

Intra-Industry Trade, Multinational Firms, and the Effect of One-Sided Wage Rigidity

Sebastian Braun*

Humboldt University of Berlin

February 28, 2007

PRELIMINARY
COMMENTS WELCOME

Abstract. The paper studies the effects of a one-sided minimum wage in a two-country model of intra-industry trade, in which multinational firms arise endogenously. With positive levels of intra-industry trade the adverse employment effects of an asymmetric minimum wage are significantly larger than in a non-trading economy. Multinational firms potentially mitigate the effect somewhat. Even though factor prices are not equalised across countries, a (binding) wage floor in one country will prop up wages in the other. The flexible wage country is insulated from shocks caused by factor accumulation in the rigid wage country, while an increase in the labour supply of the latter economy may have profound impacts on labour market outcomes in both countries.

JEL Classification: F12, F16, F23

Keywords: Intra-Industry Trade, Wage Rigidity, Multinational Firms, Unemployment

*The author is grateful to Michael C. Burda for fruitful discussions. This research was supported by the Deutsche Forschungsgemeinschaft through the SFB 649 'Economic Risk' and by the German Federal Ministry of Education and Research (project 01AK702A). All remaining errors are mine. *Address:* Humboldt University of Berlin, School of Business and Economics, Spandauer Straße 1, D-10178 Berlin, Germany. *Email:* sbraun@wiwi.hu-berlin.de.

1 Introduction

The closer economic integration of the world economy is viewed by fear and scepticism by many. In particular, the effects for employment and wages of workers in developed countries are controversially discussed in the public debate on the consequences of globalisation. International competitive pressures and footloose multinational enterprises (MNEs) are feared widely to bring down wages and endanger jobs in the western world.¹ In this context, national regulations that add to the rigidity of the labour market have come under growing pressures. Increasing the flexibility of the labour markets has been one of the major goals of recent reforms in OECD countries. The political debates surrounding these reforms often discuss the necessity of a flexible labour market for adopting successfully to the challenges of globalisation. For instance, the Kok report (2004), designed to monitor the achievements towards the Lisbon goals of the European Union, identifies increased global competition as a major challenge for European labour markets and calls for finding a new balance between flexibility and security.

Despite of the great public interest in the issue, academics have typically analysed the effects of labour market regulations in closed economy settings abstracting from international linkages. On the other hand, trade economists almost always rely on models with fully flexible labour markets and ignore possible effects of trade on employment.² Surprisingly little is known of the effect of national labour market regulation in a globalised world economy.

A notable exception is the important work of Davis (1998) who considers trade between a flexible-wage country ('America') and a rigid-wage country ('Europe') in a Heckscher-Ohlin model. The global equilibrium is characterised by Factor-Price-Equalisation (FPE) across countries. The minimum wage in Europe pins down wages in both countries. European workers have to absorb the full unemployment level of the integrated economy. Hence, a move from autarky to free trade will prop up American wages and will sharply increase European unemployment. Davis (1998) also shows that the fixed minimum wage in Europe will shield American wages against shocks originating from factor accumulation in Europe while the reverse is not true. In a recent paper,

¹Scheve and Slaughter (2001) provides a comprehensive summary of the perceptions of American workers about Globalisation.

²See Davidson and Matusz (2004) for a discussion of the likely reasons for the focus on full-employment models.

Kreickemeier and Nelson (2006) consider somewhat less stark institutional assumptions. They postulate the existence of fair wage constraints in both economies where asymmetries arise due to different attitudes towards wage inequality. The paper develops an integrated equilibrium concept for this type of model and shows that while the central message of Davis' persists some results depend on the specific model framework.

These existing papers make use of the Heckscher-Ohlin model with perfectly competitive product markets and, hence, focus on interindustry trade. However, trade flows between developed countries are largely characterised by simultaneous exports and imports of similar products. This is generally attributed to the existence of scale economies. A second distinctive feature of the modern world economy is the widespread importance of Foreign Direct Investment (FDI). Over the last two decades or so FDI has risen sharply, both in absolute terms but also relative to the levels of GDP and trade.³ In this context, concerns have been raised that multinational activity could have detrimental effects on the regulatory capacities of countries competing for FDI. Importantly, modelling (horizontal) multinational enterprises (MNEs) requires positive trade costs which cause the Factor-Price Equalisation theorem invoked by Davis (1998) to break down.

Against this background, the present paper adds to the scarce existing literature by studying labour market outcomes in a model of intra-industry trade between a rigid-wage country ('Home') and a flexible-wage country ('Foreign'), in which multinational enterprises arise endogenously. Downward rigidity is simply modelled as a lower bound on wages and might reflect various institutions such as explicit minimum wages, unemployment benefits, unions etc. Trade costs are non-negligible and the model therefore concentrates on the empirically important case where factor prices do not equalise across trading partners.⁴ The basic framework is adopted from Markusen and Venables (1998) who study the model under perfectly competitive factor

³For an overview of stylised facts on FDI see, for instance, chapter 1 of Navaretti and Venables (2004).

⁴Oslington (2002) analyses asymmetric wage rigidity in a Heckscher-Ohlin model in which Europe is specialised in the skill-intensive industry. FPE then also breaks down and Europe is left with a lower skill premium than America. The paper shows that some of Davis' results will not longer hold in that case but confirms the overarching message that factor markets can not be considered in isolation when goods markets are global. In contrast to the present paper, Oslington (2002) considers inter-industry trade and abstract from MNEs. Moreover, in a model of two developed countries (Europe and America) non-negligible trade frictions may arguably be a more important reason for factor prices not to be equalised than dissimilar endowments.

markets. Firms can either enter as national enterprises establishing a factory in one country and possibly exporting to the other. Alternatively, multinational enterprises will set up a headquarter in one country but maintain production facilities in both. Hence, the focus lies on horizontal direct investment which represents the bulk of FDI and should be of particular importance in the analysis of relatively similar developed countries.

The effects of divergent national labour market institutions in the globalised economy are contrasted with those derived in a closed economy setting and/or without allowing for the presence of multinational firms. For doing so, three different versions of the models are simulated. First, exports and multinationals are suppressed reducing the model essentially to a closed economy setting.⁵ Second, firms are allowed to exports but multinational firms are still suppressed. As noted by Markusen and Venables (1998), the model then essentially reduces to a two-factor version of Brander and Krugman (1983) and Venables (1985). Third, both exporting firms and multinational firms are allowed to arise endogenously.

The results suggest that the effect of a one-sided minimum wage on unemployment in the imposing country is much larger with positive levels of intra-industry trade than in a closed economy. The main reason for this finding is that in the presence of exporters a growing fraction of domestic consumption will be produced abroad. Interestingly, multinational firms generally dampen this effect. They are less affected by the one-sided minimum wage than domestic national firms as parts of their fixed costs are incurred in terms of foreign labour. This allows them to operate for a wider range of minimum wages than national domestic firms. Domestic labour benefits as consumption is met with local production.

Even though factor prices are not equalised across countries, Foreign sees its wage rate rising in the open economy setting with the introduction of a minimum wage in Home. Owing to a sort of home market effect, foreign wages can actually rise above the minimum wage rate even though countries are otherwise identical. The exact magnitude of these effects depends crucially on the level of trading barriers and the rate of the minimum wage. In particular, one-sided labour market rigidities are likely to have more severe effects when trading barriers are low and,

⁵Strictly speaking, this is only true for the imperfectly competitive sector. The freely traded numeraire good of the model is freely tradeable and remains so in the closed economy setting.

hence, foreign competition is fierce.

The paper also illustrates that Foreign is indeed insulated from any shocks caused by factor accumulation in Home. On contrary, factor accumulation in Foreign has marked impacts on both countries with the exact direction depending on the level of minimum wages and the types of firms active in the corresponding equilibrium.

While national labour market institutions are typically examined in closed economy models, the present analysis therefore suggests that their effects do strongly depend on global goods market linkages. Divergent institutional features markedly influence each other in a globalised world economy even if factor markets are fully national.

The remainder of the paper is structured as follows. Section 2 presents the basic model framework. Partial equilibrium results are derived in section 3, while section 4 presents the numerical simulation of the general equilibrium. In the following section, the effects of the level of trading costs on the key results are considered. Section 6 analyses the impact of local factor accumulation on labour market outcomes in the two countries. Finally, section 7 concludes.

2 Basic Model

The model⁶ has two countries, Home (h) and Foreign (f), producing two homogeneous goods, X and Y . Two factors of production exist, labour (L) and resources (R). While resources are specific to the Y sector, labour is mobile between sectors but immobile across countries.

