

DISCUSSION PAPER

GLOBALIZATION AND THE EFFECTS OF
NATIONAL VERSUS INTERNATIONAL
COMPETITION ON THE LABOUR MARKET.
THEORY AND EVIDENCE FROM BELGIAN FIRM
LEVEL DATA

by

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Globalization and the effects of national versus international competition on the labour market. Theory and evidence from Belgian firm level data.

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Abstract

In this paper we first develop a simple theoretical framework which shows that important differences exist between *national* and *international* competition and their effect on national labour markets. *National* competition refers to a reduction of monopoly power in the product market through improved market contestability and market access, which is the responsibility of competition authorities. *International* competition refers to a reduction in product market competition as a result of trade liberalization. We show that when the domestic market is unionized, national entry (FDI or domestic entry) has very different effects on the national labour market than international entry (imports in the relevant product market). One result we obtain is that national competition need not increase domestic employment while trade competition need not lower domestic employment. Our analysis has at least two important implications. First, geographic location of competitors matters when institutional settings like trade unions are country specific. Second, a change in competition policy is likely to affect labour markets differently than a change in trade policy. The results also indicate that apart from location, market structure and the level at which wages are bargained over (firm or sector level) matter. In a further step the theoretical predictions we derive, are tested on Belgian company accounts data supplemented with data from a postal survey.

JEL-codes: L13, F12, D6

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I. Introduction

In recent years a growing number of papers have looked at various aspects of globalization and its implications for competition and trade policy. While both trade liberalization and competition policy are aimed at promoting product market competition they operate via different channels. Trade policy, which is the responsibility of supra-national bodies like the WTO, aims to safeguard the free flow of goods and services. Competition policy, which is the responsibility of national authorities, tries to guarantee market access and contestability. When dealing with issues of 'Trade And Competition' attention should not be limited to issues relating to the product market but one should also look at implications for imperfect labour markets.

The purpose of this paper is to analyze the effects of a reduction in product market monopoly power on the domestic sectoral labour market when there is a labour union bargaining with the domestic firm(s) over wage levels. A different but equally interesting question which will not be explicitly dealt with here, is the way in which labour market imperfections may affect the contestability of markets as shown for example by Dewatripont (1988).

Globalization has been blamed for the increasing unemployment in Europe and the widening of wage differentials in the US (Wood 1994). In general there is no clear consensus as to how much trade has mattered (Faini et al. 1998). Trade economists have looked for inward shifts of labour demand caused by increased trade with low wage countries which could explain in a Stolper-Samuelson framework the reduced demand for less skilled workers. (Leamer 1994, Wood 1995, Borjas & Ramey, 1992) but with mixed success. This could be due to a number of reasons. Most of the empirical work testing for the effects of increased international competition on the demand for labour or wage differentials has used data at the sectoral level thereby missing a lot of the within sector reallocation and heterogeneity of firms (Revenga, 1992; Slaughter, 1996). This could also be due to ill-defined measures of international competition. A final reason why the evidence is poor could also be related to the fact that most papers miss out on important institutional characteristics of the labour market or simply that trade does not have much effect.

This paper makes a threefold contribution to this literature. *First*, we provide a simple theoretical framework that exposes a mechanism through which increased competition affects domestic jobs and wages. An important element in this is the role trade unions play as suggested empirically by Gaston and Trefler (1995) and Konings and Vandebussche (1995). We define *international* competition as an increase in the number of firms that become active in the relevant product market of Belgian firms but which are located *outside* Belgium. *National* competition is defined as an increase in the number of firms active in the relevant product market located *in* Belgium. The results indicate that an increase in *national competition* (FDI or domestic entry), puts domestic workers in a stronger position. The probability of finding a job for workers in the imperfectly competitive sector goes up which can increase domestic wage levels above the autarky level and reduce employment below the autarky level. Moreover, prices could go up despite entry. *International* import competition however, has very different effects since wage levels abroad are out of reach of the domestic union (and assumed to be exogenous here). International competition will always lower domestic wages which could even increase employment despite the foreign imports. This seems to suggest that competition policy and trade policy are complements in order to reduce labour market imperfections and to go towards more competitive markets. As will be shown below, market accessibility is not sufficient to guarantee lower price levels in the product market.

A *second* contribution is that in our empirical analysis we will use data at the *firm level* which is more disaggregated than the studies using sectoral data. We turn to company accounts supplemented with a postal survey carried out in 2041 Belgian firms with a response rate of 12% in 1997. For the period '94-97 international competition was felt most strongly from Central

Europe and the Far East. In 58% of the firms in the survey bargaining occurs at the firm level. In those firms where unions matter, in 69% of the firms bargaining is on wages. An index of job reallocation (Konings 1995) will be used to measure the degree of inter-firm mobility of labour in a sector. For those firms that experienced an increase in national competition, domestic wages turn out to be significantly higher when the inter-firm mobility of labour in the sector is high as predicted by the theory.

Third, most of the empirical papers so far have focused on the effects on US labour markets, the US being a large economy with a large domestic market. Little is known about the effects on European labour markets consisting of a large number of *small open economies* that are probably more exposed to international shocks. This is particularly relevant as with the opening of Central and Eastern Europe and with the increased economic integration of the European Union, competitive pressures will likely filter through in the European labour markets characterized by high unemployment and high and rigid labour costs. Belgium is a small open economy, characterized by high unemployment and strong labour unions, so it provides a good illustration.

The paper is structured as follows. In section II we provide a theoretical framework which captures the interaction between increased competition in the product market and imperfect labour markets. An effort is made to avoid mathematical notation in the text. The functional forms used and the derivation of the results can be found in the appendix¹. Section III discusses the data set, the econometric tests and the results. Section IV concludes the paper.

II. Theoretical Framework

In this section we show how in the presence of trade unions and endogenous wage determination the effects of national and international competition on the domestic labour market differ. To this end we use simple theoretical tools in which we reduce the monopoly power of a domestic incumbent firm by allowing entry which leads to certain employment and wage effects. Our findings suggest different results depending on the nature of competition - national or international - and on the level at which domestic trade unions bargain over domestic wages - at the firm or sector level. For a number of European countries, such as Belgium, wages are negotiated at both levels.

On the empirical side, recent findings suggest that labour market imperfections and the degree of competition, measured by the number of rivals in the industry are important factors which interact with increased domestic and foreign competition to explain the effects on domestic employment and wage levels (Brander and Spencer, 1988; Mezzetti and Dinopoulos, 1991; Motta 1992; Konings and Vandebussche, 1995; Wes, 1995).

In order to study the effects of increased competition in the presence of product and labour market imperfections, we start off by considering an incumbent firm enjoying a high degree of monopoly power. Then we proceed by allowing an entrant into the domestic market which can be either national or international. By a *national entrant* we mean a firm with production facilities within the incumbent's country borders². While a *international competitor* exports to the incumbent's relevant product market. In the national and international duopoly case we assume Cournot competition in the product market.

