Production	B > 0	0.02** (0.01)	0.65 (2.38)	75
Export <sup>(OECD)</sup> /Production	B > 0	0.01** (0.007)	0.82 (1.82)	75
Export <sup>(CEE)</sup> /Production	B > 0	2.52*** (0.62)	0.04 (2.19)	75
Export <sup>(NICs)</sup> /Production	B > 0	-0.01 (0.02)	-0.48** (0.19)	75
Export <sup>(other NON-OECD)</sup> /Prod.	B > 0	-0.003 (0.006)	-0.09*** (0.02)	75
Outsourcing Narrow <sup>a</sup>	B < 0	0.04 (0.08)	0.04 (0.18)	30
Outsourcing Broad <sup>a</sup>	B < 0	-0.003 (0.10)	0.02 (0.16)	30
Tariffs <sup>a</sup>	B > 0	0.50*** (0.10)	1.21 (1.72)	30
<i>Inward Foreign Direct Investment Variables</i>				
Relative Number of Foreign-owned Firms	B < 0	0.21 (0.09)	-2.65*** (0.69)	75
Relative Employment of Foreign-owned Firms	B < 0	0.02 (0.02)	-0.39 (0.59)	75
Relative Value-added of Foreign-owned Firms	B < 0	0.02 (0.02)	3.02 (16.28)	75
<i>Technology Variables</i>				
R&D/output	B > 0 or B < 0	1.48*** (0.32)	-2.07 (11.91)	75
Patents/output	B > 0 or B < 0	0.04 (0.14)	0.01 (0.18)	75
% Change in TFP	B > 0 or B < 0	-0.04 (0.30)	-0.03 (0.08)	75
<i>Control Variables</i>				
Unemployment Rate	B < 0	0.14* (0.07)	-0.001 (0.22)	75
Short-term Unempl. Rate	B < 0	0.07 (0.14)	-0.11 (0.15)	75
C5- Concentration Ratio	B > 0 or B < 0	0.004 (0.02)	-0.01 (0.01)	75
Capacity Utilisation <sup>b</sup>	B > 0	-0.27** (0.13)	-0.01 (0.20)	70
Skill Intensity	B > 0	0.09 (0.09)	-0.04 (0.09)	75

\*\*\* 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.



In general, the regression results of Table 7 reveal that -except for the control variables and some of the trade variables split up to various destinations/origins- the expected sign of the regression coefficients is obtained. In a number of cases, these regression coefficients are not always statistically significant as their significance depends on the inclusion of sector fixed effects.

**Basic Results.** As mentioned above, we have estimated Eq. (5) with no sector and time fixed effects, only sector fixed effects, only time fixed effects and sector as well as time fixed effects. The weighted IV results reveal that the sign and the significance of the estimated effect of the variables in the specifications without fixed effects accord with those in the specifications with only time fixed effects. Both specifications focus on the inter- as well as on the intra-sectoral variation of the variables. Similarly, the sign and the significance of the estimated effect of the variables in the specifications with sector fixed effects equal those of the specifications with both time and sector fixed effects. When sector fixed effects are included, we use the time-series information of the variables. In other words, the focus is on the intra-sectoral variation of the variables, i.e. on how the workers' relative bargaining power moves over time. For the sake of brevity, we only report in Table 7 the results of the specifications with time fixed effects and both time and sector fixed effects.

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 with only time fixed effects, statistically significant positive effects are found for the variables related to trade with the rest of the world, the OECD countries and the CEE countries. Sectors characterised by strong export performance to these countries enable workers to cream off a larger share of the rents. The same is true in sectors where higher tariffs apply which shield them from international competition.

In the regressions with both time and sector fixed effects, the variables related to imports coming from the NICs and the other NON-OECD countries are statistically significant. This implies that in sectors confronted with stronger import competition, the share of rents going to workers is squeezed. The tariff variable loses its statistical significance but still has the expected sign. Surprisingly, our regression results reveal that higher exports to the NICs and the other NON-OECD countries induce a negative effect on the workers' relative bargaining power.

When controlling for both time and sector fixed effects, our results show that workers have a 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.

In the specifications with only time fixed effects, a strong statistically significant result emerges from our variable of innovative input (R&D divided by output). In those sectors with more technological change in the form of high R&D expenditures, 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. No statistically significant effects are found for the TFP- and patent variables.

We do not obtain the expected sign for the regression coefficients of our control variables. The regression coefficient for the unemployment (capacity utilisation) variable in the specification with only time fixed effects has a statistically significant positive (negative) sign. This positive coefficient for the unemployment variable accords in some sense with the empirical results of other empirical work for Belgium, e.g. Abraham and De Bruyne (2000) find that higher unemployment has not led to wage moderation<sup>44</sup> and Veugelers (1989) points to a positive, although not significant, effect of unemployment on workers' bargaining power in the Belgian industry. We also take up short-term instead of total unemployment in a sector. In all the specifications, short-term unemployment does not appear to have any statistically significant effect on the workers' relative bargaining power.

***Combination of Independent Variables.*** As a robustness check, we estimate Eq. (5) using a combination of the independent variables. The choice of the included regressors is based on the significance of these variables in the univariate regressions. We combine trade-variables split up to various destinations/origins with an FDI variable (the number of foreign-owned firms relative to the total number of firms), a technology variable (R&D divided by production) and three control variables (short-term unemployment, C5 ratio and skill intensity). We also take up time and sector fixed effects.

Including all these variables in a regression might cause one of them to lose its statistical significance due to multicollinearity problems. The reason is that the link between trade and FDI on the one hand and technology on the other hand occurs in two directions. Technological change spurs globalisation as technological progress diminishes the economic distance between countries. Also, increased international trade and inward FDI often trigger technological change (see Abraham and Brock, 2003; Bernard and Jensen, 1999, 2001; Doms and Jensen, 1998; Globerman et al., 1994; Lawrence, 2000 and Wood, 1995, among others). Likewise, multicollinearity might arise between the trade and FDI variables as they are often substitutes or complements (see Blomström et al., 1988; Lipsey and Weiss, 1981, among others).

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<sup>44</sup> 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).

Table 8 reveals that the statistical significance of the trade variables depends on the destination/origin of exports and imports. Focusing on the results with trade with the rest of the world shows that the FDI variable loses its statistical significance while the export variable is significant at 5% (see first column of Table 8). Even stronger statistically significant trade-effects arise if trade with the OECD countries is considered (see second column). In this specification, strong import competition seems to squeeze the share of rents going to the workers while the opposite is true for strong export performance. When trade with the CEE countries is taken into account, we find that the trade variables lose their statistical significance while the FDI variable is significant at 1% (see third column). The fourth column of Table 8 reveals that no significant effects are found when we consider trade with the NICs. The results including trade with the other NON-OECD countries equal the ones including trade with the CEE countries, i.e. the trade variables lose their statistical significance in favour of the FDI variable (see last column). In all specifications, no statistically significant effects show up for the technology and control variables.

**Table 8** Second-Stage Multivariate Regression Instrumental Variables Results:  
Determinants of the Workers' Relative Bargaining Power.

EXPLANATORY VARIABLE	Hypothesised Effect on Bargaining Power (B)	Sector & Time Fixed Effects				
Import <sup>(WORLD)</sup> /Production	B < 0	-0.001 (0.07)				
Import <sup>(OECD)</sup> /Production	B < 0		-0.34* (0.19)			
Import <sup>(CEE)</sup> /Production	B < 0			-1.18 (1.46)		
Import <sup>(NICs)</sup> /Production	B < 0				-3.51 (10.41)	
Import <sup>(other NON-OECD)</sup> /Prod.	B < 0					-0.006 (0.70)
Export <sup>(WORLD)</sup> /Production	B > 0	0.40** (0.19)				
Export <sup>(OECD)</sup> /Production	B > 0		0.55** (0.25)			
Export <sup>(CEE)</sup> /Production	B > 0			-0.04 (2.71)		
Export <sup>(NICs)</sup> /Production	B > 0				1.38 (4.90)	
Export <sup>(other NON-OECD)</sup> /Prod.	B > 0					-0.05 (0.85)
Relative Number of Foreign-owned Firms	B < 0	-4.81 (3.53)	-6.99 (6.62)	-3.16*** (1.29)	-4.45 (3.41)	-3.76** (1.70)
R&D/output	B > 0 or B < 0	-1.71 (17.1)	-4.47 (26.9)	3.94 (11.8)	10.70 (33.5)	2.54 (12.03)
Short-term Unempl. Rate	B < 0	0.001 (0.002)	0.005 (0.003)	0.11 (0.20)	0.34 (0.69)	0.12 (0.29)
C5- Concentration Ratio	B > 0 or B < 0	-0.02 (0.02)	-0.01 (0.03)	-0.022 (0.02)	-0.006 (0.04)	-0.017 (0.02)
Skill Intensity	B > 0	-0.32 (0.57)	-0.12 (0.34)	0.20 (0.52)	0.14 (0.95)	0.29 (0.49)

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

*Skill Effect.* Table 9 reports the univariate regression results using a split sample according to the sectoral skill intensity. For both groups, we estimate the specifications with only time fixed effects and both time and sector fixed effects. Unfortunately, comparing the estimated trade-effects of the unskilled-intensive sectors with those of the skill-intensive sectors does not allow us to draw clear-cut conclusions.

From the first two columns of Table 9, it follows that increased import competition lowers the workers' relative bargaining power in the unskilled-intensive sectors. This effect is most pronounced when we consider trade with the rest of the world and the OECD countries. Regarding our export variable, workers in these sectors benefit most in terms of bargaining power when considering trade with the rest of the world, the OECD and the other NON-OECD countries. These workers are also able to cream off a larger share of the rents when tariffs are higher. They lose however, in terms of bargaining power, when confronted with a relatively high number of foreign-owned firms and when the share of patents is high.