In the following, countries will be denoted by subscripts (i, j). Good Y is freely traded and chosen as the numeraire of the model; consequently its price is normalised to one. Y is sold in a perfectly competitive market and its production function is assumed to be Cobb-Douglas

$$Y_i = L_{iy}^\alpha R_i^{1-\alpha} \text{ with } 0 \leq \alpha \leq 1 \text{ and } i = h, f. \quad (1)$$

⁶As noted earlier, the model framework draws heavily on Markusen and Venables (1998). The only difference is the introduction of a minimum wage in country h .

where R_i is the resource endowment of country i . Provided that prices are fully flexible, the wage rate w_i and the rental rate on R , r_i , are given by their marginal values in production

$$w_i = \alpha \left(\frac{L_{iy}}{R_i} \right)^{\alpha-1}, \quad (2)$$

$$r_i = (1 - \alpha) \left(\frac{L_{iy}}{R_i} \right)^{\alpha}. \quad (3)$$

However, while foreign wages are assumed to be fully flexible, they are subjected to a binding minimum wage in Home

$$w_H = \bar{w}. \quad (4)$$

Note that this also implies that the labour demand of the Y sector in Home is fixed by equation (2) and the parameters R_h and w_h .

The X good is sold in an imperfectly competitive market. There are four different potential entrants in the market. National firms produce in one country only and potentially export to the other. They are denoted with the superscript n . Horizontal multinationals, marked with the superscript m , have their headquarters in either of the two countries but maintain production facilities in both countries. Fixed costs consists of factor prices for G units of labour for the headquarter and F units of labour for a factory. It is further assumed that producing a unit of X requires c units of labour. Note that production technologies are identical in the two countries. An exporting firm will additionally have to hire t units of labour in order to ship a unit of output across the border.

Let X_{ii}^k denote the amount of output that a type $k = n, m$ firm based in i supplies to country j . Since national enterprises undertake all their production in their base country, the demand of one national firm headquartered in i for countries i labour is

$$cX_{ii}^n + (c + t)X_{ij}^n + G + F \text{ with } i \neq j. \quad (5)$$

On contrary, a national firm based in j will not demand any labour in i . A multinational based in i will use labour for maintaining the headquarter and a factory in i . Additionally, it requires

labour for producing output for the i market while supply to the j market is met by local production. Hence, labour demand of one multinational based in i for labour of country i can be written as

$$cX_{ii}^m + G + F. \quad (6)$$

Finally, a multinational enterprise based in j requires labour from country i to support the local factory as well as to produce for the local market. Demand for country i labour is then

$$cX_{ji}^m + G. \quad (7)$$

Let n_i and m_i denote the number of active national firms and multinationals, respectively, with a headquarter in country i . The sum of labour demands from the different types of firms plus the unemployed units of labour, U_i , have to equal the factor endowment. Hence, the labour market clearing condition can be written as

$$L_i = U_i + L_{iy} + n_i(cX_{ii} + (c + t)X_{ij}^n + G + F) + m_i(cX_{ii}^m + G + F) + m_j(cX_{ji}^m + G), \quad (8)$$

where $U_f = 0$ due to the assumption of fully flexible wages in foreign.

Since profits are driven to zero in the (long-run) equilibrium, national income M_i will solely consist of factor rewards

$$M_i = w_i L_i + r_i R_i, \quad (9)$$

which accrue to a representative consumer in each country. The agent faces a Cobb-Douglas utility function in the two goods

$$U_i = X_{ic}^\beta Y_{ic}^{1-\beta} \quad (10)$$

with X_{ic} and Y_{ic} are the respective consumption levels and the former is given by

$$X_{ic} = n_i X_{ii}^n + n_j X_{ji}^n + m_i X_{ii}^m + m_j X_{ji}^m. \quad (11)$$

Utility maximisation gives rise to the following demand functions

$$X_{iC} = \frac{\beta M_i}{p_i}, \quad (12)$$

$$Y_{iC} = (1 - \beta)M_i, \quad (13)$$

where p_i denotes the price of good X in country i .

The firms compete in Cournot fashion. Marginal revenue of a type k firm based in i serving the market of country j is given by $p_j \left(1 + \frac{X_{ij}^k}{X_{jC}} \frac{1}{\eta_j}\right) = p_j(1 - e_{ij}^k)$. Here, $\eta_j = -\frac{p_j}{X_{jC}} \frac{\partial X_{jC}}{\partial p_j}$ is the price elasticity of demand while e_{ij}^k denote the respective proportional markup of prices over marginal costs. With Cobb-Douglas preferences the price elasticity of demand is one and markups therefore equal the market share of the respective firm.

$$e_{ij}^k = \frac{X_{ij}^k}{X_{jC}} = \frac{p_j X_{ij}^k}{\beta M_j}. \quad (14)$$

Profit maximisation implies that marginal revenue equals marginal cost. Written in complementary slackness form, the pricing equations are given as follows

$$p_i(1 - e_{ii}^n) \leq w_i c \quad (X_{ii}^n \geq 0), \quad (15)$$

$$p_j(1 - e_{ij}^n) \leq w_i(c + t) \quad (X_{ij}^n \geq 0), \quad (16)$$

$$p_i(1 - e_{ii}^m) \leq w_i c \quad (X_{ii}^m \geq 0), \quad (17)$$

$$p_j(1 - e_{ij}^m) \leq w_j c \quad (X_{ij}^m \geq 0). \quad (18)$$

Free entry of all possible firm types will drive profits to zero in the long-run equilibrium. The combination of firm types active is therefore determined by four zero-profit condition. They simply state for each firm type that markup revenues have to be equal or less than fixed costs.

Complementary variables are the respective number of firms active in equilibrium.

$$p_h e_{hh}^n X_{hh}^n + p_f e_{hf}^n X_{hf}^n \leq w_h(G + F) \quad (n_h \geq 0), \quad (19)$$

$$p_f e_{ff}^n X_{ff}^n + p_h e_{fh}^n X_{fh}^n \leq w_f(G + F) \quad (n_f \geq 0), \quad (20)$$

$$p_h e_{hh}^m X_{hh}^m + p_f e_{hf}^m X_{hf}^m \leq w_h(G + F) + w_f G \quad (m_h \geq 0), \quad (21)$$

$$p_f e_{ff}^m X_{ff}^m + p_h e_{fh}^m X_{fh}^m \leq w_f(G + F) + w_h G \quad (m_f \geq 0). \quad (22)$$

The general equilibrium of the model is then determined through a system of equalities and inequalities that solve simultaneously for the endogenous variables of the model. Output levels in X sector are associated with pricing inequalities (15) - (18) together with the markup formula in (14). The zero profit conditions (19)-(22) determine the number of each firm type active in equilibrium. Income levels are given by (9) while the price of good X is established through equation (12) in combination with (11). Finally, the wage rate in foreign and the unemployment rate in Home are determined by the labour market clearing condition in (8) together with labour demand from the Y sector, equation (2), while the rental rate of R is associated with equation (3).

3 Intuition from Partial Equilibrium Analysis

Before calculating the general equilibrium of the model numerically, I start with deriving results in a partial equilibrium setting. This is meant to give further insights into the short-run reaction of the economy and helps to provide intuition for the general equilibrium results reported in the following sections.

Equations (2) and (8) show that the wage rate in Foreign and the unemployment rate in Home depend crucially on labour demand originating in the X sector. The latter, in turn, will depend on the type (and number) of firms active in equilibrium as well as the output level of an individual firm. In the flexible wage setting, expanding X production draws labour from the Y sector thereby raising the R/L ratio in the competitive sector. Wages will increase as a result. With wages fixed at a (binding) minimum wage, labour demand of Y is fixed by equation (2).

The units of unemployed labour in Home are given by total endowment minus labour demands from the Y and X sector.

In the following, the effects of the introduction of a binding minimum wage in Home, i.e. an increase in w_h , is separately analysed for the two crucial determinants of labour demand in the X sector. First, the number of active firms is kept exogenous and the effect of a one-sided wage increase on output levels is studied. I abstract from any general equilibrium effects on income and do not consider feedback effects from the labour market. The influence in a closed economy setting is compared to the effect in an open economy setting with and without multinational enterprises. Second, the effects of a one-sided wage increase on (potential) profits of the four types of firms are considered. This will help to understand what kind of firms are likely to arise in equilibrium and how the location decisions of firms are influenced by the introduction of a minimum wage in Home.