¹ A more detailed explanation of the model can be found in the working paper version Vandebussche and Konings (1998)

² We assume national entry to be costless. Smith (1987) shows how fixed costs affect the decision of a multinational firm to either export or invest abroad.

The Model

The simple theoretical framework which we present in this section does not pretend to be an exhaustive alternative to the other more traditional theories trying to capture the effects of globalization. In contrast, our aim is to point out that geographical location matters when institutional settings like trade unions are country specific³. While different employment effects of national versus international competition with exogenous wages in the domestic market seem obvious, we will show that this is no longer the case with endogenous wage determination.

Similar to Mezetti and Dinopoulos (1991) and Bughin and Vannini (1995) we construct a simple partial equilibrium model⁴ whereby in autarky a homogenous good is produced by a monopolist. Demand for the good in the relevant product market (could be situated outside the domestic country) is assumed to be linear (expression A.1 in the appendix.) A reduction in monopoly power in this sector either occurs through entry of a domestically based competitor or through imports. We move from a domestic monopoly to a Cournot duopoly in both cases. As explained earlier the distinction between national and international competition depends on location not on ownership. National entry could be the result of competition policy aimed to improve market access while international competition could be the result of trade liberalization⁵. Wages in the imperfectly competitive national sector (W) are determined through a Nash bargaining process between the union and the national firm(s) After the wage has been set, employment is decided by the firm(s) as a function of the domestic and foreign wage and the product market competition. The wage level abroad is assumed to be exogenous.

The assumption about the production function we make is arguably the most controversial one but simplifies our analysis greatly. We simply assume that one unit of labour (L) is needed to produce one unit of output (X) thereby not allowing for capital/labour substitution (similar to Brander and Spencer 1988, Mezetti & Dinopoulos 1991, Bughin and Vannini 1995). This of course poses serious limitations on our analysis. Nevertheless we believe that a function of the form $X=L$, which provides an easy relationship between production and employment, will allow us to indicate how a reduction in monopoly power in the product market is likely to affect the labour market. What has to be kept in mind is that the results we obtain are likely to be underestimates. When labour becomes more expensive, allowing for capital/labour substitution will bring about a further reduction in employment because expensive labour will be replaced by relatively cheaper capital; which is not captured by our simple production function. In the opposite case when labour becomes cheaper, allowing for capital/labour substitution will work in the other direction rendering our estimate of employment creation again an

³ Our aim is not to study the decision exports versus FDI by a foreign multinational (see Motta 1992, Smith 1987, Zhao 1998). Neither do we look at equilibrium market structures (see Horstmann and Markusen 1992) or trade policy in the presence of unions (see Brander and Spencer 1988). For a discussion of welfare effects of exports versus FDI see Bughin and Vannini (1995). Instead we focus on the distinction between national and international competition (which entails more than FDI/exports) and the effects on domestic wages and employment which is relevant for governments when evaluating the effects of competition versus trade policy on labour markets.

⁴ For the case of *international* competition the analysis could easily be extended to a more general equilibrium setup. In addition to an imperfectly competitive sector one could assume a perfectly competitive numeraire sector where prices and wages equal unity. The numeraire sector would ensure that trade is balanced and that employment which is freed up from the Cournot sector is absorbed at the unity wage. The fall back income of workers would then equal the wage of the numeraire sector.

⁵ *International* competition usually also refers to a rise in the mobility of capital across borders. However, FDI here is classified as an increase in *national* competition. Crucial in our definitions is whether the competitor is located within the borders of the country where labour unions are active.

underestimate of what is likely to be the true employment creation. Given that we know how capital/labour substitution is likely to affect the results we feel we can go ahead using our simple production function.

There is a lot of controversy as to what is the best way to model a union. Following Brander and Spencer (1988) and Mezetti and Dinopoulos (1991) we use a Stone-Geary utility function (A.2 in the appendix). The union's utility depends on both wages (W) and employment (L). Although the functional form chosen here is not the only alternative available, it has the advantage of being tractable and well behaved. Our results however do not depend on this specification for union utility. Common to most utility functions is that positive utility is derived from home wages (W) that lie above the fall back income (W_a) and employment at that wage level. An increase in the fall back income (W_a) will always lower union utility but will always increase the wage secured in the bargaining process between union and firm.

The fall back income of a worker (W_a) is considered to be a function of the wage paid by other firms in the sector, the degree of mobility of workers between firms in the sector (α) and the income in case of unemployment (non-labour income) represented by B which for simplicity is set equal to zero (A.3 in the appendix)⁶. Another way of interpreting α is the amount of friction in the labour market. A value of $\alpha=1$ means the domestic labour market is frictionless and there is perfect mobility of labour between firms. While for $\alpha=0$, labour market rigidities are so high that despite the presence of other firms in the market, labour is immobile between firms⁷. Due to the partial equilibrium nature of the model the only type of labour reallocation we allow for is intra-sector reallocation. This is in line with recent empirical evidence which has revealed that despite the prominent role of inter-sector labour reallocation in the more traditional Heckscher-Ohlin type of trade models, most of the job reallocation is occurring between plants and within sectors (Davis and Haltiwanger, 1992, Levinsohn, 1996). In the empirical analysis in section III, the parameter α will be proxied by an index which measures the extent of inter-versus intra-sector reallocation of labour.

In the first stage of this model wage negotiations take place along a non-cooperative Nash bargaining process (equation (A.4) in appendix). Those not familiar with this concept can think of a pie that needs to be divided between workers (in terms of the wages they get) and owners of the firm (in terms of the profits they get). How this pie will be divided depends on the bargaining strength of the two parties represented by a parameter β that lies between zero and 1. The stronger the union (β) the weaker the firm ($1-\beta$) and vice versa. The two parties are non-cooperative in the sense that both the workers, represented by the union, and the owners, represented by the firm, try to secure the biggest share of the pie. What the union tries to maximize in the bargain is its utility over and above the utility that it would be left with in case

⁶ The fall back income of workers is given by the following: $W_a = \alpha \cdot \bar{W} + (1 - \alpha) \cdot B$ with $\alpha \in [0,1]$

where α is a measure for the mobility of labour between firms in a sector (exogenous to the model), \bar{W} is the wage paid by other firms in the sector and B is non-labour income which is set equal to zero. This specification is based on Layard, Nickell and Jackman (1991) but with a somewhat simpler interpretation.

Their specification of the fall back income is $W_a = (1 - u) \cdot \bar{W} + u \cdot B$ where u is the unemployment rate. Although we do not explicitly take unemployment on board in our analysis it can be shown that the direction of the results is the same under both interpretations: national competition, in contrast to international competition, increases the probability of finding a job and raises the fall back income.

⁷ Mobility of labour between firms in the sector is a function of rigidities in the labour market present in the background but not explicitly modeled like for example hiring and firing costs.

no agreement is reached. The latter is called the union's threat point (U°) because it represents what the union would have when bargaining with the firm fails. What the firm tries to maximize in the bargain is its profits over and above the profits it would have in case of conflict. The latter is again referred to as the firm's threat point (π°) because it is the payoff for the firm when no agreement is reached between union and firm. When no agreement is reached in the bargaining process we assume that no output can be produced. This renders firm's profits and union utility equal to zero in case of conflict. Hence the threat points U° and π° are equal to zero.