The results of the skill-intensive sectors follow more closely the general results (reported in Table 7). In line with the general results, workers in sectors confronted with a lot of imports from other NON-OECD countries lose in terms of bargaining power while they benefit when the sector exports a lot to the rest of the world and the CEE countries. Similar to the general results, exports to the NICs and the other NON-OECD countries seem to affect the workers' relative bargaining power negatively. Regarding the inward foreign direct investment variables, the two specifications blur a clear picture. Consistent with the general results, we find again a strongly positive technology effect of R&D/production.

**Table 9** Second-Stage Univariate Regression Instrumental Variables Results:

Determinants of the Workers' Relative Bargaining Power in (Un)skilled-Intensive Sectors.

EXPLANATORY VARIABLE	Unskilled-Intensive Sectors			Skill-Intensive Sectors		
	Time Fixed Effects	Time & Sector Fixed Effects	# Obs.	Time Fixed Effects	Time & Sector Fixed Effects	# Obs.
<i>Trade Variables</i>						
Import <sup>(WORLD)</sup> /Production	-0.02* (0.01)	0.15 (0.09)	40	0.001 (0.004)	-0.07* (0.04)	35
Import <sup>(OECD)</sup> /Production	-0.03** (0.01)	0.15 (0.09)	40	0.01 (0.01)	-0.03 (0.16)	35
Import <sup>(CEE)</sup> /Production	0.36 (0.50)	-1.72 (1.18)	40	12.14** (4.31)	7.63 (4.84)	35
Import <sup>(NICs)</sup> /Production	0.02 (0.19)	0.45 (0.57)	40	-0.06 (0.04)	-2.28 (2.50)	35
Import <sup>(other NON-OECD)</sup> /Prod.	0.06 (0.02)	-0.58 (0.75)	40	-0.005 (0.006)	-0.09*** (0.02)	35
Export <sup>(WORLD)</sup> /Production	0.008 (0.01)	0.35* (0.18)	40	0.14*** (0.02)	39.36 (80.79)	35
Export <sup>(OECD)</sup> /Production	0.006 (0.02)	0.47** (0.23)	40	0.02 (0.009)	0.99 (3.40)	35
Export <sup>(CEE)</sup> /Production	0.38 (0.68)	0.23 (0.94)	40	4.12*** (0.85)	-9.29 (5.17)	35
Export <sup>(NICs)</sup> /Production	0.92 (0.73)	7.15 (9.80)	40	-0.02 (0.02)	-0.66** (0.24)	35
Export <sup>(other NON-OECD)</sup> /Prod.	0.39** (0.17)	0.41 (1.61)	40	-0.005 (0.008)	-0.13** (0.02)	35
Outsourcing Narrow <sup>a</sup>	-0.06 (0.14)	-0.14 (0.16)	16	0.14 (0.11)	0.28*** (0.11)	14
Outsourcing Broad <sup>a</sup>	0.03 (0.16)	0.30 (0.38)	16	0.02 (0.13)	0.05 (0.15)	14
Tariffs <sup>a</sup>	0.69** (0.14)	2.04 (10.09)	16	0.34 (0.74)	-12.29 (15.43)	14
<i>Inward Foreign Direct Investment Variables</i>						
Relative Number of Foreign-owned Firms	-0.005 (0.10)	-2.30** (0.59)	40	0.49*** (0.11)	-8.50** (2.78)	35
Relative Employment of Foreign-owned Firms	-0.01 (0.03)	-0.60 (0.91)	40	0.06 (0.03)	-0.34 (0.76)	35
Relative Value-added of Foreign-owned Firms	-0.01 (0.03)	-3.85 (7.81)	40	0.05 (0.03)	-0.42 (1.30)	35
<i>Technology Variables</i>						
R&D/output	1.55 (2.06)	-1.86 (11.82)	40	1.89*** (0.36)	6.40 (14.21)	35
Patents/output	-0.64** (0.15)	0.38 (0.54)	40	0.36* (0.20)	0.43 (0.23)	35
% Change in TFP	-0.05 (0.13)	-0.06 (0.16)	40	-0.07 (0.21)	-0.12 (0.09)	35

\*\*\*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.

## 5. CONCLUSIONS

In this paper, we investigate the hypothesis that international trade has affected workers' wages in the Belgian manufacturing industry over the period 1987-1995 by using a rent-sharing framework. As a starting point, the results of reduced form equations of bargained wages and profits per worker have supported this hypothesis. Our analysis has uncovered three important mechanisms underlying these results. In the first part of the paper, we have shown that international trade affects wages through changes in the firms' rents and changes in the workers' outside option. 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 results reveal that increased foreign competition in the form of lower export prices reduces both wages per worker and profits per worker. Concerning the effect of international trade on workers' wages through changes in the workers' outside option, we find that the higher the ratio of imports over production at the sectoral level the lower the workers' outside option (and hence workers' wages), while the opposite is true for the ratio of exports over production. The underlying idea is that imports of goods are potential substitutes for labour. When international trade flows are split up according to the countries of destination/origin, our results reveal that imports from OECD countries and NICs have a significantly negative effect on the workers' outside option whereas exports to CEE countries affect the workers' outside option significantly positively.

In the second part of the paper, we have provided evidence of globalisation affecting workers' bargaining power directly. We have explored the link between globalisation and the workers' relative bargaining power by introducing measures related to import and export competition, outsourcing, tariffs and inward foreign direct investment. Import and export competition and tariffs seem to have in general the expected effect on the workers' bargaining power. Regarding inward foreign direct investment, we have found that more foreign-owned firms in a sector reduce the workers' bargaining power. We have put forward several explanations such as the footloose nature of multinational companies and the crowding-out of domestic entrepreneurship.

Finally, a weakness of the theoretical model is that imperfect competition in the product market is not explicitly modelled. Product market conditions enter the model through a revenue shifter. In a follow-up paper, we aim at modelling imperfectly competitive product markets more rigorously.

**APPENDIX A**

To test whether changes in sector-specific international prices present pure demand shocks, we follow Abowd and Lemieux (1993) and Kramarz (2003). We compare Ordinary 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 by the sector-specific price of imports and the sector-specific 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 sector-specific 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 A.1., we estimate the relation between firm-level real sales and sector-level value-added prices 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 sector-specific export and import 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 a 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. The F-statistic rejects the nullity of the instruments in the first-stage regression. Our findings are hence consistent with the fact that international prices represent pure demand shocks that increase product market competition in Belgium.

**Table A.1** Supply Equation, 1987-1995.

ESTIMATION METHOD	OLS	Firm Fixed Effects	TSLS <sup>a</sup>
Constant	25.889*** (6.545)	-48.546*** (1.387)	19.472*** (1.492)
Price of Value Added	-0.757*** (0.106)	-0.126*** (0.028)	0.539*** (0.204)
Time Trend	-0.010*** (0.003)	0.027*** (0.001)	-0.010*** (0.001)
Hansen-Sargan IV Test (p-value)			0.102
Nullity of the Instruments (F-statistic)			337
# Obs.	71594	71594	45390
R <sup>2</sup>	0.001	0.026	.

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

The dependent variable is firm-level real sales. The prices are measured at the sectoral level. All variables and instruments are expressed as natural logarithms. The price of value added is deflated by the CPI (1990=100), while sales are deflated by the producer price. Hansen-Sargan Instrument Validity Test: test of correlation among instruments and residuals, asymptotically distributed as  $\chi^2_{df}$ . Nullity of the Instruments (F-statistic): tests the nullity of the instruments for the price

of value added. A full stop in the R<sup>2</sup> box indicates that the calculated R<sup>2</sup> was negative and hence is not reported.

a: instruments: export prices<sub>t-4</sub>, import prices<sub>t-4</sub>.

## APPENDIX B

**Table B.1** Sectoral Classification for the First-Stage Regressions.

	Sector	# Firms <sup>a</sup>	NACE-70	NACE-Bel
Sec 1	Food, beverages and tobacco	2392	41+42	15+16
Sec 2	Textiles	866	43	17
Sec 3	Wearing apparel and leather and products	869	44+45	18+19
Sec 4	Wood products and furniture and fixtures	1380	46	20 + 36.1
Sec 5	Manufacture of pulp, paper and board	227	471+472	21
Sec 6	Printing and allied industries	1883	473+474	22
Sec 7	Chemical industry and man-made fibres	492	25+26	24
Sec 8	Rubber and plastic products	505	48	25
Sec 9	Non-metallic mineral products	787	24	26
Sec 10	Basic metal industries	85	22	27
Sec 11	Metal products	2197	31	28
Sec 12	Non-electrical machinery	715	32	29
Sec 13	Office and computing machinery, electrical machinery and professional goods	883	33+34+37	30-33
Sec 14	Other transport equipment	301	35+36	34+35
Sec 15	Other manufacturing	435	49	36-36.1

<sup>a</sup> The number of firms in each sector is computed as the average number of firms over the period 1987-1995.



## APPENDIX C

The sectoral classification for the second-stage regressions is based on Table B.1 of Appendix B 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 OECD.<sup>45</sup> 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 economy.<sup>46</sup> 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 B.1 of Appendix B 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 B.1. Hence, we used sectoral import shares as a weight to construct tariff data based on the classification of Table B.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 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).<sup>47</sup> 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

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<sup>45</sup> The data were first converted through the International Industrial Classification (ISIC) and subsequently converted to the NACE-70 based on Schumacher (1992).

<sup>46</sup> See <http://www.plan.be/>.

<sup>47</sup> See <http://www.belspo.be/>

conversion table of Verspagen et al. (1994).<sup>48</sup> 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 where 1990 is the base year. The percentage change of Total Factor Productivity can be expressed as follows:

$$\hat{A} = (\hat{Q} - \hat{L}) - \alpha(\hat{K} - \hat{L}) \quad (C1)$$

In this expression, the first term reflects the percentage change in the output-labour ratio. In the second term,  $\alpha$  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).<sup>49</sup> We first compute an initial capital stock for 1990. If we assume that both the depreciation rate ( $\delta$ ) and the annual growth rate ( $\eta$ ) of investments prior to 1990 are constant, the initial capital stock  $K_{1990}$  equals:

$$\begin{aligned} K_{1990} &= I_{1990} + (1 - \delta)\lambda I_{1990} + (1 - \delta)^2 \lambda^2 I_{1990} + (1 - \delta)^3 \lambda^3 I_{1990} \\ &= I_{1990} \left( \frac{1}{1 - \lambda(1 - \delta)} \right) \end{aligned} \quad (C2)$$

where  $\lambda = 1/(1 + \eta)$ . The growth rate ( $\eta$ ) 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). The short-term unemployment rate is obtained from the Belgian Labour Force and is related to those workers who lost their job less than one year ago. 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. A third control variable is the capacity utilisation rate which is obtained from the

<sup>48</sup> Again, the conversion has occurred through the ISIC-classification.