3.1 Short Run: Fixed Number of Firms

Suppose first that the types (and number) of firms active in equilibrium are fixed. For concreteness I will assume that the two countries are identical with respect to the number of active firms.⁸ Since demand functions derived from a Cobb-Douglas utility function are not suitable to study monopoly I further assume that $n_i = n_j = n \geq 2$ (and $m_i = m_j = n \geq 2$ if multinationals are present). Now plug equation (14) into (15)-(18) and rearrange to get inequalities for the

⁸The assumption does not affect the general results of this section but helps to clean up the somewhat messy expressions.

output level

$$X_{ii}^n \geq \beta M_i \left(\frac{p_i - w_i c}{p_i^2} \right), \quad (23)$$

$$X_{ij}^n \geq \beta M_j \left(\frac{p_j - w_i(c+t)}{p_j^2} \right), \quad (24)$$

$$X_{ii}^m \geq \beta M_i \left(\frac{p_i - w_i c}{p_i^2} \right), \quad (25)$$

$$X_{ij}^m \geq \beta M_j \left(\frac{p_j - w_j c}{p_j^2} \right). \quad (26)$$

If the right-hand side is positive, the equations hold with equality, otherwise output is zero. Consider first an equilibrium in which only non-exporting national firms are active. I will refer to this scenario as the closed economy setting. Abstracting from general equilibrium effects, equations (12) and (23) allow to solve for production in terms of the exogenous parameters

$$X_{ii}^n = \frac{\beta M_i (n-1)}{cn^2 w_i}. \quad (27)$$

Since just national firms producing for the domestic market are active, only the production level X_{ii}^n is of interest to country i 's labour demand. Now consider the effect of an increase in w_h on domestic production X_{hh}^n . The elasticity of output with respect to wages, denoted ϵ^c , in a closed economy can easily be calculated to equal -1

$$\epsilon^c \equiv \frac{\partial X_{hh}}{\partial w_h} \frac{w_h}{X_{hh}} = -\frac{\beta M (n-1)}{cn^2 w_h^2} \frac{w_h cn^2 w_h}{\beta M_h (n-1)} = -1. \quad (28)$$

Next, consider an open economy, in which intra-industry trade takes place. National firms do export but multinational firms are not present. A national firm based in country i produces for both markets and labour demand depends on X_{ii}^n and X_{ij}^n . Equations (12), (23) and (24) can be solved simultaneously to find

$$X_{ii}^n = \frac{\beta M_i (2n-1) (nw_j (c+t) - c(n-1)w_i)}{(nw_j (c+t) + cnw_i)^2}, \quad (29)$$

$$X_{ji}^n = \frac{\beta M_i (2n-1) (cnw_i - (n-1)w_j (c+t))}{(nw_j (c+t) + cnw_i)^2}. \quad (30)$$

Now consider the wage elasticity of output of a national firm based in h with respect to domestic wages w_h . First, note that the elasticity can be decomposed as follows

$$\begin{aligned} \frac{\partial(X_{hh}^n + X_{hf}^n)}{\partial w_h} \frac{w_h}{X_{hh}^n + X_{hf}^n} &= \frac{\partial X_{hh}^n}{\partial w_h} \frac{w_h}{X_{hh}^n} \frac{X_{hh}^n}{X_{hh}^n + X_{hf}^n} + \frac{\partial X_{hf}^n}{\partial w_h} \frac{w_h}{X_{hf}^n} \frac{X_{hf}^n}{X_{hh}^n + X_{hf}^n} \\ &= \varepsilon^{oh} s_h + \varepsilon^{of} s_f, \end{aligned} \quad (31)$$

where ε^{oi} is the wage elasticity of output produced for market i and s_i denotes the share of production for market i in total production. Calculating the two elasticities explicitly yields the following two expressions

$$\varepsilon^{oi} \equiv \frac{\partial X_{hh}^n}{\partial w_h} \frac{w_h}{X_{hh}^n} = \frac{c w_h ((n-1) c w_h - (3n-1) w_f (c+t))}{(n w_f (c+t) - c(n-1) w_h) (w_f (c+t) + c w_h)}, \quad (32)$$

$$\varepsilon^{of} \equiv \frac{\partial X_{hf}^n}{\partial w_h} \frac{w_h}{X_{hf}^n} = \frac{(c+t) w_h ((n-1) t w_h + c(r-3nr + (n-1)w))}{(w_h (c+t) + c w_f) (c(n w_f - w_h (n-1)) - t w (n-1))}. \quad (33)$$

While the expression look quite messy the following result can be established

Proposition 1. *In an open economy setting with nonnegative intra-industry trade the wage elasticities of production for both markets of a national firm based in h , ε^{oh} and ε^{of} , are smaller than or equal to -1. Hence, the elasticities are smaller than in the closed economy setting. The elasticities are furthermore decreasing in w_h .*

Proof. See Appendix A.1. □

The proposition shows that in an open economy one-sided changes in the wage rate will have more severe effects on production (and, hence, labour demand) than in a closed economy. The wage elasticities are generally smaller the larger the wage level already is. Intuitively, an increase in the wage in h only affects firms based in Home. Therefore, firms will have to reduce output not only because of the increase in marginal costs but also due to the deterioration of their competitiveness relative to their foreign counterparts. The latter effect is clearly absent in a closed economy setting.

Now consider a market in which multinational firms are active. Pricing equations for multina-

tional firms and national firms serving their local markets are exactly identical because both firms have a factory in the country and, hence, face identical marginal costs. Multinational production relevant for the labour market in h is given by X_{hh}^m and X_{fh}^m . The wage elasticity of multinational production will be the same as the wage elasticity of production for the market in Home of a national firm based in country h . If a multinational competes only with other multinationals or with national firms based in h , the output elasticity will therefore equal -1 , i.e. it will be identical to the case of a closed economy. When competing with exporting firms the elasticity will equal to ϵ^{oh} .

However, one crucial difference exist when comparing MNEs to national firms. The multinational has an outside option to produce the output in its oversea facility and then reimport it. It will do so whenever marginal production costs in h will exceed those in f , i.e. whenever $w_h c > w_f(c + t)$ or $w_h > w_f + \frac{t}{c}$. Therefore, production in i plummets out of a sudden to zero when the wages in h are set too high. In terms of production, the multinational firm then resembles an exporting firm based in Foreign. Without trading barriers any small positive deviation of w_h from w_f will result in zero production of multinational firms in Home. Note that in the long-run equilibrium the case of a multinational with just one factory producing positive output levels will never occur. In fact, the multinational would choose to become a national firm based in the country with lower factor prices.

Increasing the minimum wage in h may also affect the level of production and thus labour demand in f . Foreign production will obviously be not affected if the two countries are closed economies without any trade taking place. Increases in the minimum wage in h only influences marginal costs of producer in h and since these firms do not compete with firms based in f the latter are not affected. On contrary, for the open economy case the following result can be established

Proposition 2. *In an open economy setting with nonnegative intra-industry trade the output of firms based in f , X_{fh}^n and X_{ff}^n , will be positively affected by increases in w_h .*

Proof. See Appendix A.2. □

Increases in w_h affect marginal costs of firms based in h but not those of firms based in f .

Consequently the latter types of firms improve their relative competitiveness and gain ground on expense of the former. In an open economy setting, in which national firms based in both countries compete with each other, increases in the wage rate in Home will therefore cause firms based in Foreign to expand their production.

Finally, I am interested in the effect of increases in w_h on the production of multinational enterprises for the market in f . As long as the increase in w_h does not exceed a certain threshold, multinationals are again equivalent to national firms based in f that produce for the domestic markets only. The production will not be affected if multinational enterprises only compete with other multinational enterprises or national firms based in f . When competing with exporters based in h their output levels X_{hf}^m and X_{ff}^m will be positively affected as described in proposition 2. Whenever wages in h are such that $w_h c > w_f(c + t)$ the multinational will shift all its production to the factory in f and effectively becomes a national firm based in country f .

3.2 Long Run: Endogenous Firm Types

Up to this point, we have taken the number of firms in the market as given. In the long-run, however, changes in the minimum wage will not only alter the behaviour of existing firms but also determines which type of firms enter the market. The decision is governed by free entry conditions. In this section, I will briefly look at the effects of an increase in the wage rate of home on potential profits of the four types of firms keeping all other endogenous variables constant. Using equations (15) - (18) in (19) - (22) free entry conditions can be written as

$$\beta \left[M_h \left(\frac{p_h - w_h c}{p_h} \right)^2 + M_f \left(\frac{p_f - w_h(c+t)}{p_f} \right)^2 \right] \leq w_h(G + F) \quad (n_h \geq 0), \quad (34)$$

$$\beta \left[M_h \left(\frac{p_h - w_f(c+t)}{p_h} \right)^2 + M_f \left(\frac{p_f - w_f c}{p_f} \right)^2 \right] \leq w_f(G + F) \quad (n_f \geq 0), \quad (35)$$

$$\beta \left[M_h \left(\frac{p_h - w_h c}{p_h} \right)^2 + M_f \left(\frac{p_f - w_f c}{p_f} \right)^2 \right] \leq w_h(G + F) + w_f G \quad (m_h \geq 0), \quad (36)$$

$$\beta \left[M_h \left(\frac{p_h - w_h c}{p_h} \right)^2 + M_f \left(\frac{p_f - w_f c}{p_f} \right)^2 \right] \leq w_f(G + F) + w_h G \quad (m_f \geq 0), \quad (37)$$

which are rearranged to obtain

$$\Pi_h^n = \beta \left[M_h \left(\frac{p_h - w_h c}{p_h} \right)^2 + M_f \left(\frac{p_f - w_h(c+t)}{p_f} \right)^2 \right] - w_h(G+F) \leq 0 \quad (n_h \geq 0), \quad (38)$$

$$\Pi_f^n = \beta \left[M_h \left(\frac{p_h - w_f(c+t)}{p_h} \right)^2 + M_f \left(\frac{p_f - w_f c}{p_f} \right)^2 \right] - w_f(G+F) \leq 0 \quad (n_f \geq 0), \quad (39)$$

$$\Pi_h^m = \beta \left[M_h \left(\frac{p_h - w_h c}{p_h} \right)^2 + M_f \left(\frac{p_f - w_f c}{p_f} \right)^2 \right] - w_h(G+F) - w_f G \leq 0 \quad (m_h \geq 0), \quad (40)$$

$$\Pi_f^m = \beta \left[M_h \left(\frac{p_h - w_h c}{p_h} \right)^2 + M_f \left(\frac{p_f - w_f c}{p_f} \right)^2 \right] - w_f(G+F) - w_h G \leq 0 \quad (m_f \geq 0). \quad (41)$$