After the wage is determined in the bargaining process, we assume that *firms* decide on employment levels depending on the competition in the product market (monopoly or Cournot duopoly) without the interference of the union⁸.

In what follows we first discuss the results under autarky (monopoly) and then consider what happens with additional entry (duopoly). We analyze different levels of wage negotiations (firm level, sectoral level) and different types of entrants (national versus international).

Autarky

Suppose under autarky there is one national incumbent firm in the market, fully exploiting its market power in the product market. When there is only one domestic firm in the sector in autarky the fall back income (W_a) of workers in the labour market, is zero. Irrespective of the amount of friction in the labour market, the possibility for workers of finding a job in another firm in the sector is nihil. Hence, the fall back income of workers in autarky is equal to the non-labour income which is assumed to be zero ($W_a=B=0$).

In order to limit the mathematical notation in the text, the equilibrium wage and employment level in the manufacturing sector under autarky are listed in the appendix. Here we will refer to them as the *initial state* of the economy. We next analyze how this alters as we allow increased *national* and *international* competition. At the end of this section in table 1 we offer a numerical example which illustrates the difference between the scenarios. The initial state of the economy is listed in the first column of table 1.

National Competition

When there is an extra entrant which locates in the national market, a national duopoly arises. With two firms in the market the outside wage in the unionized sector is now the wage paid by the other firm in the market. We start by analyzing wage negotiations at the firm level and assume equal bargaining power in each firm. This results in two reaction functions whereby the equilibrium wage for each firm becomes a function of the wage paid in the other firm. Solving these two equations gives the equilibrium wages for both firms which are the same given that firms are assumed identical. The mathematical expressions can be found in the appendix.

When the labour market is frictionless which is the equivalent of perfect inter-firm mobility of labour ($\alpha=1$), the equilibrium wages in both firms are higher than under autarky. While in the other extreme case where inter-firm mobility is zero ($\alpha=0$), the equilibrium wages

⁸ We solve this game by backwards induction to obtain a subgame perfect Nash equilibrium in employment and wages. This implies that we first solve the product market competition stage to obtain equilibrium quantities, where wages are assumed to be exogenous. We use the reduced profit function to solve the first stage of the game, maximizing the Nash product, which yields us the subgame perfect equilibrium wage and employment.

are lower than under autarky. For a value of $\alpha=1/2$, the equilibrium wage level is equal to the wage under monopoly⁹. This result suggests that an increase of national competition in the product market, does not necessarily result in a downward pressure on wages when inter-firm mobility is sufficiently high. Endogenous wage formation at the firm level together with high mobility of labour between firms results in a sort of ‘race to the top’ whereby firms are willing to pay higher wages whenever there are other national firms in the market which offer job opportunities for workers. This result goes in the direction of Dewatripont (1988) where it was shown in a dynamic framework with fixed costs of entry that the presence of unions at the firm level work as an entry barrier.

Result 1:

A reduction in product market competition whereby the competitor locates in the national market can lead to higher or lower national wages than under autarky depending on the degree of inter-firm mobility of labour (α) in the sector. When inter-firm mobility is high/low (degree of friction in the labour market) ($\alpha \gtrless 1/2$), an increase in competition leads to an increase/decrease in domestic wages.

Our model is a ‘right-to-manage’ model whereby after the wage has been set, the firms decide on employment along their labour demand curve. With national competition, the extra firm locates in the national market and creates employment opportunities. As inter-firm mobility gets higher, firms’ profits are squeezed more because wages are pushed up as workers have a better outside option in terms of a higher probability of finding a job in the sector. It is even possible for the national wage to become so high¹⁰ that an increase in domestic competition reduces domestic employment. Or in other words that the duopoly output becomes smaller than the monopoly output.

An example of how national competition changes the important variables in the industry is offered in columns 2 to 4 in table 1 where we consider a numerical example with three different levels of α ($\alpha=0.3$; $\alpha=0.5$; $\alpha=0.9$). A low value of α means that the probability of a national entrant does not affect the probability of finding a job much. Or, alternatively can be interpreted as a high degree of friction in the labour market. If that is the case (f.e. $\alpha=0.3$) then domestic wages and the domestic price level drop while national employment is increased as a result of entry (column 2). However, in the opposite case where national entry does significantly affect the probability for workers to find a job (f.e. $\alpha=0.9$), wages can be pushed up to a higher level than under autarky while employment will be lower. Note that the domestic price has gone up despite the extra entry in the market. Firm profits however are much lower than in the initial state of the economy (column 4). This seems to suggest that improved market accessibility in the presence of unions can lead to a transfer from consumers (they pay a higher price) and firms (profit margins are squeezed) to workers (higher wages) although the number of workers that benefit is lower than under autarky. In such a situation the wages of insiders go up but less workers are employed. Note that in the example in table 1 wages change for unchanged values of the union bargaining power (β). This example illustrates that in contrast to what is generally believed by competition authorities, price does not necessarily drop with an increase in the number of

⁹ For all values of $0 \leq \alpha \leq 1$, the equilibrium wage in both firms in the event of firm level wage negotiations lies between $W \in [a\beta/(4-\beta), a]$. The autarky wage is $a\beta/2$ which is also what we get under firm level bargaining for $\alpha=1/2$.

¹⁰ The critical value for the wage is equal to $W = [a - 3/8.a(2-\beta)]$.

competitors in the product market. Neither can we infer from observing high prices in the market that firms necessarily have high profit margins.

Result 2:

When inter-firm mobility of labour in the sector is low, national entry reduces price, lowers wages and increases employment. However, when inter-firm mobility is high, an extra competitor located in the market can lead to an increase in domestic wages, an increase in the domestic price and a reduction in national employment.

What happens when the level of wage bargaining is more central like sector level bargaining? In contrast to wage negotiations at the firm level, with sector level bargaining the union is now concerned about *industry* employment and in the bargaining stage *industry* profits rather than firm level profits are maximized. The alternative wage W_a under sector level bargaining now becomes zero for the simple reason that when workers are not employed by the sector (firm 1 or 2) they are unemployed and earn nothing since non-labour income B is zero. The results which are given in the appendix show that the equilibrium wage under sector level wage bargaining is equal to the wage level under autarky and the wage obtained on the basis of firm level negotiations for $\alpha=1/2$. For a mobility degree higher than $1/2$, firm level negotiations result in higher wages than sector level negotiations while the opposite applies for a degree of mobility below $1/2$. This leads to the following result:

Result 3:

*Under national competition the endogenous wage negotiated at the sector level is equal to the autarky (monopoly) wage. Sectoral wages are **higher than/lower than/equal to** the wage under firm level wages for a degree of labour mobility between firms (α) **lower than/ higher than/ equal to** 1/2.*

In table 1, the results for sector level bargaining correspond with firm level bargaining for a value of $\alpha=1/2$. From column 3 we see that domestic wages are the same as under autarky, while employment has gone up and price has gone down. The domestic incumbent faces reduced profitability due to the lower price in the product market as a result of entry. Comparing columns (3) with (2) and (4) we see that for low mobility of labour ($\alpha=0.3$), firm level wages are indeed lower than sector level wages while for high mobility of labour the reverse holds ($\alpha=0.9$).