<sup>49</sup> A more complete description of how the capital series are constructed is available from the authors upon request.

Belgostat database of the Belgian National Bank.<sup>50</sup> 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 B.1 of Appendix B. First, we compute the average utilisation rate in each sector.<sup>51</sup> Some 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. A last control variable is the sectoral skill intensity. We use the total amount of skilled to total employment as a measure for skill intensity. Skilled workers are defined as those workers who obtained higher education. These data are obtained from the Belgian Labour Force Survey.

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<sup>50</sup> These data can be downloaded from <http://www.nbb.be/belgostat/>.

<sup>51</sup> Taking averages also filters out seasonal fluctuations. Another option would be to use a filtering technique such as the Census X-11 method.

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# OWNERSHIP, FIRM SIZE AND RENT SHARING IN BULGARIA<sup>\*,\*\*</sup>

## ABSTRACT

Using a unique 3-digit firm-level data set of all medium and large manufacturing enterprises in Bulgaria covering the years 1997-1998, we investigate how wages are affected by ownership status, firm size and rent sharing. Our pooled OLS, panel and first-difference TSLS estimates clearly point to ownership structure as an important determinant of both the wage level (for given productivity) and the degree of rent sharing. Rent sharing is very pronounced in state-owned firms but far less pronounced in private domestic and foreign firms. The results strongly confirm the existence of a multinational wage premium. In addition, we find weak evidence of a positive firm size-wage effect and a positive effect of firm size on the degree of rent sharing. If these effects exist, they are often more pronounced in private domestic firms.

*JEL Classification* : C23, D21, J30, P31.

*Key Words* : Rent Sharing, Foreign Ownership, Firm Size, Panel Data.

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## 1. INTRODUCTION

This paper focuses on wage determination in Bulgaria and contributes to three topics in the empirical labour economics literature. The first topic concerns rent sharing. In a prominent attack on traditional analysis, Sumner Slichter (1950) showed that wages in the US manufacturing sector appeared to be positively correlated with various measures of firms' ability-to-pay. In the spirit of Slichter, labour economists have devoted much effort to test for imperfect competition in labour markets in the US and Canada<sup>1</sup> and in Western Europe.<sup>2</sup> The few related firm-level studies for post-communist Europe compare mainly rent-sharing behaviour before and during the transition period (Basu et al., 1997a [Poland, Hungary, the Czech and Slovak Republic]; Basu et al., 1997b [Poland]; Grosfeld and Nivet, 1997 [Poland]). These studies indicate that, except in Poland and to a lesser extent in the Slovak Republic, wages were set relatively independently of firms' performance under communism. During the transition period, however, wages started to vary with sales per worker, suggesting the presence of rent sharing. Commander and Dhar (1998) and Köllö (1997) investigate respectively for Poland and Hungary whether rent-sharing behaviour differs between firms with increasing and decreasing real sales.

Besides adding Bulgaria to the list of country studies,<sup>3</sup> we contribute to this literature by allowing the rent-sharing coefficient to vary across firms. More specifically, we investigate whether labour market imperfections differ between (1) state, private domestic and foreign companies and (2) small and large firms. In contrast to Grosfeld and Nivet, 1999 [Poland] and Luke and Schaffer, 1999 [Russia], our analysis draws upon a unique representative panel of firms in manufacturing with detailed information on output and input factors and on firm ownership for the period 1997-1998.

The positive relationship between wages and firm size is another well-documented empirical regularity. In their seminal paper, Brown and Medoff (1989) found a significant positive firm size-wage effect in the US. This effect has also shown up in more recent studies in the US (see Oi and Idson, 1999 for a review of the literature) as well as in other (mostly West European) countries.<sup>4</sup> Testing the firm size-wage hypothesis in post-communist countries has remained a largely unexplored field. Post-communist countries provide, however, certain advantages since firm size

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<sup>1</sup> Among them are Abowd and Lemieux, 1993; Blanchflower et al., 1996; Budd and Slaughter, 2004; Christofides et al., 1992; Currie and McConnell, 1992.

<sup>2</sup> e.g. Abowd and Allain, 1996 [France]; Abowd et al., 1999 [France]; Blanchflower et al., 1989 [UK]; Budd et al., 2004 [West and East European Countries]; Goos and Konings, 2001 [Belgium]; Hildreth and Oswald, 1997 [UK]; Lever and Marquering, 1996 [the Netherlands]; Margolis and Salvanes, 2001 [France and Norway]; Nickell and Kong, 1992 [UK]; Nickell and Wadhvani, 1990 [UK]; Piekkola and Kauhanen, 2003 [Finland]; Teulings and Hartog, 1998 [the Nordic countries and Germany].

<sup>3</sup> Note that Jones and Kato (1996) provide evidence that the compensation of chief executives in Bulgarian not fully state-owned firms is positively related to labour productivity.

<sup>4</sup> e.g. Australia (Meagher and Wilson, 2000), Austria (Oosterbeek and van Praag, 1995), Canada (Morrisette, 1993), France (Abowd et al., 1999), Germany (Criscuolo, 2000; Schmidt and Zimmerman, 1991; Winter-Ebmer, 1995), Italy (Loveman and Sengenberger, 1991), Japan (Idson and Ishii, 1993; Rebick, 1993), Sweden (Edin and Zetterberg, 1992), UK (Main and Reilly, 1993).

can be considered largely exogenous to productivity in these countries (Svejnar, 1999). The reason is that at the onset of transition firm size was mostly politically determined by the central planners. To our knowledge, only one study investigates explicitly the firm size-wage effect in a post-communist country, Russia (Idson, 2000). Our analysis goes one step further as we test additionally whether the firm size-wage effect depends on the ownership structure of the firm.

A third empirical issue is the impact of foreign ownership on the firm's wage policy. In the literature on multinational enterprises, it is a stylised fact that foreign firms pay on average higher wages than their domestic counterparts, even controlling for a wide range of worker and/or firm characteristics.<sup>5</sup> In transition countries, newly established private firms pay higher wages than other firms (Svejnar, 1999). Previous studies investigating ownership effects on wages in these countries had to rely on ownership dummy variables (Earle et al., 1995 [Russia], Grosfeld and Nivet, 1999 [Poland], Jones and Kato, 1996 [Bulgaria] and Luke and Schaffer, 1999 [Russia]). Having data on the fraction of shares held by state, private domestic and foreign owners, we can investigate the ownership-wage effect in more detail.

In the remainder, we first discuss the institutional context of wage determination in Bulgaria during the transition period. In section 3 we set out the theoretical framework. Section 4 describes the empirical setting whereas section 5 presents the data set. Section 6 confronts the hypotheses with Bulgarian firm-level data and reports some robustness checks. Section 7 summarises and interprets the results. Our main conclusions are that rent sharing is very pronounced in state-owned firms but far less pronounced in private domestic and foreign firms. The results strongly confirm the existence of a multinational wage premium. In addition, we find weak evidence of a positive firm size-wage effect and a positive effect of firm size on the degree of rent sharing. If these effects exist, they are often more pronounced in private domestic firms.

## 2. INSTITUTIONAL BACKGROUND

Under central planning, collective bargaining was absent and wage levels and structures were determined by central planning authorities without union input. Trade unions acted merely as workplace representatives of the Communist Party in state-owned enterprises (Flanagan, 1998).

In Bulgaria, the transformation of industrial relations started in 1989-1990. To establish industrial relations in line with the European standards, an institutional and legislative framework

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<sup>5</sup> See e.g. Dale-Olsen, 2002 [Norway]; Doms and Jensen, 1998 [US]; Feliciano and Lipsey, 1999 [US]; Globberman et al., 1994 [Canada]; Howenstine and Zeile, 1994 [US]; Lipsey, 1994 [US] and Lipsey and Sjöholm, 2001 [Indonesia]. For a survey of the literature on foreign firms in Mexico, Venezuela and the US, see Aitken et al., 1996.

was laid down in the Labour Code in 1993. The Labour Code is based on two fundamental principles: tripartite dialogue among social partners, i.e. social dialogue among governments, reformed and alternative unions and employer organisations, and independence of the social actors (Beleva et al., 1999). In line with the requirements of the Labour Code, the National Council for Tripartite Cooperation emerged in Bulgaria at the beginning of 1993. Only those trade unions and employer organisations which passed the criteria of representation established by law could participate in the social dialogue (Iankova, 1998). Once recognised by the government, the representative status was automatically transferred to the lower organisational levels (see *infra*). Until 1998, four employer organisations and six trade unions participated in tripartite negotiations. On the employer side, the Bulgarian Industrial Association (BIA), the Chamber for Trade and Industry, the Union for Private Enterprising and the Union Revival covered the criteria for national representation. During the 1990s, the Bulgarian Industrial Association played the most important role in the social dialogue (Gradev, 2000). On the employee side, the most powerful syndicates were Prodkrepa Confederation of Labour and the Confederation of Independent Trade Unions (CITUB) (Beleva et al., 1999). Although union membership declined sharply in all Central and East European Countries, union membership in Bulgaria is significantly higher than in most other CEE countries. Estimates of union membership amount to more than 70 percent of total employment in Bulgaria compared to only 20 percent in other CEE economies (IMF, 2001; Worldbank, 2001).

The development of tripartism has led to a multi-level bargaining structure in Bulgaria (Iankova, 1998). Negotiations are carried out on four independent levels: the national, branch, regional and enterprise level. The branch and regional levels are not well developed. Basic issues of working conditions, unemployment insurance and the minimum wage, as well as the initial level of average wages in the public sector, are negotiated at the national level. Similar issues with local importance are subject to agreements at branch and regional levels. All specific parameters concerning wages, employment, job evaluation and the level of additional payments are bargained at the enterprise level (Beleva et al., 1999).

