



# Union wage demands with footloose firms and agglomeration forces<sup>☆</sup>

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## ABSTRACT

This paper considers the wage demand of a sector-level monopoly union facing internationally mobile firms. A simple two-country economic geography model describes how firms relocate in response to international differences in production costs and market size. In contrast to standard models, the union fully takes into account the international mobility of firms. If international differences in labour productivity and market size are small, lower foreign wages or lower trade costs necessarily lead to lower union wage demands. Otherwise, lower foreign wages or trade costs may reduce the sensitivity of the remaining firms in the home country to wage changes, leading to higher union wage demands.

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## 1. Introduction

The effect of trade integration on unionised labour markets has attracted a lot of attention in the literature. Starting with [Brander and Spencer \(1988\)](#) and [Mezzetti and Dinopoulos \(1991\)](#), quite a few authors have analysed unionised labour markets in the context of international competition between immobile firms competing oligopolistically (e.g. [Huizinga, 1993](#); [Naylor, 1999](#); [Andersen and Sørensen, 2000](#); [Kikuchi and Amegashie, 2003](#); [Lommerud et al., 2003](#)), or under monopolistic competition (such as [Driffill and van der Ploeg, 1995](#)). Another strand of literature, with contributions such as [Picard and Toulemonde \(2003, 2006\)](#), [De Bruyne \(2004\)](#) and [Munch \(2003\)](#), among others, uses economic geography models with demand linkages to consider the effects of unionisation on the location choice of firms.

In all these contributions, unions take firm location as given. Either because firms are immobile (in most oligopolistic models), or because

unions take firm location as given in spite of long-run firm mobility (in the economic geography models). Although this approach is deemed reasonable given the longevity of capital investment compared to the duration of wage agreements, the assumption seems to be at odds with the characteristics and the behaviour of labour unions. Labour unions typically are a stable organisation with a long time-horizon, operating at the sector level. It seems implausible that such unions would ignore firm mobility, or are unable to commit to wage levels. In fact, strategic delegation by individual union members in order to aid commitment could be an important reason for the existence of unions ([Jones, 1989](#)). Typical labour unions are well organised and, occasionally, the lack of organisation and commitment on the employers' side has been reported as being problematic by unions, rather than the other way around.<sup>1</sup>

Operating at the sector level, even short sighted unions should be aware that at any point in time at least a fraction of firms in the sector will be at the end of an investment cycle, such that some relocation will occur in response to wage increases. Moreover, if firms value future profits highly, then even with long-lived fixed localised investment where relocation would hurt the firm in the short-run, the threat of relocation by the firm should be credible and relevant to myopic unions (see [Espinosa and Rhee, 1989](#); [Addison and Chilton, 1998](#)).

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<sup>1</sup> See, for example, the article by IG Metal president Klaus Zwickel in the *Frankfurter Allgemeine Zeitung* of April, 6, 1995 and the discussion in [Thelen \(2000\)](#).

Examples are abound of firms relocating or considering relocation in search of lower production costs or better market opportunities, and unions report that these threats are frequently used during the collective bargaining process (Eurofound, 2010). It is hard to imagine that the observed relocation of firms, or just the presence or perception of a threat of firm relocation, does not affect union behaviour.

We therefore believe it is important to consider the case where unions explicitly take into account the international mobility of firms, and study the effect of firm mobility on union wage demands. We use a simple new economic geography model to explain the location choices of firms in response to changes in international differences in market access, wages, labour productivity and trade costs. A sector-level union fully takes into account how its wage demands affect the international distribution of firms and firm level labour demand. The interaction of agglomeration and dispersion forces and the effect of trade costs thereon affect how firms relocate in response to international wage differences. This in turn affects the sector-level labour demand elasticity and union wage demands.