Now consider an increase in minimum wage of country h holding all other endogenous variables fixed. It is easy to see that we have the following result

$$d\Pi_h^n < d\Pi_h^m < d\Pi_f^m < d\Pi_f^n = 0. \quad (42)$$

This finding suggests that national firms based in Home will suffer most from an increase in the minimum wage. Not only their marginal production costs but also their fixed costs for the headquarter and the factory increase. Multinational firms headquartered in Home are less affected as they produce their output for the foreign market in Foreign. Multinationals based in Foreign have the additional advantage that fixed costs for their headquarter do not depend on w_h . Finally, exporters based in Foreign are not at all affected by the change. Hence, altering the minimum wage in Home will harm firms based in Home most and is likely to give rise to a long-run equilibrium with heavy weight placed on firms based in Foreign.

Importantly, those firms most beneficial for Home in terms of labour demand are affected most severely. Given production levels, a national firm based in country h will generate more labour demand than a multinational based in Home, with the latter demands more labour than a multinational based in Foreign. Finally, national firms based in Foreign, which are not affected by the increase in w_h , do not demand any labour in country h .

4 Numerical Simulation of the General Equilibrium

Now I compute the general equilibrium of the model described in section 2.⁹ The benchmark simulation sets trading cost t at 0.2. As in Markusen and Venables (1998) the fixed costs of multinational enterprises are 1.45 times the fixed costs of national firms when factor prices are equalised. Endowment of labour and resources are $L_h = L_f = 150$ and $R_h = R_f = 50$, respectively. The wage rate in Home is set initially so that it equals the free market equilibrium ($w_h = 0.5$). In order to study the effect of a one-sided minimum wage in Home the level of w_h is then successively increased. The effects of the full-fledged model are contrasted with those derived from a model without multinational firms and those of closed-economy setting. For doing so I calculate three different versions of the model which impose the following restrictions on firm types active in equilibrium

- only non-exporting national firms allowed (closed economy setting);
- exporting national firms but no multinational enterprises allowed (open economy without multinational activity);
- no restrictions on the type of firms active in equilibrium (full-fledged model).

Note that the different versions of the model do not specify which type of firm will arise endogenously but only restrict the range of possible firm types. There are also no limitations on the location of the headquarters i.e. the respective firm type might not arise in either country, only in one or in both countries. Furthermore, the term 'closed economy' refers to the X sector only. The numeraire good is freely traded in all three settings.

Table 1 provides an overview of the firms actually active in equilibrium over the parameter space w_h and listed separately for the three different model settings. Positive numbers of national and multinational firms headquartered in country $i = h, f$ are indicated by $n_i > 0$ and $m_i > 0$, respectively. In the closed economy domestic firms do not face foreign competition and will prevail in both countries over the whole parameter space. With exports allowed the firms located in Foreign will constantly gain in terms of relative competitiveness and domestic firms

⁹The numerical calculations are conducted using the MCP solver of GAMS.

w_h	Nat. Firms	Exp. Nat. Firms	Exp. Nat. Firms & MNEs	
0.50	$n_h > 0; n_f > 0$	$n_h > 0; n_f > 0$	$m_h > 0; m_f > 0$	
0.51			$m_f > 0; n_f > 0$	$m_f > 0$
0.52				
0.53				
0.54				
0.55				
0.56				
0.57				
0.58				
0.59				
0.60				
0.61				
0.62				
0.63			$m_h > 0; n_f > 0$	
0.64			$n_f > 0$	
0.65				
0.66				
0.67				
0.68				
0.69				
0.70				
0.71				
0.72				
0.73				
0.74				
0.75				
0.76				
0.77				
0.78				
0.79				
0.80				

Table 1: Type of Firms Active in Equilibrium

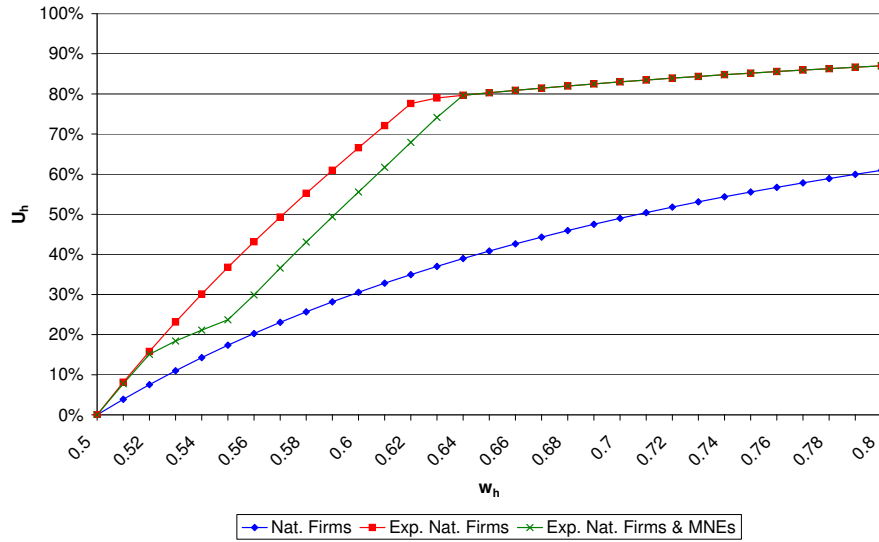


Figure 1: Effect of a Minimum Wage in Home on Unemployment

based in Home will altogether quit the market at a minimum wage of 0.63. Without imposing restrictions on the firm types the initial equilibrium is characterised by coexisting multinational firms. The figure shows that a relative small increase in the minimum wage in Home is sufficient for all multinational firms in Home to displace their headquarters to Foreign. Further increases in w_h profit national firms based in Foreign which are the only type of firms whose costs are not affected by the wage level in country h . Consequently, for high levels of w_h multinational firms are not longer profitable and exporting firms based in country f will be left as the only active type of firm.

Consider now the effect of an increase in w_h on the level of unemployment in Home as depicted in figure 1. Clearly, unemployment is on the rise for all three simulation. The closed economy setting provides a lower bound to the other specifications. Once firms are allowed to export, the effect of one-sided downward rigidity on the unemployment rate is significantly larger. The simulation shows that the calculated unemployment rate is more than twice as high for large parts of the parameter space.

Interestingly, the existence of multinational enterprises dampen the effect over some range of parameters somewhat as they keep larger parts of production in Home. As long as multinational

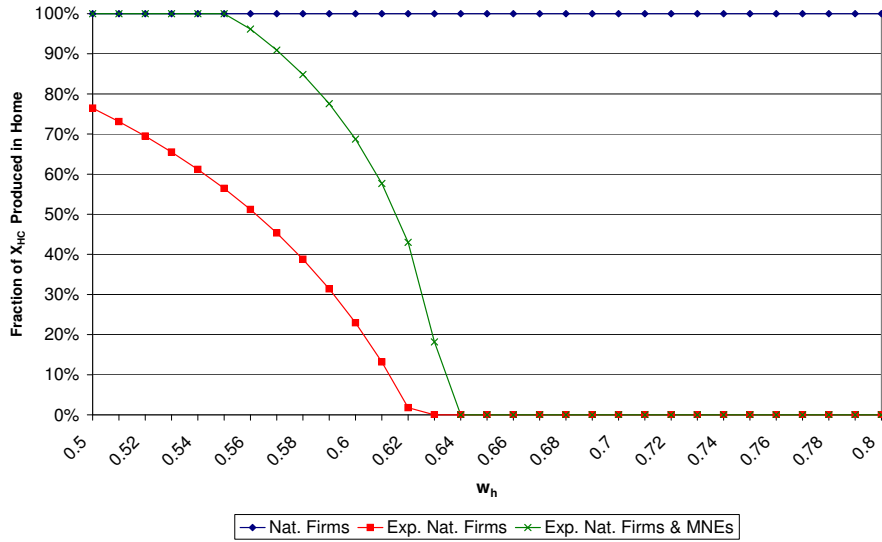


Figure 2: Effect of a Minimum Wage in Home on the Fraction of X Consumption in Home Produced Domestically

are present in the market a fraction of domestic consumption of X is still produced at Home. This is illustrated in figure 2 that also highlight that the sharp increase in unemployment coincides with the fall in the fraction of X_{hC} produced domestically. Once all the production takes place in Foreign further increases in w_h only affect U_h via the impact on Y production. Consequently, the difference between the open and closed economy setting will diminish for larger values of w_h since in the former setting the domestic production of X is still negatively affected by increases in w_h .