Let us now turn to the case where the extra competitor in the market locates abroad which means it is not subject to wage bargaining.

International Competition

When the entrant in the market is a foreign firm exporting to the domestic market domestic unions no longer have power over the wage paid by the foreign firm. We assume that the foreign wage W_2 is exogenously given¹¹. (Subscript 1 is now used to indicate variable of the home country and subscript 2 for variables of the foreign country). International competition in the form of imports imply that the fall back income of national workers does not change but remains zero because the probability of finding another job is not affected. However, the level of W_2 will

¹¹ A lower wage abroad can be due to many reasons. In a traditional trade framework, differences in wages are explained by differences in factor endowments. A lower wage abroad would suggest that the foreign country is relatively more endowed with labour.

influence national wage negotiations since equilibrium output depends on W_2 implying that national employment and profits are also a function of W_2 . The equilibrium wage and employment levels are given in the appendix. Note that the home wage (W_1) is a positive function of the foreign wage level (W_2) which implies that the higher/lower the foreign wage, the higher/lower the domestic wage. In the extreme case where $\overline{W_2} = 0$, the domestic wage is lower than any wage level under national Cournot competition. When $\overline{W_2} = a$, the foreign wage is so high that sales on the domestic market are not viable which leads to a national monopoly with an equilibrium wage equal to autarky level. For values of $a \geq \overline{W_2} \geq 0$, for which domestic sales are possible, international competition always results in domestic wages which are lower or equal than under monopoly ($W_1^* \leq W^m$).

Result 4:

An increase in international competition (imports in the relevant product market) always lowers domestic wages.

Regarding employment the following applies. When the foreign wage is equal to zero ($W_2=0$), imports lower the market share of the incumbent and lower domestic employment. For a positive wage level abroad ($W_2>0$), we find that imports result in more or less domestic employment depending on the strength of the domestic Union (β) and the level of the foreign wage (W_2)¹². The mathematical expression showing this result can also be found in the appendix. The interpretation is the following. The higher (lower) the foreign wage, the more likely that imports will result in domestic job creation (destruction). Unions also matter. Under weak (strong) union power, imports are more likely to result in domestic job losses (gains). The intuition behind this result is that under weak unions, wages are relatively low and employment relatively high under autarky in the absence of competition. Under strong unions the opposite applies which means that a reduction in monopoly power through imports will more easily result in extra jobs.

Result 5:

Imports in the relevant product market have ambiguous effects on domestic employment; the direction depends on the foreign wage level and domestic union power. The higher the wage level abroad and the higher the domestic union power, the more likely that imports can increase the demand for labour even beyond the autarky level.

Again we turn to table 1 to illustrate the results with a numerical example. The last two columns show what happens under international competition where the extra entrant active in the relevant product market of the national firm locates abroad. We fix the level of domestic bargaining power (β) but we vary the foreign wage level (W_2). In column (5) imports come from a low wage country ($W_2=1$) while in column (6) imports come from a high wage country ($W_2=4$). Irrespective of the wage level abroad, domestic wages and product market price always drop with imports compared to autarky.

¹² $Q^m \geq X^c \Leftrightarrow \frac{a \cdot (2 - \beta)}{6} \geq \overline{w_2}$

In terms of employment we note that when imports come from a low wage country (5) domestic jobs are lost. When imports come from a high wage country (6) domestic jobs are preserved or increased¹³ compared to autarky.

Table 1: National and International Competition in the Domestic market: a numerical example

Domestic	Autarky		National Entry		International Entry	
	(1)	(2) $\alpha=0.3$	(3) $\alpha=0.5$	(4) $\alpha=0.9$	(5) $W_2=1$	(6) $W_2=4$
Wage	2.5	1.92	2.5	6.25	1.37	1.75
Empl.	3.75	5.38	5	2.5	2.75	3.5
Price	6.25	4.61	5	7.5	4.12	5.25
Profits	14.0	7.24	6.25	1.56	7.56	12.25

Notes: a) The demand parameters in this exercise are set equal to: $a=10$, $b=1$, the bargaining power of the union is set equal to $\beta=0.5$
b) national versus international do not refer to ownership but to location
c) α = probability of finding a job in the sector

Policy Implications

In the previous section we discussed two channels through which monopoly power of a domestic incumbent can be eroded: imports and national entry. The former resides under trade policy the latter under competition policy. While trade policy is the responsibility of supra-national bodies like the WTO and the European Commission, competition policies are still the responsibility of national authorities. Under endogenous wage formation both types of policies have different effects on domestic labour markets. Our results suggest that trade liberalization of imports will always lower domestic wages and the product market price but can have ambiguous effects on employment depending on the wage level of the trade partner. The profits of domestic firms go down but wages go down relatively more. National entry with extra firms locating in the national market can have very different effects. As long as entry does not significantly affect the job opportunities for workers in the domestic market, competition has the expected effects of lowering wages, prices and enhancing employment. Domestic profits decrease relatively more than domestic wages. However, if under firm level wage bargaining the probability of finding a job is significantly increased, wages will be pushed up which can result in domestic prices which are higher than under autarky. Under those conditions it is very well possible that an increase in

¹³ For a value of $W_2=5.5$, employment in column (6) becomes higher than in (1) but for $W_2=6$, the foreign market share turns zero.

the number of competitors in the market lowers profit margins and at the same time increases price and wages to workers (wages are increased more).

Sector level bargaining after entry keeps wages in place while at the same time lowers the price and lowers firms' profit margins. This seems to suggest that more centralized bargaining is less likely to affect wages, while prices and profits are reduced. The analysis therefore suggests that trade liberalization and competition policy can have different effects on the labour market which supports the view that they are complements rather than substitutes. Domestic incumbent firms prefer imports to national entry because imports discipline wages more than profit margins. Domestic workers however, are likely to prefer national entry which lowers firms' profits relatively more than wages.

III. The Empirical Evidence

In this section we look for empirical evidence which could confirm the above predictions. Most studies to date have used sector level data on employment, wages and import penetration at a fairly aggregate industrial classification (1 or 2 digit) to test the effects of increased globalization on the labour market (e.g. Abraham and Brock, 1997; Revenga, 1992). While sector studies can reveal a number of interesting patterns, they could hide important differential responses of *firms* within one sector. This is especially the case when strategic interactions between firms within the same sector are important. For this reason we opted for firm level data published in yearly accounts which we supplemented with a postal survey inquiring amongst others after the effect of increased globalization.