In many countries union influence at the enterprise level is limited. Wages are generally determined unilaterally by management. As mentioned above, union power is relatively large and wage determination occurs through bargaining in Bulgaria (Martin and Cristescu-Martin, 1999). This institutional feature motivates our choice of Bulgaria for analysing wage determination at the firm level.

### 3. THEORETICAL FRAMEWORK

In accordance with the wage determination system applicable to Bulgaria, wages are considered to be the result of bargaining between the union<sup>6</sup> and the firm represented by its manager. To this end, we rely on the Right-To-Manage model (Nickell and Andrews, 1983). Under the assumption that union members are risk neutral and -given our short-run focus- that employment is not an argument in the union's utility function, the real wage  $w$  is assumed to result from the maximisation of the following Nash-bargaining maximand:

$$\Phi = \{w-A\}^{\phi} \{Y-wN\}^{1-\phi} \quad (1)$$

with  $A$  the workers' outside option expressed in real terms,  $Y$  real value added,  $N$  the employment level and  $Y-wN=\pi$  real profits. The bargaining strength of employees, i.e. insider power, is represented by  $\phi$ .

Maximisation of this function with respect to the wage rate gives the following first-order condition:

$$w = A + \frac{\phi}{1-\phi} \frac{\pi}{N} \quad (2)$$

According to this model, real firm-level wages are affected by both internal conditions (represented by profits per employee) and external factors (taken up by the outside option or the alternative wage) and the bargaining power of employees.

In the empirical part, we use value added to capture the firm's ability-to-pay. Our motivation is that although profits per worker have the advantage that they control for all costs, they have the disadvantage that they are negatively related to wages by construction, hence creating a severe endogeneity bias. Switching to value added per employee eliminates the direct endogeneity problem.<sup>7</sup>

<sup>6</sup> Although worker influence on enterprise policies may occur through trade unions, works councils and employee ownership, in Bulgaria worker participation is largely exercised through trade unions (Flanagan, 1998).

<sup>7</sup> This does not imply, however, that endogeneity is not an issue anymore. For example, wage shocks affecting productivity may cause endogeneity problems when using real value added per employee.

By adding the term  $\frac{\phi}{1-\phi}w$  to both sides of equation (2), we obtain an expression for the optimum wage as a function of real value added per worker:<sup>8</sup>

$$w=(1-\phi)A+\phi\frac{Y}{N} \quad (3)$$

Although a well-developed theory of the determinants of bargaining power is lacking, some authors have made  $\phi$  heterogeneous. Bughin (1991), Svejnar (1986) and Veugelers (1989) link the firm-level or sectoral bargaining power parameter to meso- or macroeconomic variables like the consumer price index, sectoral unemployment rates and proxies for product market concentration. Others consider firm-specific variables like the elasticity of labour supply at the level of the firm, firm size, risk of bankruptcy and technology level as important determinants of rent sharing (e.g. Piekkola and Kauhanen, 2003). The focus in this paper is on the potential influence of ownership status and firm size on the employees' bargaining power and the degree of rent sharing. Depending on these structural variables, we presume that different relative weights will be given to the workers' interests and to profitability considerations. We adopt a straightforward specification:

$$\phi=\gamma_0+\gamma_{own}OWN+\gamma_NN+\gamma_{own*N}OWN*N \quad (4)$$

In this equation *OWN* refers to the ownership status of the firm: state-owned, private domestic or foreign. Firm size is measured by the firm's employment level (*N*).

Substituting (4) into (3), we obtain the following basic equation for bargained real wages:

$$w=A+\gamma_0\left[\frac{Y}{N}-A\right]+\gamma_{own}OWN\left[\frac{Y}{N}-A\right]+\gamma_NN\left[\frac{Y}{N}-A\right]+\gamma_{own*N}OWN*N\left[\frac{Y}{N}-A\right] \quad (5)$$

<sup>8</sup> In the empirical section, all real variables are deflated by the (exogenous) producer price ( $P_p$ ). The real wage  $w$  will be the real product wage. It could be argued that workers bargain over different wages. Workers' utility is affected by wages deflated by the (exogenous) consumer price index ( $P_c$ ). Algebraically, equation (1) would be  $\Phi^*=\{w\kappa-A\kappa\}^\phi\{Y-wN\}^{1-\phi}$  with  $w$  the real product

wage and  $\kappa=\frac{P_p}{P_c}$ . Since the effect of  $\kappa$  on the maximand is multiplicative, the bargained real wage ( $w$ ) in equation (3) is unaffected.

Assuming risk-averse workers does not change that result for a large range of utility functions.

## 4. EMPIRICAL FRAMEWORK AND TESTABLE HYPOTHESES

### 4.1. Empirical Framework

In this section we test the model described by equation (5) using panel data for 1514 Bulgarian firms during the period 1997-1998. Equation (6) reflects this panel data set-up. Note that in this equation we explicitly model the effect of the three possible ownership categories mentioned before. Furthermore, for generality and in line with the literature, we have extended equation (5) by allowing for an intercept term ( $\alpha$ ) that can also differ according to ownership status and firm size.<sup>9</sup> A final element of flexibility is the coefficient on  $A$  (as a separate variable). Rather than imposing 1, we estimate this coefficient freely ( $\delta$ ). We justify this choice below.

$$\begin{aligned}
 w_{it} = & \alpha_0 + \alpha_{privd} PRIVD_{it} + \alpha_{for} FOR_{it} + \alpha_N N_{it} + \alpha_{privd*N} PRIVD_{it} N_{it} + \alpha_{for*N} FOR_{it} N_{it} + \delta A_t + \\
 & \gamma_0 [valad\_N_{it} - A_t] + \gamma_{privd} PRIVD_{it} [valad\_N_{it} - A_t] + \gamma_{for} FOR_{it} [valad\_N_{it} - A_t] + \\
 & \gamma_N N_{it} [valad\_N_{it} - A_t] + \gamma_{privd*N} PRIVD_{it} N_{it} [valad\_N_{it} - A_t] + \gamma_{for*N} FOR_{it} N_{it} [valad\_N_{it} - A_t] + \alpha_i + D97 + \varepsilon_{it}
 \end{aligned} \tag{6}$$

where subscript  $i$  is used to index observations on individual firms and  $t$  represents year.

The dependent variable is the annual real wage per worker. Among the explanatory variables,  $valad\_N$  stands for real value added per worker and  $N$  for employment. To check robustness, we will later use real profits per worker as a proxy for internal conditions. The variables  $PRIVD$  and  $FOR$  are ownership categories. They refer to the fraction of shares held by private domestic and foreign owners. The ownership category that is left out is the state, which refers to the fraction of shares in the firm held by the state, municipalities or Treasury.

To stick as close as possible to the theory, the workers' outside option ( $A$ ) is proxied by its expected value: the regional probability of employment times the real average regional wage.<sup>10</sup> Controlling for region-specific variables is in the context of Bulgaria particularly important as there are considerable disparities between the regions in which the firms are located (UNDP, 2000). Obviously, assuming our proxy to equal the theoretical  $A$  is rather strong. Allowing some flexibility in the coefficient on  $A_t$  ( $\delta$ ) is therefore justified.<sup>11</sup>  $\varepsilon$  represents a white noise error term.

<sup>9</sup> Note that excluding firm size in the intercept term of the wage equation would bias the estimate of the rent-sharing effect.

<sup>10</sup> Ideally, the proxy for  $A$  would be: (regional probability of unemployment \* unemployment benefits) + (regional probability of employment \* real average regional wage). Since the level of unemployment benefits is determined at the national level (IMF, 2001), however, there is no variation between firms. Therefore, we proxy  $A$  by regional probability of employment \* real average regional wage.

<sup>11</sup> Note however that we do not allow flexibility in the variable ( $valad\_N - A$ ). The reason is that we can not impose proportional restrictions in STATA. From the estimates, it follows that the coefficient on  $A$  is 0.7 on average. As a test, we have therefore created the variable ( $valad\_N - 0.7*A$ ) and re-estimated the model. The results were broadly similar to those reported in the paper.



All specifications include a year dummy ( $D97$ ) to capture possible unobservable aggregate shocks in 1997. Finally, we control for unobserved firm heterogeneity by including a firm-level fixed effect ( $\alpha_i$ ), even within the separate ownership groups.

The heterogeneity that we have introduced in the wage intercept and the rent-sharing parameter affects the interpretation of the coefficients in equation (6).  $\alpha_0 + \alpha_N N$  is the wage intercept in state-owned firms whereas  $\alpha_0 + \alpha_N N + \alpha_{privd} + \alpha_{privd*N} N$  and  $\alpha_0 + \alpha_N N + \alpha_{for} + \alpha_{for*N} N$  indicate the wage intercept in private domestic and foreign firms respectively. Likewise,  $\gamma_0 + \gamma_N N$  reflects the degree of rent sharing in state firms while  $\gamma_0 + \gamma_N N + \gamma_{privd} + \gamma_{privd*N} N$  and  $\gamma_0 + \gamma_N N + \gamma_{for} + \gamma_{for*N} N$  indicate the degree of rent sharing in private domestic and foreign firms respectively.

We specify the variables in equation (6) in levels rather than logs for two reasons. First, the levels-levels specification is the most consistent with the theoretical model (equations (2) and (3)). Second, given the presence of loss-making firms in our data, the use of logs would have necessitated discarding observations from poorly performing firms. This would possibly introduce problems of selection bias.

#### 4.2. Testable Hypotheses

In the literature, various explanations have been put forward for the wage differential between foreign-owned and domestically-owned firms. Strand (2002) refers to the fact that foreign firms try to attract a higher quality work force and to differences in labour turnover costs. Jensen and Meckling (1976) point to efficiency wage mechanisms. Other authors explain the wage differential by differences in firm size and technological superiority (Aitken and Harrison, 1999; Djankov and Hoekman, 1998). A very recent explanation for the multinational wage premium is international rent sharing (Budd and Slaughter, 2004; Budd et al., 2004). The idea is that profits within multinational firms are shared across borders. Our data do not allow an explicit test of these explanations. However, we believe that technological superiority and international rent sharing are two potential explanations for finding a multinational wage differential in Bulgaria. Therefore we expect  $\alpha_{for} > \alpha_{privd}$ .