The observed dampening effect of multinational enterprises is only evident in a setting, in which trading barriers are low enough as for intra-industry trade to occur in their absence. If trading barriers are prohibitively high, the open economy setting with exporting firms will effectively reflect a closed economy. Adding multinational firms to such a scenario will raise the actual unemployment rate.¹⁰

The effects resulting from an introduction of a minimum wage in Home for the foreign wage level are shown in figure 3. National labour market legislation introduced in h has no effect

¹⁰In Appendix B.1 calculations for such an example are presented.

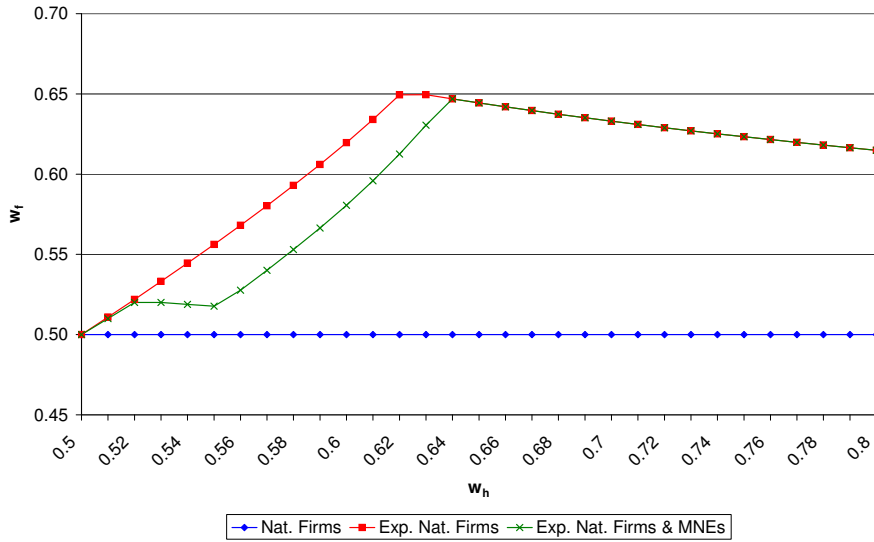


Figure 3: Effect of a Minimum Wage in Home on the Wage Rate in Foreign

on the foreign labour market in a closed economy. However, wage rigidity in Home props up wages in Foreign when product markets are global. Foreign firms gain a relative cost advantage vis-a-vis their competitors and will therefore produce larger amounts of X . This raises labour demand and wages in Foreign. As long as multinationals are profitable, the effect is somewhat less pronounced in the unrestricted setting since a lower fraction of the production for the Home market is transferred to Foreign. After reaching a peak the wage level in Foreign is decreasing in w_h . This is so because further increases of wages in Home generate further unemployment and income losses in country h .¹¹ Demand for good X in Home falls and so does production and labour demand in Foreign.

There is yet another interesting aspect evident from figure 3. For a certain parameter range the wage level is actually higher in Foreign than in Home despite of the (binding) minimum wage in the latter. Why can such an equilibrium be sustainable? The reason is a sort of home market effect. While income levels in Foreign are soaring, unemployment in Home depresses local income and demand for X production. Therefore, national firms based in Foreign serve a far larger domestic market than their counterparts in Home. And since national markets are

¹¹The effect of wages on income levels in the two countries are depicted in figures 10 and 11 in Appendix B.2.

somewhat shielded by trading barriers foreign national firms do have a competitive advantage despite of higher domestic equilibrium wages. In the presence of multinational enterprises there is just one wage level of w_h at 0.63 that is consistent with $w_f > w_h$. Note that in this case there is a sudden shift backwards to multinationals based in Home, since MNEs based in different countries clearly do not have a home market advantage in comparison to each other.

Finally, a note on the welfare consequences of the introduction of a minimum wage. After the preceding analysis it is hardly surprising that introducing downward wage rigidity depresses consumption and, hence, welfare levels in Home. The adverse effects are felt stronger in open economies but are somewhat dampened in the presence of multinational firms. In Foreign income levels are raised and thus consumption will increase at given prices. However, while the price of the numeraire is normalised to one, the price for the X good will be higher following the increase in factor prices. Hence, there are opposing effects on the welfare level in Foreign. These are also reflected in the welfare calculations presented in Appendix B.2. While in the setting with only exporting firms welfare is increasing in w_h up to the point at which the production of X_{hC} takes place solely in Foreign, welfare in the unrestricted setting is decreasing initially. However, the peaks in both scenarios are well above the welfare level without a binding one-sided minimum wage in Home.

5 The Role of Trading Barriers

The previous section has illustrated how the effects of a one-sided minimum wage in an open economy with multinationals differ from those in a closed economy or an open economy without multinational firms. It has been shown that the effects of national labour market institutions might be much more pronounced in a world in which product markets are linked globally. Trading barriers are of great importance to the results as they determine the degree of openness of an economy and the type of firms active in equilibrium. With very high trading barriers horizontal multinational enterprises are more likely to arise while exporting is relatively costly. In this section, the unrestricted full-fledged model is simulated for different levels of trading barrier $t = \{0.2, 0.6, 1.0, 1.4\}$ to assess their influence on the model's main results.

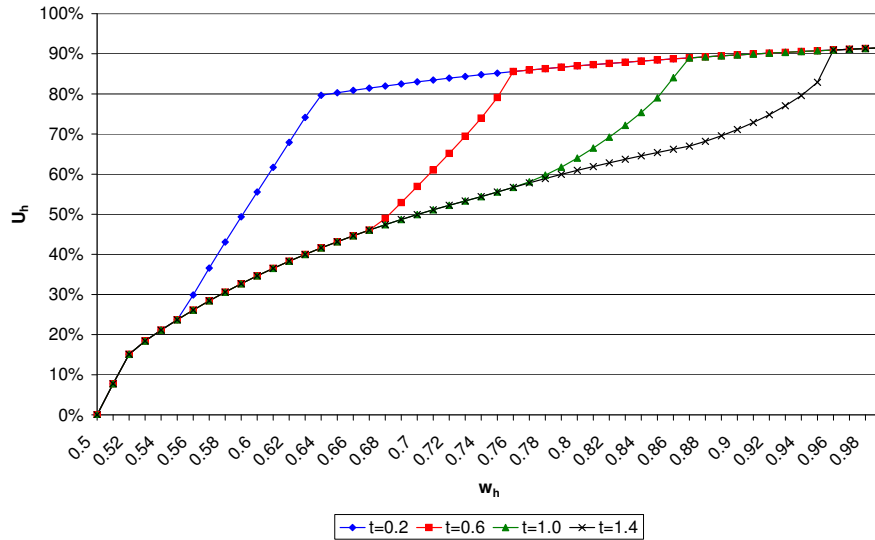


Figure 4: Effect of a Minimum Wage in Home on Unemployment for Different Trading Costs

Figure 4 provides an overview of the effect of a one-sided minimum wage in Home on the unemployment rate. The four curves coincide for a range of parameters at the lower and the upper bound of w_h . For low and high levels of the minimum wage the active types of firms are the same irrespective of the level of trading barriers. Introducing only a moderate minimum wage will prevent multinational enterprises from leaving the market while at very high levels only national firms based in Foreign can prevail.¹²

The effect of the level of trading barriers is evident from the intermediate parameter range. With relative low barriers exporters will enter the market already at relatively small values of w_h . Labour demand for the production of the X good is transferred abroad and the unemployment rate rises abruptly above the one calculated in simulation with higher trading barriers. A comparably moderate minimum wage is sufficient to generate high unemployment. With higher levels of trading costs the entry barriers of exporting national firms are higher. Therefore, the ‘turning point’, at which the fraction of X consumption produced abroad increases sharply, lies at higher values of w_h . The range of parameters w_h consistent with multinational production is

¹²A detailed table showing the types of firms active for any combination of w_h and t is provided in the Appendix B.3.