The survey was carried out in the Summer of 1997. We sent out 2041 surveys with questions relating to employment levels, wages of blue collars versus white collars, the extent of foreign and domestic competition, etc.. This resulted in a sample of 234 firms, or a response rate of 12%. The addresses were obtained by a random draw from the published company accounts of all large Belgian firms. To be included in the data set at least two of the following criteria had to be satisfied: Total number of workers greater than 150, total assets more than 12 million US dollars, total turnover more than 12 million US dollars. Thus one drawback from the data set is that we do not cover the very small firms. The data refer to plant data for the years 1994-1997 as we explicitly asked to answer the survey with respect to the plant the questionnaire was sent to.

One potential problem with surveys is that there might be sample selection bias with respect to the firms that decide to cooperate in the survey. Table 2 shows the initial distribution according to the one digit Nace sector classification of the original sample and of the responses. A statistical test of differences in proportions between the original sample and the responses shows that there is no statistically significant difference between the two, hence we can say that there is no sample selection bias in the responses.

Table 2: Distribution of Belgian firms in the Postal Survey

SECTOR	SELECTED FIRMS		FIRMS WHICH ANSWERED		Z-VALUE
	Number	Frequency	Number	Frequency	
1	3	0,01	0	0,00	n.m.
2	285	0,14	38	0,16	0,37
3	320	0,16	34	0,15	0,17
4	788	0,39	84	0,36	0,48
5	222	0,1	41	0,18	1,19
6	69	0,03	7	0,03	0,05
7	311	0,15	26	0,11	0,56
8	38	0,019	3	0,01	0,06
9	5	0,001	1	0,00	n.m.
Total	2041	1	234	1	

n.m.: not mentioned

Table 3 gives summary statistics on a number of variables that we used in our analysis. Two key variables are of interest in the current context. The first is related to how we measure *international competition* and the second to *national competition*. We defined an increase in international competition (*fc*) as an increase in the number of firms that became active in the relevant product market of the Belgian firm we sampled, which are *not* located in Belgium. An increase in national competition (*dc*) was then defined similarly but referring to competitors located within Belgium. The question asked in the survey was: *Did your plant, for its most important product, experience for the period '94-'97 an increase/decrease/no change in national/international competition? (it was clarified what we meant with national and international competition)* In the theoretical section it became clear that this distinction has implications for the effects on domestic employment and wages because domestic competitors are subject to the same institutional settings but foreign competitors are not.

Virtually nobody responded with a decrease in competition. Therefore we restrict our attention to increased competition versus no change. Table 3 shows that about 75% of the firms experienced an increase in international competition between 1994 and '97. Of this 75%, 32 percentage points refers to increased international competition that originates from Central and Eastern Europe and/or Asia. Increased national competition was only experienced in 58% of the cases. Our sampling is limited to the large firms with total number of workers higher than 150. According to Belgian law firms with at least 50 employees are required to recognize trade unions. Therefore all firms in our sample can be considered to be unionized. However, union power can differ significantly between firms. Moreover is it not necessarily the case that the most important level at which negotiations occur are at the firm. To obtain an idea about trade union power in the plant we asked: *At what level did negotiations with trade unions take place and what are the negotiable issues ?*

81 % of the firms answered that negotiations with trade unions occur at some level. Of those firms where negotiations with trade unions take place, 58% occurs at the firm level while 54% occurs at sector level¹⁴.

¹⁴ In some cases negotiations occur at both the sector and firm level.

In 66% of the firms, it was reported that trade unions also have a substantial impact on either wages, employment and/or work conditions in the firm. In those firms where unions matter, negotiations are either on wages (69%), on employment (40%) or on work conditions (66%). Only 34% of the firms responded that trade unions do not have much impact. We take this as our indicator for union power. We use a dummy equal to 1 if the union has some impact, 0 else, (*union*).

Table 3: Summary Statistics

Increased foreign competition	75%
Increased domestic competition	58%
Unionized	81%
Unions have impact	66%
Negotiations over wages when unions matter	69%
mean number of blue collar workers	315
mean hourly wage	384

Finally, it can be seen in table 3 that the average plant (averaged over firms and over years 1994-'97) employs 315 blue collar workers, paying them an average hourly gross wage of 384 BF¹⁵. Growth in the number of blue collar (white collars) workers is negative (positive) while growth in their wages is positive.

In the majority of firms in the survey (52%), between 76 and 100% of the blue collar workers are unionized. While for white collars the majority of firms report a very low degree of unionization: 61% of the firms have trade union membership of white collars not higher than 25%. Given that we are interested in the interaction of competition and unions we restrict our analysis to blue collar workers as typically blue collar workers have lower education levels and are more unionized.

In table 4 we show summary statistics for growth rates in blue collar workers and the hourly wage for different splits of the sample. Regarding workers, the first two rows show that in unionized plants the mean growth of workers is negative, while in non-unionized plants this is positive. This result is consistent with the findings for the UK by Blanchflower et al. (1991) that unionized plants have lower employment growth rates and it suggests that the right to manage model where unions bargain over wages only, is the correct model to think about the way in which unions operate. The second column in table 4 shows that the mean growth rate in wages is higher in unionized plants than in non-unionized ones. The third and the fourth row show that plants which experienced an increase in international competition (*fc*) have a lower growth rate for both workers and wages than plants that did not experience an increase in foreign competition. In the theoretical section we showed that national employment effects of international competition depend on the foreign wage level. Since the data suggest that the majority of foreign competition is from low wage countries (CEE, Asia), it is no surprise to find a lower wage growth rate in firms that experienced an increase in foreign competition. In the final two rows the same exercise is done for an increase in domestic competition (*dc*). An increase in domestic competition is on average associated with lower employment growth, but higher wage growth. In the theoretical section it became clear that with an increase in domestic competition, domestic wages increase as a result of competition for workers in terms of wages (provided there is inter-firm mobility). The summary statistics are consistent with this prediction

¹⁵ At an exchange rate of 1\$=35BF, this is about \$11.

showing that an increase in domestic competition results in a higher wage increase than in the absence of domestic competition.

Table 4: Summary statistics on growth

	Growth of Workers	Growth of Wages
Unionized	-0.01	0.04
non-unionized	0.04	0.02
Increased fc	0.01	0.02
no increase in fc	0.02	0.05
Increased dc	0.01	0.04
no increase in dc	0.02	0.02

We now turn to a more rigorous testing of our theoretical predictions. We set out to estimate reduced form equations of employment and wage equations. We estimate both the employment equation and the wage equation in first differenced form for two reasons. First, this allows us to control for unobserved fixed effects and second our indicators of foreign and domestic competition are measuring *changing* competition. Therefore it is important to estimate a change in employment/wages on a change in competition. Since our competition variables refer to the changing competition between 1994-97 we estimate the equations between 1994-97 and control for unobserved aggregate shocks by including year dummies¹⁶ for the change between 1995-96 (*yd96*) and from 1996-97 (*yd97*). We start in table 5 by reporting the results for the employment equations. In column (1) we show the direct effects of increased foreign (*fc94*) and domestic competition (*dc94*) and the interaction of increased foreign competition with unionization (*fc_un*) on the plant level growth in blue collar workers. Increased foreign competition has a statistical negative effect, while increased domestic competition is negatively but insignificantly correlated with the change in the number of blue collars at plant level. The direct effect of unions (*union*) is negative, which is consistent with the right to manage model. The interaction term is positive suggesting that the negative effect of foreign competition is offset by the effect of trade unions. The interaction term on foreign competition and union power confirms our theoretical finding that the effect of international competition is a function of the level of the union bargaining power in the sector. We showed that the higher the domestic union bargaining power, the more likely the positive effect of foreign competition on employment.