Explanations for the positive relationship between firm size and wages build on different aspects of wage formation: labour quality (Hammermesh, 1980; Kremer, 1993; Weiss and Landau, 1984), compensating differentials (Masters, 1969), efficiency wages (Oi, 1983; Garen, 1985) or more generally firm-specific compensation policies (Bullow and Summers, 1976), internal labour

markets (Doeringer and Piore, 1971), union avoidance and union demand (Weiss, 1966), job seniority (Schmidt and Zimmerman, 1991) and rent sharing. Based on the literature, we expect  $\alpha_N$  to be significantly positive. We also investigate whether the firm size-wage effect differs according to ownership status. A priori, no clear prediction can be made about the magnitude of the firm size effect in the different ownership categories ( $\alpha_{privd*N}$  and  $\alpha_{for*N}$ ), however.

In the rent-sharing literature, higher total rents increase the incentives for workers to appropriate a proportion of these rents. Hence, we anticipate an upward responsiveness of real firm-level wages to rents per worker. At the same time, we expect the insider effect to be determined by ownership form and/or firm size. Intuitively, we expect to find a strong rent-sharing effect in state firms and a small one in foreign firms. The idea is that foreign firms, being much more efficient than state firms, are concentrated in sectors with high value added. In contrast, value added in state-owned firms is much lower. Therefore, workers in state firms need to capture a large part of the rents to secure an acceptable wage while the opposite is true for workers in foreign firms. Moreover, employees in foreign firms are able to appropriate some portion of the rents from their parent firms (international rent sharing) which is translated into a higher inside wage level. Therefore, we expect  $\gamma_{for} < \gamma_{privd} < 0$ . In addition, the bargaining strength of the employees is expected to be positively correlated with firm size, i.e.  $\gamma_N$  is expected to be positive. Whether this effect is different in private domestic and foreign firms than in state-owned firms ( $\gamma_{privd*N}$  and  $\gamma_{for*N}$ ) is ex ante unclear, however.

## 5. DATA AND SUMMARY STATISTICS

We use a panel of 1514 manufacturing firms from the 28 Bulgarian regions ('oblasti'). To be included in the data set at least one of the following conditions has to be satisfied. Either total assets or total sales exceed 8 and 16 million USD respectively, or the number of employees is larger than 100.

All variables are taken from published annual company accounts which are collected by "Bureau Van Dyck" and marketed as the Amadeus data set. Nominal variables are expressed in millions of leva.<sup>12</sup> Although the data cover the period 1994-1998, we will focus the analysis on the period 1997-1998 as only for these two years detailed information on the ownership structure of the firms is available.

This unique data set allows us to make at least two major contributions. First, until now the scarce existing empirical work in this field typically had to rely on small samples of firms collected

<sup>12</sup> In 1997 the exchange rate (annual average) was 1.674 leva per USD (EBRD, 2000).

through surveys. In contrast, our sample contains virtually the entire population of medium and large firms in manufacturing. Comparing the employment and sales coverage of our data with total employment and sales in manufacturing reported in the statistical yearbooks, reveals that our data cover 82% of total sales and 66% of total employment in manufacturing.<sup>13</sup> Furthermore, the Amadeus data set is collected from company accounts at the three-digit level of sectoral disaggregation. To our knowledge, this kind of detailed firm-level data for a transition country has not been used before for this purpose.

A second strength of the data set is that it offers detailed information on the ownership structure of firms for two consecutive years. In particular, we know the fraction of shares held by the state and by private investors and can observe their evolution over time. Next, we are able to make a distinction between private domestic investors and foreign investors. Earlier studies for Central and Eastern Europe had to rely on ownership dummies to investigate the crucial question of how wage formation is related to form of ownership (Earle et al., 1995, Grosfeld and Nivet, 1999, Jones and Kato, 1996 and Luke and Schaffer, 1999). Detailed information on the shareholding structure also enables us to perform some additional robustness checks. Table 1 shows the distribution of ownership on average.

**Table 1** Distribution of Ownership

	1997	1998
	Mean (St.Dev.)	Mean (St.Dev.)
<b>Fraction of shares held by the state (STATE)</b>	0.34 (0.38)	0.27 (0.35)
<b>Fraction of STATE firms in total number of firms<sup>a</sup></b>	0.70	0.66
<b>Fraction of STATE in all STATE firms</b>	0.49 (0.36)	0.40 (0.35)
<b>Fraction of shares held by private domestic owners (PRIVD)</b>	0.62 (0.39)	0.68 (0.37)
<b>Fraction of PRIVD firms in total number of firms<sup>b</sup></b>	0.79	0.83
<b>Fraction of PRIVD in all PRIVD firms</b>	0.78 (0.26)	0.82 (0.23)
<b>Fraction of shares held by foreign owners (FOR)</b>	0.04 (0.17)	0.05 (0.19)
<b>Fraction of FOR firms in total number of firms<sup>c</sup></b>	0.06	0.08
<b>Fraction of FOR in all FOR firms</b>	0.68 (0.23)	0.63 (0.29)
<b>Number of majority state firms</b>	332	269
<b>Number of majority private domestic firms</b>	897	1150
<b>Number of majority foreign firms</b>	63	83

Source: Amadeus Database

a: STATE firms are firms for which STATE > 0.

b: PRIVD firms are firms for which PRIVD > 0.

c: FOR firms are firms for which FOR > 0.

In 1997 the fraction of shares held by foreign owners was only 4% on average, meaning that only a relatively small fraction of firms had some foreign participation. However, if we look at shareholding in foreign firms only, i.e. firms with at least some shares held by foreign owners, we

<sup>13</sup> Sales coverage ratio = total sales of firms in Amadeus in 1998 divided by total national sales as reported by the National Statistical Offices. Idem for employment.

can see that the low average share of foreign ownership hides the fact that foreign investors were concentrated in a few firms. For example, in 1998 119 firms had a foreign owner who held an average share of 63%. In 83 firms foreign owners were holding more than 50% of the shares. Hence, in most cases foreign investors owned a majority share. Looking at shareholding in private domestic firms only reveals that private domestic investors held on average 80% of total shares. Finally, we can observe that the fraction of private domestic and foreign firms in the total number of firms increased over time.<sup>14</sup> During the 1990s, the inflow of foreign direct investment rose rapidly. By 1998 inward FDI was almost 10 times higher than in 1991 (EBRD, 2000). The rising total number of firms reflects a better coverage in the latest year and indicates that our analysis draws upon an unbalanced panel.

The regional variable  $A_t$  (at the NUTS3-regional level) is collected from the National Statistical Institute (NSI, 1998; 1999) and the United Nations Development Program (UNDP, 2000). Table 2 reports summary statistics for the main variables used in the regression analysis.

**Table 2** Summary Statistics

VARIABLES	1997			1998			1997-1998		
	# Obs.	Mean	St. Dev.	# Obs.	Mean	St. Dev.	# Obs.	Mean	St. Dev.
Employment (N)	1306	374.12	759.47	1381	348.03	693.74	2687	360.71	726.41
Average wage (w)	1043	98.62	101.86	1109	112.22	76.55	2152	105.63	89.95
Alternative wage (A)	1514	83.22	18.32	1514	93.92	16.77	3028	88.57	18.35
Profits per employee (prof_N)	1038	178.08	601.59	1106	303.45	3277.26	2144	242.75	2391.06
N * prof_N	1038	81070.1	453430.5	1112	59549.7	352974.7	2150	69939.5	404647.2
Value added per employee (valad_N)	1038	277.09	663.89	1108	415.98	3279.45	2146	348.80	2401.73
valad_N - A	1038	192.95	661.23	1108	321.51	3278.29	2146	259.33	2400.41
N * (valad_N - A)	1038	99075.6	537981.3	1108	80076.9	431478.2	2146	89266.4	485894.2

Source: Amadeus Database, NSI (1998, 1999), UNDP (1999)

Wages are constructed as the reported wage bill divided by the average number of employees, which is standard for corporate data in the rent-sharing literature (e.g. Hildreth and Oswald, 1997). The wage bill includes wage and salary payments to employees as well as mandated employer contributions to government social insurance funds.<sup>15</sup> Annual wages are expressed as real wages per worker, i.e. nominal wages deflated by a three-digit producer price index, normalised to 1 in 1995. This price index is obtained from the central statistical offices. 'A' represents the conditions on the labour market, measured as the regional probability of employment times the real average regional wage. Profits and value added per worker are also expressed in real terms. They are constructed in the standard way. Value added is calculated as sales minus material

<sup>14</sup> Note that the sum of the fractions of respectively state, private domestic and foreign firms in the total number of firms does not add up to 1 as each firm can have multiple owners.

<sup>15</sup> The wage measure hence refers to paid wages. Wage arrears could bias the rent-sharing effect. To our knowledge, however, the problem of wage arrears is a very important issue in Russia and Ukraine but less severe in Bulgaria (Alfandari and Schaffer, 1996; Earle and Sabirianova, 2001; Ivanova and Wyplosz, 1999; Lehmann et al., 1999).

costs and profits as value added minus the wage bill (see e.g. Blanchflower et al., 1996). Our profit measure hence corresponds to the economic concept of rents available for sharing with workers. Variables per worker are constructed by dividing by the average number of employees in each firm for each year respectively. Employment ranges from 6 to 16280 employees. Its average level is 361. From Table 2, it is clear that profits as well as value added vary much more than wages.

Table A.1 in Appendix presents summary statistics by ownership category. In this table firms are classified according to majority shareholding. The average employment level is the highest in majority foreign firms (652), followed by majority state firms (441) and the lowest in majority private domestic firms (331) (see lower part of Table A.1). Workers in majority foreign firms get the highest wages (mean wage of 153). Wages in majority state and majority private domestic companies are much lower (mean wage of 100 and 106 respectively).