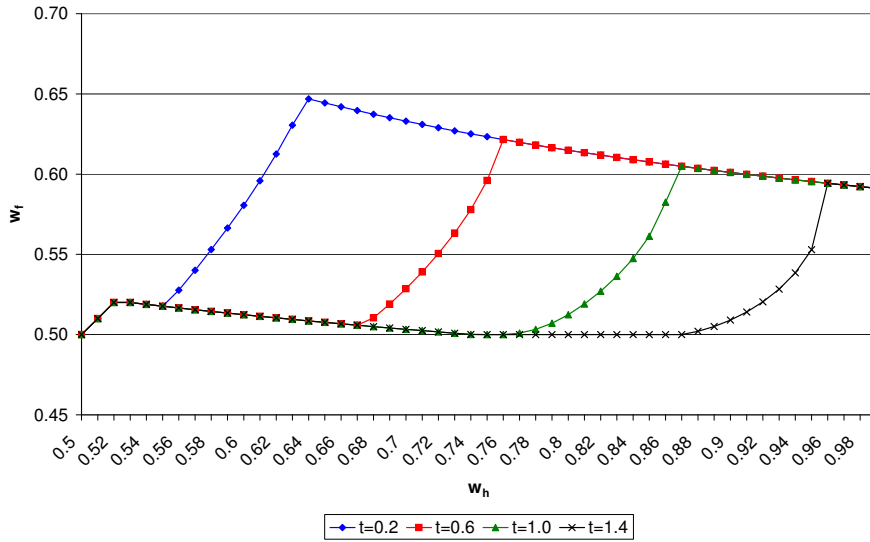


Figure 5: Effect of a Minimum Wage in Home on the Wage Rate in Foreign for Different Trading Costs

enlarged while exporting firms arise only at higher values of w_h . Hence, higher trading barriers reduce the adverse effects on unemployment in Home for intermediate values of w_h .

Figure 5 provides the mirror image for the foreign labour market. Again, the curves coincide for low and high levels of w_h . Foreign wages are increasing initially as multinational enterprises are relocating their headquarters to Foreign. Marked increase in w_f can be observed once foreign exporter start to produce higher fraction for the market in Home. The lower the level of trading barriers the lower the level of w_h sufficient for the appearance of foreign-based exporting firms. Consequently, the positive effect of minimum wages in Home on wages in Foreign is higher with lower trading barriers for some intermediate parameter range of w_h .

6 National Labour Supplies, Global Consequences

In this section I study the effect of national factor supplies on the two labour market.¹³ In line with Davis (1998) the fixed minimum wage in Home insulates Foreign from any effects caused by factor accumulation in Home. Figure 6 shows how foreign wages and unemployment in country

¹³For the simulations the wage rate in Home is fixed at 0.6.

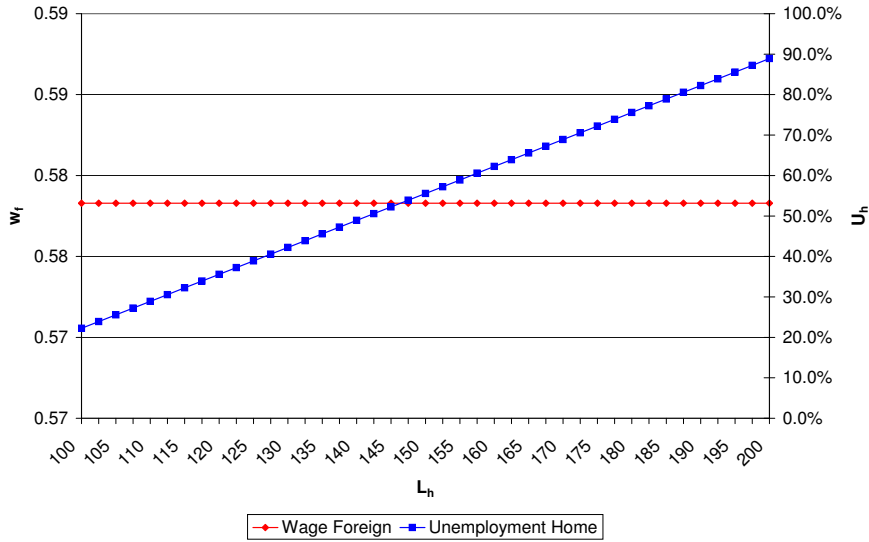


Figure 6: Labour Market Consequences of an Increase in Labour Supply of Home

h varies with the labour endowment of country h . As long as the minimum wage binds labour supply has no effect on factor prices in Home and additional labour endowment in Home will add to its unemployment stock. Hence, the unemployment rate is steeply increasing in L_h . On contrary, foreign cost competitiveness and labour demand are not affected by factor accumulation in Home. Therefore, the foreign wage rate is independent from factor supplies in country h .

The effects of an increase in foreign labour supply, depicted in figure 7, are more subtle. Initially, there is a parameter range, in which foreign wages do not react to foreign labour supply and equal the (fixed) wage in Home. This results resembles the one of Davis (1998) who finds that differences in the accumulation of labour can not explain divergent wage trends. The parameter space corresponds to a regime of multinational firms based in both countries. Increases in the foreign labour supply put downward pressure on foreign wages. More and more multinationals move their headquarter from Home to Foreign increasing labour demand in Foreign and decreasing it in Home. This allows the foreign country to sustain its wage level while unemployment in Home soars.

Once all multinationals have relocated to f further factor accumulation leads to a decline in

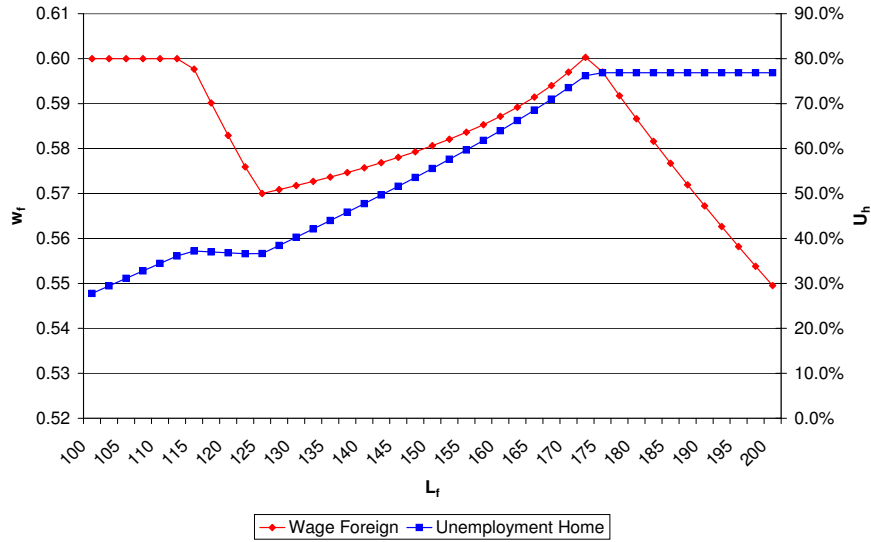


Figure 7: Labour Market Consequences of an Increase in Foreign Labour Supply

foreign wages. The number of multinationals based in Foreign increases only slightly and no additional labour demand is generated from relocation of headquarters. In this parameter space unemployment in Home is hardly affected by foreign factor accumulation. It even falls somewhat as the (slightly) increasing number of foreign multinationals is accompanied by a (slight) increase of production in Home.

Further decreases in the foreign wage rate increase the competitiveness of national foreign firms relative to their multinational competitors. As soon as national firms enter the market production of the X goods starts being relocated from Home to Foreign. This causes a surge in foreign labour demand and depresses labour demand in Home. Hence, foreign wages and unemployment in Home starts to increase. These developments also change the relative size of the two markets and favour the establishment of national firms based in Foreign. Further factor accumulation will lead to higher and higher foreign wages while unemployment keeps on rising in Home. The development comes to an end at the point at which all production of the X good takes place in Foreign and only national firms are left in the market. Further increases in foreign labour supply will then again depress foreign wages. The unemployment rate in Home is left unchanged since the X sector does not generate labour demand any more. Hence, lower foreign wages does not

influence relative costs of firms in h as the latter do simply not exist.

7 Concluding Remarks

This paper has studied the effects of introducing a one-sided minimum wage in a model of intra-industry trade and multinational firms. Even though factor prices do not equalise across countries, the overarching message of Davis (1998) is confirmed. National labour market regulations profoundly interact and can not be analysed in isolation when goods markets are global. I have shown that the adverse employment effects of a one-sided minimum wage are much more pronounced in an open economy setting with positive intra-industry trade compared to a framework without exporters. Perhaps surprisingly, multinational firms do not worsen but potentially mitigate the effects somewhat. While there is no one-to-one relation between the minimum wage in Home and wages in Foreign (as in Davis, 1998), a (binding) wage floor in one country will prop up wages in the other. The magnitude of the effects and the differences between the results derived in open and closed economy settings depend crucially on the level of trading barriers. In particular, (asymmetric) wage rigidities are likely to affect employment prospects more severely in economies with a high degree of openness than in economies that are shielded from foreign competition by relatively high trading barriers. Hence, wage flexibility appears to be of specific importance for the labour market performance of open economies. This finding suggests that labour market reforms should indeed be directed towards a higher degree of (wage) flexibility in the face of global competition. Alternatively, one may argue for more co-ordination of labour market policies among countries. If institutions that cause wage rigidity are - for whatever reason - perceived to play a beneficial role, adverse effects can be reduced by simultaneously introducing them in more than just one country.