In column (2) we include other control variables such as indicators of the degree of competition firms face in their product market. Specifically, *tough1* and *tough2* refer to the price responsiveness of firms. In the questionnaire the following question was asked: *What is your expectation of the price movement if some other firms enter ? (plummet ?, go down strongly ?, go down ?, not change ?, go up ?)*

In constructing the dummy *tough1* we considered all firms that responded, price would *plummet* or *go down strongly* while *tough 2* represents those firms that face weaker competition with a value of 1 whenever firms reported price would *go down*.

¹⁶ The change from 1994-95 is the benchmark.

Table 5: Employment Equation: the change in the number of blue collar workers at plant level.

	(1)	(2)	(3)	(4)
<i>fc94</i>	-0.053* (-2.045)	-0.067* (-2.20)	-0.066* (-2.405)	0.030 (0.386)
<i>dc94</i>	-0.014 (-1.039)	-0.019 (-1.368)	-0.02 (-1.255)	-0.017 (0.616)
<i>Union</i>	-0.073* (-2.791)	-0.086* (-3.19)	-0.096* (-3.344)	0.0367 (0.511)
<i>fc_un</i>	0.052** (1.66)	0.066* (2.028)	0.068* (1.961)	-0.0483 (-0.563)
<i>tough1</i>		-0.008 (-0.419)		
<i>tough2</i>		0.006 (0.426)		
<i>Comp</i>		0.0218 (1.358)		
<i>yd96</i>	0.0102 (0.629)	0.008 (0.487)	0.009 (0.487)	0.013 (0.405)
<i>yd97</i>	-0.003 (-0.216)	-0.002 (-0.180)	0.001 (0.103)	-0.0144 (-0.455)
<i>Constant</i>	0.08* (3.20)	0.078* (2.815)	0.096* (3.408)	0.004 (0.074)

Note: t-statistics between brackets, * or ** significance at the 5% and 10% level respectively

fc94: plants which had an increase in international competition over the period '94 -'97

dc94: plants which had an increase in national competition over the period '94 -'97

Union: dummy with value 1 if unions have an impact

fc-un: dummy with value of 1 if plants had an increase in international competition and unions have an impact

tough1: dummy with value 1 if price competition in sector is tough

tough2: dummy with value 1 if price competition in sector is weak

Comp: dummy with value 1 if firm faces many rivals

yd96, yd97: year dummies to control for unobserved aggregate shocks

The variable *comp* was constructed on the basis of the number of competitors a firm is said to be facing in its most important product market; *comp* gets a value of 1 if the firm is facing many competitors (suggests tough competition) while a value of 0 otherwise. These variables control for the degree of competition in the product market. The results suggest that the change in the number of blue collar workers at plant level does not differ much with the degree of competition in the product market¹⁷. Indeed our theoretical results indicated that variables such as the inter-firm mobility of labour, the wage level abroad and unionization matter more in explaining the direction of domestic employment change.

¹⁷ We also checked the theoretical results for Stackelberg competition with the incumbent being the leader but the results go in the same direction as under Cournot which suggest the degree of competition in the product market is not the most important determinant (Stackelberg leads to lower prices than Cournot).

As a proxy for the degree of inter-firm mobility measured by parameter α in the theory we use an index of intra-industry job mobility (IIJ) as in Konings (1995). Specifically, this index is defined as

$$IIJ_t = 1 - \frac{\sum_j |(POS - NEG)_{jt}|}{\Sigma GROSS_{jt}}$$

POS_{jt} is the *job creation rate* or the sum of all job gains in expanding firms in sector j at time t divided by the employment of the sector. NEG_{jt} is the *job destruction rate* or the sum of all job losses at time t expressed as a positive number divided by employment in the sector j . $GROSS_{jt}$ is the sum of job creation and destruction ($POS + NEG$) or the *job reallocation rate* which is an indicator of the turbulence in a sector j . If this index equals 1 than all job reallocation occurs entirely within one sector between different firms, when the index is equal to 0 than all job reallocation occurs across sectors.

We computed IIJ at the level of one digit sectors using all firms that reported positive employment and were required to submit company accounts with the Central Bank of Belgium for the year 1994. The mean value of the IIJ index for our sample is 0.6. The results of a split regression for values of the IIJ index above 0.6 (inter-firm mobility is high) and below 0.6 (inter-firm mobility is low) are shown in table 5 in columns (3) and (4).

For a high degree of inter-firm mobility ($IIJ > 0.6$ column (3)), the effect of domestic competition on blue collar employment change is more negative and has a higher t-value than when inter-firm mobility is low ($IIJ < 0.6$ column (4)). This is in line with the theoretical result that the higher α , the more likely that an increase in domestic competition has a negative effect on domestic jobs. In table 6 we turn to the results of the wage equation.

Table 6: Wage Equations: the wage growth of blue collars at plant level

	(1)	(2)	(3)	(4)
<i>fc94</i>	-0.014* (-1.845)	-0.0175* (-2.131)	-0.018** (-1.638)	-0.001 (-0.352)
<i>dc94</i>	0.0116** (1.547)	0.0133** (1.445)	0.018** (1.590)	0.002 (0.763)
<i>Union</i>	0.008 (1.041)	0.006 (0.762)	0.013 (1.202)	-0.003 (-0.490)
<i>tough1</i>		0.002 (0.220)		
<i>tough2</i>		0.009 (1.159)		
<i>Comp</i>		0.007 (0.894)		
<i>yd96</i>	0.002 (0.259)	0.002 (0.289)	0.002 (0.175)	0.002 (0.684)
<i>yd97</i>	0.014** 1.75	0.015** (1.756)	0.016 (1.305)	0.010* (2.597)
<i>constant</i>	0.014 (1.305)	0.008 (0.649)	0.010 (0.70)	0.018* (2.189)

Note: t-statistics between brackets, * or ** significance at the 5% and 10% level respectively.

Columns 1 and 2 show that an increase in foreign competition has a robust negative effect on blue collar wage growth while an increase in domestic competition has a positive effect on wages but only at the 90% confidence interval. Both findings are in line with the theory.