Privatisation is clearly associated with better firm performance. Majority private firms outperform majority state firms. Furthermore, majority foreign firms outperform majority state firms as well as majority private domestic firms. Using the same data set, recent empirical research by Estrin et al. (2001) confirms these findings. Strikingly, 18% of majority state companies (87 out of 476) are classified as loss-making firms, reporting negative profits per employee over the sample period.

## **6. RESULTS AND ROBUSTNESS CHECKS**

### **6.1. Estimation Method**

Our estimation strategy consists of three parts. First, in order to get some grip on the more long-term relationships of the model, the Pooled Ordinary Least Squares estimator is used as a benchmark for cross-sectional time-series estimates. Second, the Panel Data Estimation Method allows us to control for firm-specific heterogeneity which may capture various unobservables, such as the quality of capital and labour. In the last part, we check the robustness of the fixed-effects estimator. In addition, we try to deal with two problems that have not been addressed so far. First, simultaneity may obscure the true relationship between wages and the variables reflecting internal conditions. Moreover, firm size will be endogenous in that any effect from size to wages will induce the firm to economise on labour. Second, the level of employment entering both the definition of the wage and the measure of rents per worker, raises the standard problem that measurement error may induce spurious correlation between these two key variables. To circumvent these problems, we use the first-difference Instrumental Variables method suggested for dynamic fixed-effects models by Anderson and Hsiao (1982). Under the assumption that

endogeneity is constant across years, these results are expected to be in line with those obtained by the fixed-effects estimator.

## 6.2. Results

We use the pooled OLS, panel and first-difference TSLS method to estimate four alternative specifications of equation (6). Gradually, we loosen a number of restrictions. In the first specification it is imposed that only ownership status matters for the wage intercept and the degree of rent sharing. Firm size does not, i.e.  $\alpha_N = \alpha_{privd*N} = \alpha_{for*N} = 0 = \gamma_N = \gamma_{privd*N} = \gamma_{for*N}$ . The second specification relaxes the restriction that  $\alpha_N = \gamma_N = \gamma_{privd*N} = \gamma_{for*N} = 0$  whereas in the third specification we drop the restriction that  $\alpha_N = \alpha_{privd*N} = \alpha_{for*N} = \gamma_N = 0$ . In the final specification all coefficients are freely estimated. As noted above, the benchmark ownership type is state-owned firms.

The pooled OLS results using real value added per worker to capture the firm's good fortune are reported in the left part of Table 3. Consider first ownership-, size- and cross-effects on the wage intercept, i.e. the effects on inside wages for given rent sharing. Even after controlling for differences in firm size, private domestic and foreign ownership exerts a significantly positive effect on the wage intercept in all specifications. In accordance with the MNE-literature and our first hypothesis, foreign firms pay the highest wages ( $\alpha_{for} > \alpha_{privd} > 0$ ). Furthermore, we find a significantly positive relationship between firm size and wages in specification 2 ( $\alpha_N > 0$ ), confirming our second hypothesis and the findings of Idson (2000) for Russia. There is also evidence that the firm size-wage effect differs according to ownership structure. From specification 3, it follows that the combined effect of private domestic as well as foreign ownership and firm size is significantly positive. Concentrating on privately-owned firms the larger the firm, the higher the wages. Once the positive combined effect of private ownership and firm size on rent sharing is also taken into account, however, the effects on the wage intercept are less clear.

Focusing on the degree of rent sharing, the results clearly indicate that ownership status is a crucial determinant of insider power. Each of the four specifications shows that workers in state-owned firms succeed in appropriating a significant part of the rents ( $\gamma_0$  is about 0.12). In contrast, the employees' capacity to capture productivity gains is very low in both private domestic ( $\gamma_0 + \gamma_{privd}$ ) and foreign firms ( $\gamma_0 + \gamma_{for}$ ). These results confirm our third hypothesis. Moreover, the results regarding state-owned and private domestic firms are in line with the existing empirical research for Poland (period 1992-1994) and Russia (1996-1997) in this field (Grosfeld and Nivet,

1999; Luke and Schaffer, 1999). Both these studies use ownership dummies to discriminate between state, privatised and commercialised enterprises and find that the share of rents taken by workers in privatised companies is significantly less than the share taken by employees in state-owned firms. From specification 3, it is clear that workers' bargaining power is positively correlated with firm size ( $\gamma_N > 0$ ). This effect is highly pronounced in private domestic and foreign firms as indicated by the significantly positive combined effect of private domestic and foreign ownership and firm size. Finally, the estimates show that outside forces play an important role in the wage determination process ( $\delta$  is about 0.65).

**Table 3** Wage Equation 1997-1998, dependent variable wage<sub>it</sub> - Pooled OLS

<b>Constant</b>	22.869** (11.168)	28.734*** (10.599)	28.653*** (10.878)	0.054 (14.422)	<b>Constant</b>	23.810** (11.430)	26.940*** (10.968)	27.202*** (11.187)	26.458** (11.013)
<b>PRIVD</b>	20.400*** (5.315)	12.663*** (5.070)	8.693* (5.551)	17.906*** (5.504)	<b>PRIVD</b>	16.914*** (5.445)	11.085** (5.257)	6.054 (5.739)	11.259** (5.689)
<b>FOR</b>	74.432*** (11.458)	60.705*** (11.346)	50.439*** (14.835)	60.435*** (14.601)	<b>FOR</b>	73.489*** (11.662)	64.097*** (11.547)	49.997*** (15.227)	55.473*** (15.087)
<b>N</b>		0.009*** (0.003)	-0.011*** (0.004)	0.019*** (0.005)	<b>N</b>		0.016*** (0.003)	-0.004 (0.004)	0.016*** (0.005)
<b>PRIVD * N</b>			0.033*** (0.007)	-0.020*** (0.008)	<b>PRIVD * N</b>			0.034*** (0.007)	-0.001 (0.008)
<b>FOR * N</b>			0.030** (0.015)	-0.004 (0.018)	<b>FOR * N</b>			0.030** (0.015)	0.015 (0.018)
<b>A</b>	0.705*** (0.108)	0.620*** (0.103)	0.670*** (0.105)	0.615*** (0.103)	<b>A</b>	0.738*** (0.111)	0.653*** (0.106)	0.703*** (0.108)	0.658*** (0.107)
<b>valad_N - A</b>	0.128*** (0.010)	0.126*** (0.010)	0.105*** (0.010)	0.129*** (0.010)	<b>prof_N</b>	0.098*** (0.011)	0.099*** (0.011)	0.079*** (0.011)	0.099*** (0.011)
<b>PRIVD * (valad_N - A)</b>	-0.124*** (0.010)	-0.124*** (0.010)	-0.102*** (0.010)	-0.126*** (0.010)	<b>PRIVD * prof_N</b>	-0.095*** (0.011)	-0.098*** (0.011)	-0.077*** (0.011)	-0.098*** (0.011)
<b>FOR * (valad_N - A)</b>	-0.118*** (0.011)	-0.120*** (0.011)	-0.100*** (0.011)	-0.123*** (0.012)	<b>FOR * prof_N</b>	-0.092*** (0.013)	-0.093*** (0.013)	-0.076*** (0.012)	-0.091*** (0.013)
<b>N * (valad_N - A)</b>		-0.00003*** (0.00001)	0.00004*** (0.00001)	-0.00004*** (0.00001)	<b>N * prof_N</b>		-0.00004*** (0.00001)	0.00003*** (0.00001)	-0.00004*** (0.00001)
<b>PRIVD * N * (valad_N - A)</b>		0.0001*** (0.00001)		0.0002*** (0.00002)	<b>PRIVD * N * prof_N</b>		0.0001*** (0.00001)		0.0001*** (0.00002)
<b>FOR * N * (valad_N - A)</b>		0.0001*** (0.00002)		0.0001*** (0.00002)	<b>FOR * N * prof_N</b>		0.00004** (0.00002)		0.00003 (0.00003)
<b>Year 1997</b>	-1.841 (3.971)	-2.505 (3.752)	-2.758 (3.839)	-2.638 (3.754)	<b>Year 1997</b>	-1.408 (4.064)	-2.463 (3.885)	-2.481 (3.951)	-2.283 (3.893)
<b># Obs.</b>	2040	2040	2040	2040	<b># Obs.</b>	2040	2040	2040	2040
<b>R<sup>2</sup></b>	0.132	0.229	0.193	0.231	<b>R<sup>2</sup></b>	0.091	0.173	0.146	0.174

\*\*\*Significant at 1%; \*\*Significant at 5%; \*Significant at 10%. Standard errors in parentheses.

The panel estimates are reported in the left part of Table 4. We control for firm heterogeneity for each individual firm, even within the different ownership categories. In all specifications, the Hausman test indicates that we should rely on the fixed-effects model.<sup>16</sup>

Since unobserved fixed effects, of which the unobserved quality of workers is probably an important one, are likely to be positively correlated with private ownership, we are implicitly controlling for one of the potential sources of endogeneity of ownership by using the fixed-effects estimator (Estrin et al., 2001). In line with the previous results, private ownership is positively correlated with the wage intercept although this effect is not always statistically significant for private domestic firms. Foreign firms pay the highest wages. The results also point to a significantly positive firm size-wage effect in private domestic firms, even after controlling for the cross-effect on rent sharing.

With respect to rent sharing, we find again that employees in state-owned firms manage to cream off a significantly larger share of the rents than workers in private domestic and foreign companies, although this share is smaller than in the pooled OLS estimates. Foreign-owned firms are in fact characterised by zero rent sharing. On average, the bargaining power of workers in large firms is higher than in small firms. Specification 2 suggests that this effect is only significant in private domestic firms. From specification 4, however, it follows that the cross-effect on rent sharing is not statistically significant. This would suggest that the positive effect of firm size on the degree of rent sharing does not differ according to ownership status. Again, external labour market conditions appear to be important for wage setting.