The interaction of national labour market institutions is also illustrated with respect to the effects of local factor accumulation on global labour market outcomes. Factor accumulation in Home has no effect on foreign wage rates which are protected by the binding minimum wage in Home. Unemployment rates in Home rise hand in hand with national labour endowment. On the contrary, the effects of an increase in the foreign labour supply are more subtle. The direction

generally depends on the level of the minimum wage and the resulting types of firms active in equilibrium.

The model lends itself to a number of extensions. The present study has, for instance, abstracted from key elements that characterise the recent wave of economic integration. A central and novel feature that has attracted a lot of academic and public attention has been the fragmentation of production across national borders. Furthermore, trade with developing countries such as China or India has soared. Adding elements of these features to the model may generate further important insights on the interaction of national labour market regulation in a globalised world.

References

- [1] Brander, James and Paul Krugman (1983). A 'reciprocal dumping' model of international trade. *Journal of International Economics*, 15(3-4):313–321.
- [2] Davidson, Carl and Steven J. Matusz (2004). *International trade and labor markets: theory, evidence, and policy implications*. W.E. Upjohn Institute for Employment Research, Kalamazoo, Michigan.
- [3] Davis, Donald R. (1998). Does European unemployment prop up American wages? National labor markets and global trade. *American Economic Review*, 88(3):478–94.
- [4] Kok, Wim (2004). *Facing the challenge. The Lisbon Strategy for Growth and Employment*,. Report from the High Level Group chaired by Wim Kok submitted to the European Council.
- [5] Kreckemeier, Udo and Douglas Nelson (2006). Fair wages, unemployment and technological change in a global economy. *Journal of International Economics*, 70(2):451–469.
- [6] Markusen, James R. and Anthony J. Venables (1998). Multinational firms and the new trade theory. *Journal of International Economics*, 46(2):183–203.
- [7] Navaretti, Giorgio B. and Anthony J. Venables (2004). *Multinational Firms in the World Economy*. Princeton University Press.
- [8] Oslington, Paul (2002). Factor market linkages in a global economy. *Economics Letters*, 76(1):85–93.
- [9] Scheve, Kenneth F. Slaughter Matthew J. (2001). *Globalization and the Perception of American Workers*. Institute for International Economics, Washington, DC.
- [10] Venables, Anthony J. (1985). Trade and trade policy with imperfect competition: The case of identical products and free entry. *Journal of International Economics*, 19(1-2):1–19.

A Proofs

A.1 Proof of Proposition 1

Proof. I start with differentiating equations (32) and (33) with respect to w_h to find

$$\frac{\varepsilon^{oh}}{\partial w_h} = cw_f(c+t) \left(\frac{-n(n-1)}{(nw_f(c+t) - c(n-1)w_h)^2} - \frac{2}{(w_f(c+t) + cw_h)^2} \right) < 0, \quad (43)$$

$$\frac{\varepsilon^{of}}{\partial w_f} = cw_f(c+t) \left(\frac{-(n-1)n}{(cnw_f - (n-1)(c+t)w_h)^2} - \frac{2}{(cw_f + (c+t)w_h)^2} \right) < 0. \quad (44)$$

Hence, the elasticities are decreasing in w_h . Next, one can calculate the wage rate, at which the two elasticities exactly equal -1. For ε^{oh} this is true for $w_h = \frac{nw_f(c+t)}{c(3n-2)}$, while for ε^{of} one finds that $w_h = \frac{cnw_f}{(c+t)(3n-2)}$ delivers an elasticity of -1. Hence, the following conditions have to be fulfilled for the proposition to hold

$$w_h \geq \frac{nw_f(c+t)}{c(3n-2)}, \quad (45)$$

$$w_h \geq \frac{cnw_f}{(c+t)(3n-2)}. \quad (46)$$

Consider first condition (45) referring to the wage elasticity of production for market h . From equation (30) one can infer that for nonnegative levels of exports into the market of country h , w_h has to be equal to or larger than $\frac{(n-1)w_f(c+t)}{cn}$. Plugging this lower bound into equation (45) leaves us with $\frac{n-1}{n} \geq \frac{n}{3n-2}$, which is always fulfilled for our assumption $n \geq 2$. Similarly, for the j market one can derive a lower bound for w_i from equation (32) assuming $X_{ji}^n > 0$.¹⁴ Substituting into condition (46) yields again $\frac{n-1}{n} \geq \frac{n}{3n-2}$. \square

A.2 Proof of Proposition 2

Proof. Taking the first derivative of exports from country f to market h with respect to w_h yields

$$\frac{\partial X_{fh}^n}{\partial w_h} = \frac{\beta M_h c (2n-1) ((3n-2)w_f(c+t) - cnw_h)}{n^2 (w_f(c+t) + cw_h)^3}. \quad (47)$$

¹⁴The assumption follows directly from assuming nonnegative intra-industry trade. A national firm will always produce for the domestic market provided that it is an exporter.

This expression is nonnegative as long as $w_h \leq \frac{(3n-2)w_f(c+t)}{cn}$. By plugging in the upper bound for w_h as derived from equation (29), $w_h \leq \frac{nw_f(c+t)}{c(n-1)}$, I obtain $\frac{n}{n-1} \leq \frac{3n-2}{n}$. Our assumption $n \geq 2$ guarantees that the condition is satisfied.

The derivative of production of a firm based in f for its domestic market with respect to wages in h is given by

$$\frac{\partial X_{ff}^n}{\partial w_h} = \frac{\beta M_f(2n-1)(c+t)(cw_f(3n-2) - nw_h(c+t))}{n^2((c+t)w_h + cw_f)^3} \quad (48)$$

The expression will be nonnegative for $w_h \leq \frac{cw_f(3n-2)}{n(c+t)}$ which can again be verified by plugging in the upper bound of w_h . □

B Additional Tables and Figures

B.1 Re-estimating the Labour Market Effects with $t = 0.8$

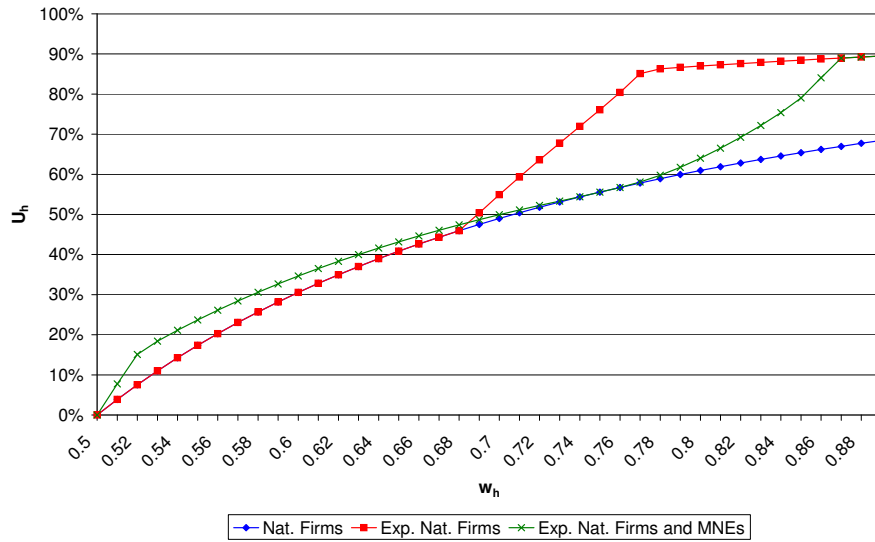


Figure 8: The Effect of a Minimum Wage in Home on Unemployment ($t = 1.0$)

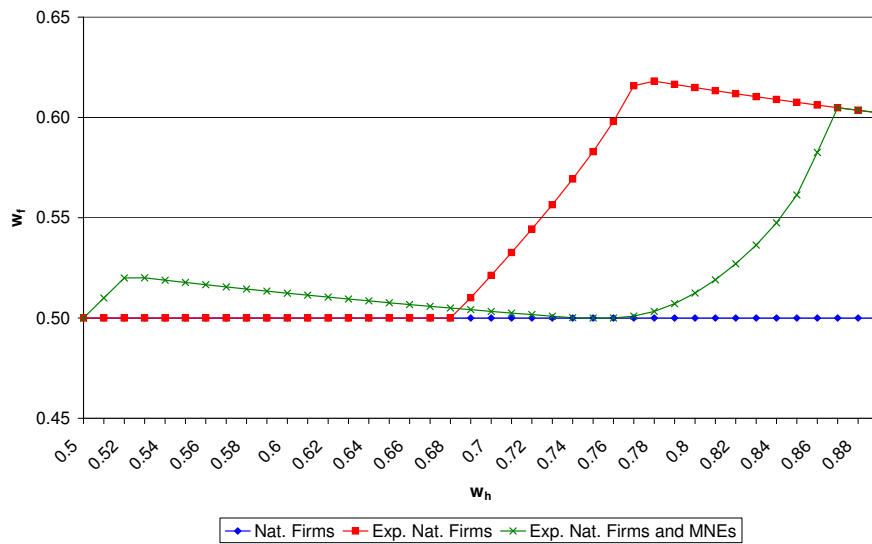


Figure 9: Effect of a Minimum Wage in Home on the Wage Rate in Foreign ($t = 1.0$)