The extent to which unions matter represented by the *union* dummy is not significant. But the degree of inter-firm mobility seems to matter. Column (3) and (4) give the results of a split regression for industries with a value of IJJ above and below 0.6 respectively. When the IJJ is high (IJJ > 0.6 column (3)), suggesting a high degree of inter-sector mobility, the effect of domestic competition on wages is positive and more significant than when IJJ is low (column (4)), as predicted by the theory.

IV. Conclusion

In this paper we have shown that the geographical location of competitors matters in the presence of domestic unions and endogenous wage formation. An additional firm locating in the domestic country is regarded as *national* competition irrespective of the ownership of the firm. Whereas if the competitor locates abroad and provides the relevant product market through exports that is considered to be *international* competition. While both in the case of an increase in national and international competition, the domestic sector faces a reduction in price cost margins, the effects on domestic wages, price and industry employment differs.

In the first part of the paper we construct a simple partial equilibrium and static framework where we vary the degree of price competition in the product market. Although we are fully aware of the numerous limitations inherent to the approach we used, we believe that the point we want to make is a valid one. We show that when institutional settings are country specific, the effects of imports can be very different from those of an increase in competition from domestically based firms.

Under the conditions outlined in this paper we argued that imports results in a reduction of domestic wages irrespective of the wage level of the trade partner abroad. While importing from a low wage country leads to a reduction in the number of domestic jobs, imports from a high wage country can actually lead to job gains compared to autarky. The intuition for the last result is that import competition lowers the domestic price which increases demand. If the import competitor has high costs, a relatively larger market share goes to the domestic firm which can increase employment levels beyond autarky. It was also shown that for a fixed wage level abroad, the strength of the union also determines whether import competition will create or destroy domestic jobs. The higher the bargaining power of the union, the more likely import competition will result in job gains.

An increase in domestic competition, for example through improved market accessibility, can have different effects on the labour market depending on the level at which trade unions operate (firm or sectoral) and the extent to which workers can move between firms in the sector. Sector level negotiations imply that wages are the same as under autarky. Firm level negotiations can lead to lower or higher wages compared to autarky depending on the degree of inter-firm mobility of labour. When labour mobility is very high, wages can be pushed up beyond autarky levels. When this situation prevails in the labour market, national competition can lead to a higher price and a loss of jobs compared to autarky.

In the second part of the paper we used Belgian company data supplemented with data from a postal survey which we carried out in 1997 in 2041 Belgian firms with a response rate of 12%.

The survey data revealed that the majority of the respondents experienced an increase both in domestic and in foreign competition in the period 1994-97.

Several reduced employment and wage equations were tested for the Belgian firms. We restricted the regressions to blue collar workers given that the degree of unionization turned out highest in that group. Foreign competition for Belgian firms was felt most strongly from low wage countries (CEE, Asia), the negative effect of foreign competition in the employment equation and in the wage equation was expected on the basis of the theory.

Union bargaining power turned out to be inversely correlated with the change in blue collar workers' employment which suggests that the 'right to manage model' was the correct one to use in the theoretical model. Hence high bargaining power yields high wages and low employment which explains the negative effect of union bargaining in the employment equation. However an interaction of an increase in foreign competition with union bargaining power had a significantly positive effect on employment which suggests that in the event of strong domestic unions, foreign competition results in job gains which was consistent with the theoretical prediction.

An increase in domestic competition was negative but not significant in the employment equation. After performing split regressions on the basis intra-industry job mobility which we took as a proxy for worker mobility between firms in the sector, we noted that the effect of domestic competition on employment was more negative when inter-firm mobility was high which is what we expected on the basis of the theory.

In the wage equation, an increase in domestic competition had a positive and significant effect on wages. The split regressions showed that this effect was strongest when inter-firm mobility proxied by intra-sector job mobility was highest. Again this is a confirmation of the theoretical prediction of domestic competition on wages.

In the light of the special issue on Trade and Competition in this volume we can say that in contrast to what is often heard, our theoretical and empirical results seem to suggest that trade liberalization and competition policy (which usually deals with issues of market accessibility), should not be regarded as substitutes. The reason is that national competition (responsibility of competition authorities) can have very different effects on sectoral prices, wages and employment than international competition (responsibility of trade authorities). If governments are mainly concerned about consumer welfare and profitability of national firms, the free flow of imports seems the best way to ensure those objectives. The reason is that imports will always lower domestic prices and will reduce wages even more. However, if governments primary objective is to secure high wage and employment levels our analysis suggest they should encourage national entry (for example FDI) by improving market accessibility and by reducing the friction (like hiring and firing costs) in the labour market to smooth the mobility of workers between jobs.

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APPENDIX

The demand in the home market is assumed linear and of the following form.

$$P(Q) = a - bQ \quad (\text{A.1})$$

where Q reflects the monopolist's output. When we move from a domestic monopoly to a Cournot duopoly we use X to refer to the output of the incumbent and Y for the output of the entrant.

The Union utility function is given by:

$$U(W, L) = (W - W_a)^\varepsilon \cdot L \quad (\text{A.2})$$

where W is the domestic wage which will be bargained over, W_a represents the 'fall back income' or what workers get if they are not employed by the firm/sector, L refers to the employment level, set by the firm in a later stage of the game and ε is a parameter of wage preference. In order to simplify the calculations we will set ε equal to 1 where the union gives equal weight to wages and jobs. An alternative interpretation of $\varepsilon = 1$ is that the union is risk-neutral and maximizes the total wage bill.

The fall back income of workers (W_a) is a function of:

$$W_a = \alpha \cdot \bar{W} + (1 - \alpha) \cdot B \quad \text{with } \alpha \in [0, 1] \quad (\text{A.3})$$

where α is a measure for the mobility of labour between firms in a sector (exogenous to the model), \bar{W} is the wage paid by other firms in the sector and B is non-labour income which is set equal to zero¹⁸. Another way of interpreting α is the amount of friction in the labour market. A value of $\alpha = 1$ means the domestic labour market is frictionless and there is perfect mobility of labour between firms. While for $\alpha = 0$, labour market rigidities are so high that despite the presence of other firms in the market, labour is immobile between firms

In the first stage of the model, wage negotiations take place along a non-cooperative Nash bargaining process:

¹⁸ This specification is based on Layard, Nickell and Jackman (1991) but with a somewhat simpler interpretation. Their specification of the fall back income is $W_a = (1-u) \cdot \bar{W} + u \cdot B$ where u is the unemployment rate. Although we do not explicitly take unemployment on board in our analysis it can be shown that the direction of the results is the same under both interpretations: national competition, in contrast to international competition, increases the probability of finding a job and raises the fall back income.

$$\Omega = (U(w) - U^\circ)^\beta \cdot (\pi(w) - \pi^\circ)^{1-\beta} \quad (\text{A.4})$$

The Nash product (Ω) consists of the utility of the union $U(w, L)$ above the threat point U° times the profit of the domestic firm $\pi(w, L)$ above the threat point π° . These threat points are the payoffs when no agreement is reached between union and firm. In case of conflict, no output can be produced which renders firm's profits and union utility equal to zero. Hence the threat points U° and π° are set equal to zero. The parameter β lies between zero and 1 and is an indicator of union power in the bargaining process.