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<sup>16</sup> A critique to the use of within-group estimation is that the assumption of non-zero correlation between the time-invariant fixed effect and the exogenous variables does not allow for doing out-of sample inference (Baltagi, 1995). Since we rely on a large and



**Table 4** Wage Equation 1997-1998, dependent variable wage<sub>it</sub> - Panel (Fixed Effects)

<b>Constant</b>	23.123 (17.216)	27.691 (18.123)	30.107* (18.319)	31.641* (18.345)	<b>Constant</b>	27.345* (17.401)	26.923 (18.340)	25.808 (18.673)	28.594 (18.717)
<b>PRIVD</b>	19.259** (8.951)	17.279** (9.080)	10.789 (9.517)	11.681 (9.599)	<b>PRIVD</b>	20.754** (9.010)	17.606** (9.161)	16.127* (9.763)	15.561* (9.833)
<b>FOR</b>	63.980*** (14.398)	65.070*** (14.729)	65.546*** (17.500)	63.234*** (18.148)	<b>FOR</b>	68.921*** (13.999)	69.989*** (14.383)	75.542*** (17.415)	69.951*** (18.139)
<b>N</b>		-0.001 (0.011)	-0.011 (0.012)	-0.011 (0.013)	<b>N</b>		0.007 (0.010)	0.006 (0.013)	0.003 (0.013)
<b>PRIVD * N</b>			0.015*** (0.005)	0.012* (0.007)	<b>PRIVD * N</b>			0.004 (0.007)	0.005 (0.008)
<b>FOR * N</b>			0.003 (0.012)	0.008 (0.015)	<b>FOR * N</b>			-0.008 (0.012)	0.002 (0.016)
<b>A</b>	0.723*** (0.171)	0.692*** (0.172)	0.711*** (0.171)	0.696*** (0.172)	<b>A</b>	0.754*** (0.173)	0.750*** (0.174)	0.765*** (0.174)	0.750*** (0.174)
<b>valad_N - A</b>	0.050*** (0.010)	0.054*** (0.011)	0.045*** (0.011)	0.048*** (0.011)	<b>prof_N</b>	0.033*** (0.011)	0.040*** (0.011)	0.037*** (0.012)	0.038*** (0.012)
<b>PRIVD * (valad_N - A)</b>	-0.018 (0.012)	-0.031** (0.013)	-0.021* (0.012)	-0.027** (0.014)	<b>PRIVD * prof_N</b>	-0.035*** (0.014)	-0.043*** (0.014)	-0.037*** (0.014)	-0.042*** (0.014)
<b>FOR * (valad_N - A)</b>	-0.047*** (0.017)	-0.053*** (0.018)	-0.053*** (0.017)	-0.051*** (0.019)	<b>FOR * prof_N</b>	-0.075*** (0.017)	-0.072*** (0.019)	-0.079*** (0.018)	-0.072*** (0.020)
<b>N * (valad_N - A)</b>		0.000003 (0.00001)	0.00003*** (0.00001)	0.000029* (0.000015)	<b>N * prof_N</b>		-0.000016* (0.00001)	-0.00001 (0.00002)	-0.00001 (0.00002)
<b>PRIVD * N * (valad_N - A)</b>		0.00002*** (0.000007)		0.00001 (0.00001)	<b>PRIVD * N * prof_N</b>		0.000017* (0.00001)		0.00001 (0.00001)
<b>FOR * N * (valad_N - A)</b>		0.000001 (0.000001)		-0.00001 (0.00002)	<b>FOR * N * prof_N</b>		-0.00002 (0.00002)		-0.00002 (0.00002)
<b>Year 1997</b>	-8.186*** (2.460)	-8.542*** (2.468)	-8.591*** (2.462)	-8.619*** (2.470)	<b>Year 1997</b>	-7.721*** (2.498)	-7.635*** (2.504)	-7.735*** (2.504)	-7.690*** (2.511)
<b>Hausman test</b>	$\chi^2(7)=46$	$\chi^2(11)=40$	$\chi^2(11)=74$	$\chi^2(13)=36$	<b>Hausman test</b>	$\chi^2(7)=116$	$\chi^2(11)=48$	$\chi^2(11)=355$	$\chi^2(13)=31$
<b># Obs.</b>	2040	2040	2040	2040	<b># Obs.</b>	2040	2040	2040	2040
<b>R<sup>2</sup></b>	0.182	0.189	0.190	0.192	<b>R<sup>2</sup></b>	0.158	0.166	0.163	0.166

\*\*\*Significant at 1%; \*\*Significant at 5%; \*Significant at 10%. Hausman test checks for orthogonality of individual effects and other regressors. Standard errors in parentheses.  $R^2 = R$ -sq within.

In Table 5, we calculate the size of the total impact of private ownership on firm-level wages (using the values of the variables from Table 2). The main conclusion is that ownership effects on wages differ consistently between ownership regimes. The first two rows refer to the pooled OLS and the panel estimates using value added as proxy for the firm's ability-to-pay. From the pooled OLS estimates, it follows that the strongly negative effect of private domestic ownership on rent sharing dominates the positive effect of private domestic ownership on the wage intercept, resulting in a negative total impact of private domestic ownership on wages. On average over all four specifications, a 1% increase in the fraction of shares held by private domestic owners decreases

representative sample of manufacturing firms, however, we argue that this critique does not apply to our results.

the average wage by 8 000 leva (in 1995 prices). In contrast, the total impact of foreign ownership on wages is positive and amounts to 38.784 on average. The multinational wage premium clearly compensates for the negative effect of foreign ownership on rent sharing. The fixed-effects estimates are more in line with our expectations: the total effect of private domestic as well as foreign ownership on wages is positive and highest in absolute value for foreign ownership (on average over all specifications 6.894 for private domestic ownership and 51.232 for foreign ownership).

**Table 5** Ownership Effects on Wages

	Spec. 1		Spec. 2		Spec. 3		Spec. 4	
	$\frac{\partial w}{\partial \text{PRIVD}}$	$\frac{\partial w}{\partial \text{FOR}}$	$\frac{\partial w}{\partial \text{PRIVD}}$	$\frac{\partial w}{\partial \text{FOR}}$	$\frac{\partial w}{\partial \text{PRIVD}}$	$\frac{\partial w}{\partial \text{FOR}}$	$\frac{\partial w}{\partial \text{PRIVD}}$	$\frac{\partial w}{\partial \text{FOR}}$
<b>OLS (valad_N)</b>	-11.757	43.831	-10.567	38.512	-5.855	35.327	-4.131	37.464
<b>FE (valad_N)</b>	19.259	51.791	11.025	51.326	-0.035	51.802	-2.673	50.008
<b>fd TSLS (valad_N)</b>	-1.317	80.338	-6.617	118.218	-6.050	197.962	-16.438	127.810
<b>OLS (prof_N)</b>	-6.147	51.156	-5.711	44.319	-6.428	42.369	-5.537	33.383
<b>FE (prof_N)</b>	12.258	50.715	8.357	52.511	7.145	56.365	5.366	52.473

$$\text{valad\_N: } \frac{\partial w_{it}}{\partial \text{PRIVD}_{it}} = \alpha_{\text{privd}} + \alpha_{\text{privd}^*N} N_{it} + \gamma_{\text{privd}} [\text{valad\_N}_{it} - A_t] + \gamma_{\text{privd}^*N} N_{it} [\text{valad\_N}_{it} - A_t]. \text{ Idem for FOR.}$$

$$\text{prof\_N: } \frac{\partial w_{it}}{\partial \text{PRIVD}_{it}} = \alpha_{\text{privd}} + \alpha_{\text{privd}^*N} N_{it} + \gamma_{\text{privd}} [\text{prof\_N}_{it}] + \gamma_{\text{privd}^*N} N_{it} [\text{prof\_N}_{it}]. \text{ Idem for FOR.}$$

### 6.3. Robustness Checks

To test whether the estimation results are robust to the use of different variables and estimation techniques, two robustness checks are carried out.

The first one is related to the measurement of internal conditions and ownership status.<sup>17</sup> Following the empirical literature, we substitute profits per worker for value added per worker. Next, we define three slightly different samples to investigate whether our results are robust to the use of discrete instead of continuous shareholding variables.<sup>18</sup> More specifically, to test for jump effects we define the ownership dummies in three different ways. The first option is private domestic (foreign) ownership in the strictest sense: the dummy PRIVDDUM10 (FORDUM10) equals 1 if private domestic (foreign) ownership exceeds 10%. The 10% threshold is chosen since it is an internationally accepted standard (see e.g. Blomström and Sjöholm, 1999; Konings, 2001). Furthermore, it is the criterion used by the IMF to characterise foreign ownership. Second, we check for majority shareholding: the dummy PRIVDDUM50 (FORDUM50) equals 1 if private

<sup>17</sup> Note that for all specifications, the Hausman test rejects the random effects estimator.

<sup>18</sup> When we estimate the model using the continuous shareholding variables ranging between zero and one, we assume a linear relationship between the fraction of shares held by the different owners and the control over the firm. To get rid of this -arguably strong- assumption, we use dummies for shareholding to check the robustness of our findings. These results, which are not reported, are available upon request (for a discussion of the results, see p. 3.18).

domestic (foreign) ownership is higher than 50%. Third, we define fully-owned private domestic (foreign) firms as those owned for at least 95% by a private domestic (foreign) shareholder (dummy PRIVDDUM95 (FORDUM95)).

The second check refers to the estimation method. We check the robustness of the fixed-effects estimator by applying the first-difference Instrumental Variables approach.

Including profits per worker, the pooled OLS estimates (right part of Table 3) are very well in line with the earlier results, except for the last specification. This specification points to a positive firm size effect on the wage intercept ( $\alpha_N$ ) which is however independent of the firm's ownership status. Note that the rent-sharing estimate for state firms is lower than the estimate using value added. The direct endogeneity bias might be an explanation for this finding. The fixed-effects estimates using profits per worker are reported in the right part of Table 4. In contrast to the previous panel results, we find no significant firm size-wage effect. Remarkably, the rent-sharing coefficient in both private domestic and foreign firms is found to be negative and highest in absolute value for foreign firms. Table 5, however, shows that the size of the total impact of private ownership on wages using profits per worker to capture the firm's internal conditions accords very well to the one using value added per worker.