B.2 Income Levels and Welfare in the Baseline Model

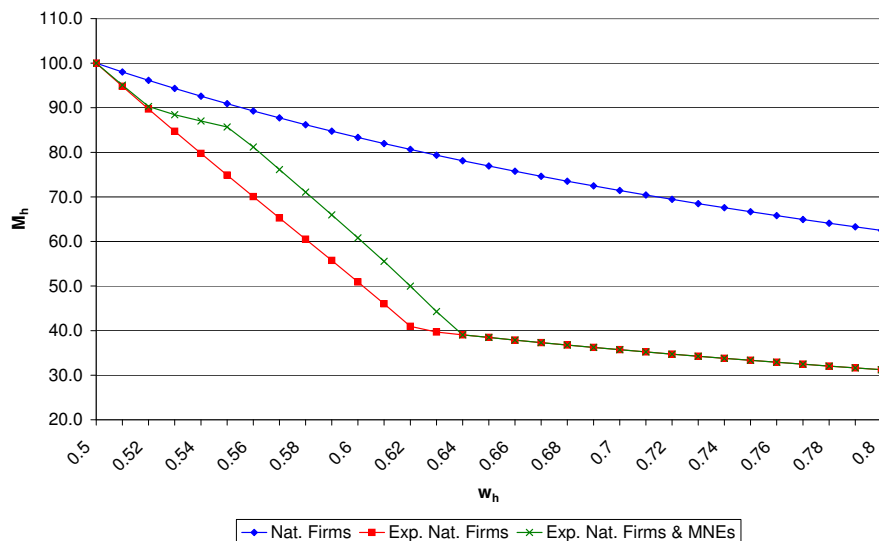


Figure 10: Effect of a Minimum Wage in Home on the Income Level in Home

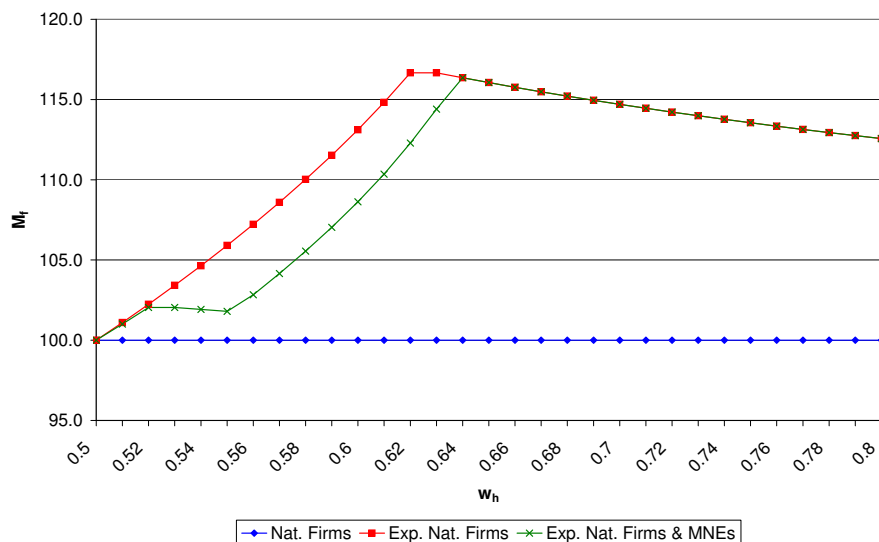


Figure 11: Effect of a Minimum Wage in Home on the Income Level in Foreign

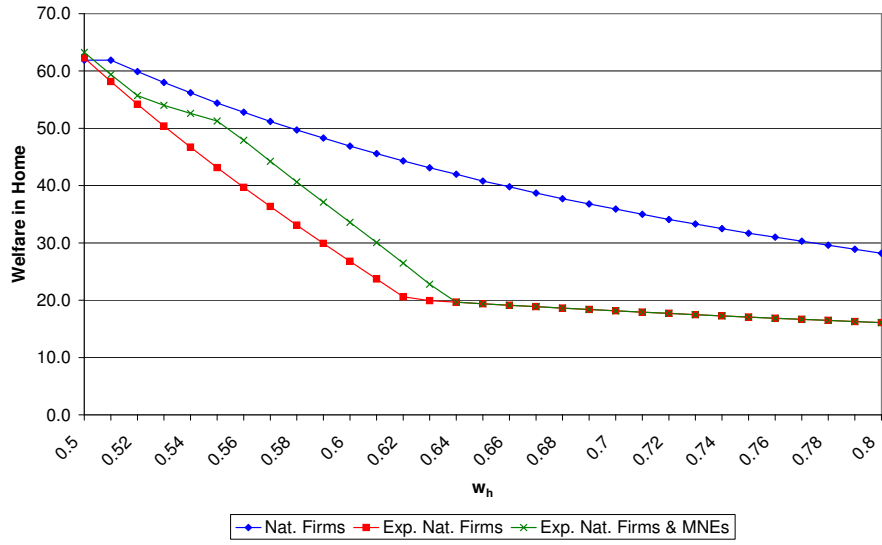


Figure 12: Effect of a Minimum Wage in Home on Welfare in Home

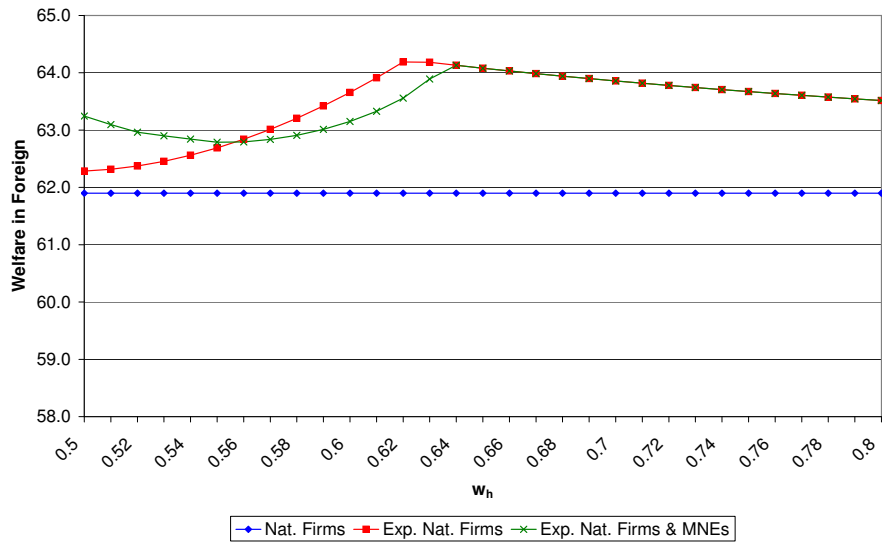


Figure 13: Effect of a Minimum Wage in Home on Welfare in Home

B.3 The Effect of the Level of Trade Barriers

w_h	$t = 0.2$	$t = 0.6$	$t = 1.0$	$t = 1.4$	
0.50	$m_h > 0; m_f > 0$	$m_h > 0; m_f > 0$	$m_h > 0; m_f > 0$	$m_h > 0; m_f > 0$	
0.51	$m_f > 0$	$m_f > 0$	$m_f > 0$	$m_f > 0$	
0.52					
0.53					
0.54					
0.55					
0.56					
0.57					
0.58					
0.59					
0.60					
0.61	$n_f > 0$	$n_f > 0$	$n_f > 0$	$n_f > 0$	
0.62					
0.63					$m_f > 0; n_f > 0$
0.64					
0.65					
0.66					
0.67					
0.68					
0.69					
0.70					
0.71	$m_f > 0; n_f > 0$				
0.72	$n_f > 0$	$n_f > 0$	$n_f > 0$	$n_f > 0$	
0.73					
0.74					
0.75					
0.76					
0.77					
0.78					
0.79					
0.80					
0.81					
0.82	$n_f > 0$	$n_f > 0$	$n_f > 0$	$n_f > 0$	
0.83					
0.84					
0.85					
0.86					
0.87					
0.88					
0.89					
0.90					
0.91					
0.92	$n_f > 0$	$n_f > 0$	$n_f > 0$	$n_f > 0$	
0.93					
0.94					
0.95					
0.96					
0.97					
0.98					
0.99					

Figure 14: Type of Firms Active in Equilibrium