After the wage is determined in the bargaining process, we assume that firms decide on employment levels ('right-to-manage' model) depending on the competition in the product market (monopoly or Cournot duopoly).

We solve the game by backwards induction to obtain a subgame perfect Nash equilibrium in employment and wages. This implies that we first solve the product market competition stage (monopoly, national and international duopoly) to obtain equilibrium quantities, where wages are assumed to be exogenous. We use the reduced profit function to solve the first stage of the game, maximizing the Nash product, which yields us the subgame perfect equilibrium wage and employment.

AUTARKY: initial state of the economy (monopoly in the product market)

Using the production function $Q=L$ whereby Q is the monopoly output, the Union's utility in the domestic country is given by:

$$U(W, L) = (W - W_a) \cdot L = W \cdot \frac{(a - W)}{2b} \quad \text{with} \quad W_a = 0 \quad (\text{A.5})$$

The domestic firm's profits are given by:

$$\pi = \frac{(a - W)^2}{4b} \quad (\text{A.6})$$

The Nash bargaining Product is then given by:

$$\Omega = [U - U^\circ]^\beta \cdot [\pi - \pi^\circ]^{(1-\beta)} = \left[W \cdot \left(\frac{a - W}{2b} \right) \right]^\beta \cdot \left[\frac{(a - W)^2}{4b} \right]^{(1-\beta)} \quad \text{where } U^\circ, \pi^\circ = 0 \quad (\text{A.7})$$

The first order condition of the Nash bargaining product gives the equilibrium wage in the domestic sector under autarky:

$$\frac{\partial \ln \Omega}{\partial W} = 0 \quad \Leftrightarrow \quad W^* = \frac{a \cdot \beta}{2} \quad (\text{A.8})$$

Equilibrium output/employment is then given by:

$$Q^* = L^* = \frac{a \cdot (2 - \beta)}{4b} \quad (\text{A.9})$$

NATIONAL COURNOT COMPETITION

Firm level bargaining

Using the production function $X=L$ and $Y=L$, whereby X and Y represent duopoly output of incumbent and entrant respectively, the domestic union's utility for each of the two identical firms is given by:

$$U_i(W, L) = (W_i - \alpha.W_j) \cdot \frac{(a - 2.W_i + W_j)}{3b} \quad \text{with } i, j = 1, 2 \text{ and } i \neq j \quad (\text{A.10})$$

Domestic profits for each of the two national firms are:

$$\pi_i = \frac{(a - 2.W_i + W_j)^2}{9b} \quad \text{with } i, j = 1, 2 \text{ and } i \neq j \quad (\text{A.11})$$

The first order condition of the Nash bargaining product results in a reaction curve for each of the two national firms where wage at the firm level is a function of the wage in the other firm:

$$\frac{\partial \ln \Omega}{\partial W} = 0 \Leftrightarrow W_i = \frac{a \cdot \beta + W_j (4\alpha + \beta - 2\beta\alpha)}{4} \quad \text{with } i, j = 1, 2 \text{ and } i \neq j \quad (\text{A.12})$$

Solving these two equations simultaneously gives the equilibrium wages for both firms which are equal to:

$$W_1^* = W_2^* = \frac{4a \cdot (1 + \alpha)\beta + a \cdot (1 - 2\alpha)\beta^2}{16 \cdot (1 - \alpha^2) + 8 \cdot (2\alpha^2 - \alpha) \cdot \beta + (4\alpha - 4\alpha^2 - 1) \cdot \beta^2} \quad (\text{A.13})$$

For particular values of the parameter α which measures the 'probability of finding another job' in the sector we get:

$$\text{for } \alpha=0 \Rightarrow W_1^* = W_2^* = \frac{a \cdot \beta}{4 - \beta} \text{ and } L_1^* = L_2^* = \frac{2a \cdot (2 - \beta)}{3b \cdot (4 - \beta)} \quad (\text{A.14})$$

$$\text{for } \alpha=1/2 \Rightarrow W_1^* = W_2^* = \frac{a\beta}{2} \text{ and } L_1^* = L_2^* = \frac{a \cdot (2 - \beta)}{6b} \quad (\text{A.15})$$

$$\text{for } \alpha=1 \Rightarrow W_1^* = W_2^* = a \text{ and } L_1^* = L_2^* = 0 \quad (\text{A.16})$$

Sector level bargaining

The results for firm level bargaining with $\alpha=1/2$ are also the ones that apply under sector level bargaining.

INTERNATIONAL COURNOT COMPETITION

Domestic Union utility is given by:

$$U_1(W, L) = (W_1 - W_a) \cdot L_1 = W_1 \cdot \frac{(a - 2.W_1 + \overline{W_2})}{3b} \quad (\text{A.17})$$

Domestic firms' profits are:

$$\pi_1 = \frac{(a - 2.W_1 + \overline{W}_2)^2}{9b} \quad (\text{A.18})$$

The equilibrium domestic wage that follows from the f.o.c. of the Nash bargaining product is equal to:

$$\frac{\partial \ln \Omega}{\partial W_1} = 0 \quad \Leftrightarrow \quad W_1 = \frac{\beta(a + \overline{W}_2)}{4} \quad (\text{A.19})$$

This result for the equilibrium domestic output/employment is equal to:

$$X^* = L_1^* = \frac{(a + \overline{W}_2).(2 - \beta)}{6b} \quad (\text{A.20})$$

For particular values of the exogenous wage abroad W_2 we get:

$$\text{For } \overline{W}_2 = 0 \Rightarrow W_1^* = \frac{a\beta}{4} \quad \text{and } X^* = L_1^* = \frac{a.(2 - \beta)}{6b} \quad \text{and } Y^* = L_2^* = \frac{a(4 + \beta)}{12b} \quad (\text{A.21})$$

$$\text{For } \overline{W}_2 = a \Rightarrow W_1^* = \frac{a\beta}{2} \quad \text{and } L_1^* = \frac{a.(2 - \beta)}{4b} \quad \text{and } L_2^* = 0 \quad (\text{A.22})$$

It can be noted that national employment is higher/lower under Cournot (X) than under monopoly (Q) when the foreign exogenous wage \overline{W}_2 is higher/lower than

$$\overline{W}_2 \lesseqgtr \frac{a.(2 - \beta)}{6} \quad \Leftrightarrow \quad X \lesseqgtr Q \quad (\text{A.23})$$

This critical value is determined by the wage level abroad (W_2) and the strength of the domestic union (β).

$$\text{For } \beta=0, \overline{W}_2 \lesseqgtr \frac{a}{3} \quad \Leftrightarrow \quad X \lesseqgtr Q \quad (\text{A.24})$$

$$\text{For } \beta=1, \overline{W}_2 \lesseqgtr \frac{a}{6} \quad \Leftrightarrow \quad X \lesseqgtr Q \quad (\text{A.25})$$

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