The pooled OLS results using discrete shareholding variables correspond strongly to those using continuous shareholding variables. From the results, it follows that no systematic differences in the estimates across the various ownership dummy categories can be detected. This suggests that the degree of private ownership does not affect the previous qualitative conclusions. The results of the panel estimates using majority shareholding as criterion are very similar to those using continuous shareholding variables. In contrast, when the 10% threshold is used both the firm size-wage effect and the negative correlation between private domestic ownership and rent sharing totally disappear. The estimates using the fully-owned ownership definition suggest that firm size has no effect on rent sharing.

To correct for possible simultaneity between value added and wages as well as between firm size and wages and to allow for firm-specific effects, we report the results of the first-difference Instrumental Variables procedure in Table 6. The various specifications include the first differences of all variables. As suggested by Arellano (1989), the instruments are in levels. The 3-period lagged value of value added combined with the 3-period lagged value of real wages at the firm level are used as instruments for value added. Firm size is instrumented by its 3-period lagged value. To check instrument validity, we present the probability values of a chi-square statistic testing overidentifying restrictions, the Hansen-Sargan test. It is clear that all specifications pass the

overidentification test. To check the usefulness of the instruments, we have performed F-tests. For all specifications, the nullity of the instruments in the first-stage regression is rejected.<sup>19</sup>

In line with the panel estimates, foreign firms pay very high inside wages, followed by private domestic firms. Specifications 2 and 3 point to a positive effect of firm size on the wage intercept. In contrast to the panel estimates, however, this effect does not differ across ownership structure. In line with the panel estimates, the results confirm the existence of crucial differences in the degree of rent sharing across the various ownership types. Comparing the fixed-effect estimates (left part of Table 4) with the first-difference TSLS estimates (Table 6) reveals that the extent of rent sharing in state-owned companies is underestimated using an OLS technique. A rather unexpected result is that the coefficients on rents in private firms are negative in all specifications.<sup>20</sup> No significant effect from firm size on rent sharing is found in specifications 2 and 3. Specification 4 suggests, however, that workers in large private domestic firms have more bargaining power than those in small firms. From Table 5, it follows that the first-difference TSLS estimates result in a negative total effect of private domestic ownership on wages and a strongly positive effect of foreign ownership on wages.

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<sup>19</sup> For sake of brevity, these test statistics are not reported but are available upon request.

<sup>20</sup> A potential explanation for this result may be the limited forecasting power of our instruments. Due to data availability we are forced to use lags to instrument financial conditions. These instruments, however, are not capturing exogenous demand shocks hitting the industry. Therefore, this unexpected result might partly be due to weak instrument bias, yielding downward biased insider effects (for a recent discussion of the issue of weak instruments, see Stock and Yogo, 2002 and Chao and Swanson, 2003).

**Table 6** Wage Equation 1997-1998, dependent variable  $wage_{it}$  - First-difference TSLS

<b>Constant</b>	6.309* (3.413)	6.809** (3.495)	4.968 (4.188)	7.875** (3.759)
<b>PRIVD</b>	45.622*** (15.122)	36.432*** (14.779)	43.741*** (18.440)	29.047* (17.609)
<b>FOR</b>	160.73*** (28.213)	183.31*** (34.718)	291.58*** (91.314)	205.09*** (79.101)
<b>N</b>		0.066*** (0.026)	0.053* (0.030)	0.017 (0.030)
<b>PRIVD * N</b>			-0.004 (0.019)	0.023 (0.017)
<b>FOR * N</b>			-0.109 (0.083)	-0.007 (0.076)
<b>A</b>	0.845*** (0.221)	0.894*** (0.227)	0.960*** (0.246)	0.814*** (0.228)
<b>valad_N - A</b>	0.099*** (0.024)	0.105*** (0.025)	0.118*** (0.028)	0.096*** (0.027)
<b>PRIVD * (valad_N - A)</b>	-0.181*** (0.052)	-0.166*** (0.053)	-0.192*** (0.056)	-0.184*** (0.054)
<b>FOR * (valad_N - A)</b>	-0.310*** (0.065)	-0.251*** (0.066)	-0.361*** (0.075)	-0.298*** (0.078)
<b>N * (valad_N - A)</b>		-0.00003 (0.00002)	-0.00006 (0.00006)	0.00005 (0.00005)
<b>PRIVD * N * (valad_N - A)</b>		0.00002 (0.00002)		0.000025* (0.000015)
<b>FOR * N * (valad_N - A)</b>		-0.00007 (0.00005)		-0.00005 (0.00005)
<b>Hansen-Sargan IV Test (p-value)</b>	0.834	0.976	0.938	0.328
<b># Obs.</b>	695	695	695	695
<b>R<sup>2</sup></b>	.	.	.	.

\*\*\*Significant at 1%; \*\*Significant at 5%; \*Significant at 10%. Standard errors in parentheses. A full stop in the  $R^2$  box indicates that the calculated

$R^2$  was negative and hence is not reported. Hansen-Sargan Instrument Validity Test: test of correlation among instruments and residuals, asymptotically distributed as  $\chi^2_{df}$ . The null hypothesis is that the instruments are valid. All variables are in first differences, the instruments are in levels.

## 7. CONCLUSIONS

To conclude, our results clearly show that ownership status is an important determinant of both the wage intercept and the degree of rent sharing. Rent sharing is very pronounced in state-owned firms but far less pronounced in private domestic and foreign firms. The results strongly confirm the existence of a multinational wage premium. In addition, we find weak evidence of a positive firm size-wage effect and a positive effect of firm size on the degree of rent sharing. If these effects exist, they are often more pronounced in private domestic firms.

In our view, the higher technology level of foreign firms and the presence of international rent sharing are two plausible explanations for the significant multinational wage premium in Bulgaria. The resulting high wage may prevent insiders in foreign firms from translating productivity gains into wage increases. This may partly explain the result that the share of rents taken by workers in foreign companies is considerably less than the part taken by state-owned employees. Another explanation is that foreign ownership seems to be concentrated in firms with high value added. Consequently, workers in these firms need to capture only a small fraction of the rents to secure an acceptable wage. A third possible explanation for the observed differences in rent-sharing behaviour across ownership categories is that firm mobility may curb insider power. If one thinks about a two-stage game in which the location decision of foreign firms occurs after firms and insiders bargain over wages, the 'threat of relocation' possibility of foreign firms vis-à-vis the insiders increases the relative bargaining power of the firm. If bargaining breaks down, the conflict payoff (or outside option for the firm) is positive as foreign firms can relocate activity to other countries. This may lead to a low responsiveness of real wages to productivity gains (Zhao, 1995).

The strong positive relationship between firms' ability-to-pay and wages in state-owned firms may partly be explained by the fact that insiders in these companies still play an important role. This is however not a sufficient explanation as increased product market competition (resulting for example from increased FDI) may prevent insiders from exploiting their power at the bargaining table. More plausible explanations are the relatively low inside wage level (for given rent sharing) and the low value-added profile in these firms which may induce (or necessitate) employees to cream off a considerable part of the rents to obtain an acceptable wage.

Finally, a caveat to our results is the possibility of residual selection bias. It could be that some categories of owners were able to obtain shares in better firms, in ways which are unobservable to the researcher but possibly observable to the buyers. This problem arises in all studies of privatisation and firm performance. In our analysis, we argue that the fixed-effects estimator controls for ownership endogeneity. This is valid if the unobservable quality is fixed for each firm. The effect may be dynamic, however, if for example the unobservable quality relates to potential for restructuring and improvements in productivity rather than being intertemporally fixed. We implicitly control for this dynamic effect by using the first-difference TSLS method. Nevertheless, the possibility of selection bias should be borne in mind in interpreting our findings.

## APPENDIX A

Table A.1 Summary Statistics by Ownership Category

VARIABLES	# Obs.	Total Sample Mean (St. Dev.)	# Obs.	Maj. State Firms Mean (St. Dev.)	# Obs.	Maj. Priv. Dom. Firms Mean (St. Dev.)	# Obs.	Maj. Foreign Firms Mean (St. Dev.)
<b>1997</b>								
Employment	1163	400.4 (799.0)	303	528.6 (1398.4)	802	335.0 (390.4)	58	635.3 (553.3)
Average wage	933	101.7 (105.6)	265	98.2 (84.2)	620	100.3 (114.3)	48	137.9 (89.0)
Profits per employee	931	167.3 (595.5)	265	111.5 (396.3)	618	179.1 (667.2)	48	323.8 (495.2)
Value added per employee	931	269.1 (663.3)	265	209.7 (446.5)	618	279.6 (742.0)	48	461.7 (545.8)
<b>1998</b>								
Employment	1371	346.8 (695.0)	236	328.5 (609.3)	1058	327.8 (708.5)	77	664.1 (685.7)
Average wage	1102	112.2 (76.7)	211	102.0 (78.0)	828	110.8 (71.5)	63	164.7 (112.2)
Profits per employee	1099	303.4 (3287.5)	211	98.5 (271.5)	827	337.2 (3741.0)	61	553.9 (2153.0)
Value added per employee	1101	415.9 (3289.7)	211	200.6 (304.1)	828	447.6 (3743.2)	62	725.8 (2145.3)
<b>1997-1998</b>								
Employment	2534	371.4 (744.8)	539	441.0 (1126.8)	1860	330.9 (592.5)	135	651.7 (630.1)
Average wage	2035	107.4 (91.2)	476	99.9 (81.5)	1448	106.3 (92.4)	111	153.1 (103.2)
Profits per employee	2030	241.0 (2452.7)	476	105.7 (346.3)	1445	269.6 (2863.8)	109	452.6 (1641.7)
Value added per employee	2032	348.7 (2463.3)	476	205.6 (389.5)	1446	375.8 (2874.2)	110	610.5 (1649.7)

Source: Amadeus Database

Note: In Table A1, the sample is restricted to firms which are classified according to majority shareholding. By contrast, the sample in Table 2 also contains firms which have multiple owners. Consequently, the number of observations in Table A1 differs from the number in Table 2.

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