The response of union wage demands is non-monotonic in some key model parameters. An important example is when a foreign wage decrease lowers the number of firms in the unionised country, but the remaining firms become less sensitive to wage changes. In this case, lower foreign wages lead to higher local union wage demands. Another example is that trade liberalisation leads to lower union wage demands only if the differences between both countries in terms of labour productivity and market size are small. With sufficiently large differences between countries full agglomeration may occur, and union wage demands then are proportional to the agglomeration rents. Agglomeration rents due to a market size advantage (and therefore union wages) are a hump-shaped function of trade freeness (as in Pflüger, 2004b). Agglomeration rents due to a comparative advantage rather than a market size advantage, however, always increase with trade openness. But even when both countries contain firms, union wage demands may increase after trade liberalisation: when trade becomes sufficiently free, a country with a large market size disadvantage and productivity advantage will increasingly attract firms and simultaneously experience a decrease in the sensitivity of the international distribution of firms to wage changes, inducing higher union wage demands.

These results are different from the results which would be obtained when modelling firm location as in simpler – but far more tractable – oligopolistic frameworks such as those developed by Haufler and Wooton (2010) or Gagné and Wooton (2011) in the context of tax competition, or for example Andersen and Sørensen (2000) in the context of union wage setting. In these models local optimal tax rates are linearly increasing in the level of foreign taxes. In the oligopolistic models of Naylor (1999) and Lommerud et al. (2003) with union wage setting with immobile firms, wages may increase after trade liberalisation, but for very different reasons compared to our model.

This paper consists of five sections after the Introduction. Section 2 introduces a simple two-country NEG model where wages in both countries are taken as given. We consider the effect of exogenous wage changes on the equilibrium international distribution of firms. In Section 3 wages are set by a monopoly union which fully takes into account the results on firm behaviour. We determine how union wage demands react to changes in transport costs and foreign wages. Section 4 compares the welfare effects of trade liberalisation in the case of union wage setting to the case of competitive wages. Section 5 describes the international non-cooperative Nash equilibrium in wages. A final section concludes.

## 2. A simple two-country NEG model

In this section the two-country footloose-capital model of Martin and Rogers (1995) is adapted to allow for international differences

in wages and labour productivity. There are two countries,  $H$  and  $F$ . As in Pflüger (2004a) the utility function  $V$  of the representative consumer is quasi-linear in the consumption of a homogeneous good  $C_A$ , and a CES-composite  $C_M$  of a continuum of differentiated manufacturing varieties. A mass of  $n^w$  of such manufacturing varieties is produced worldwide. Assume that

$$V = C_A + \mu \ln(C_M) \quad \text{and} \quad C_M = \left( \int_{i=0}^{n^w} q(i)^{\frac{\sigma-1}{\sigma}} di \right)^{\frac{\sigma}{\sigma-1}}, \quad (1)$$

where  $\mu > 0$  expresses the preference for manufacturing goods, and  $\sigma > 1$  is the elasticity of substitution between varieties. Choosing the  $A$ -sector good as the numéraire implies  $p^A = 1$ . The individual demand for the CES-composite then is given by  $C_M = \mu P_k^{-1}$ , where  $P_k = \left[ \int_{i=0}^{n^w} p(i)^{1-\sigma} di \right]^{\frac{1}{1-\sigma}}$  is the price-index of manufacturing goods consumed in country  $k$ . Per-consumer expenditure on manufacturing goods equals  $\mu$  and the individual consumer expenditure on the homogeneous good is the residual of the individual income after subtracting expenditures on manufacturing goods, or  $C_A = Y - \mu$ . Denote the quantity of a manufacturing variety  $i$  which is produced in country  $j$  and sold in country  $k$  by  $q_{jk}(i)$ . The demand of the representative consumer in country  $k$  at price  $p_{jk}(i)$  is

$$q_{jk}(i) = \frac{\mu}{P_k} \left( \frac{p_{jk}(i)}{P_k} \right)^{-\sigma} \quad j, k \in \{H, F\}. \quad (2)$$

Because of the quasi-linear utility specification, the demand for manufacturing goods does not depend on income. Total demand in country  $k$  equals the demand of the typical consumer times the exogenous mass of consumers  $M_k$  in country  $k$ .

Sector  $A$  uses labour as the sole input. Perfect competition, CRS and free trade imply that prices and marginal costs in the  $A$  sector are equalised internationally. With  $1/\alpha_j^A$  the quantity of labour required in country  $j$  to obtain one productivity-equivalent unit of labour and  $w_j^A$  the reward to labour in sector  $A$ , this implies

$$\frac{w_H^A}{\alpha_H^A} = \frac{w_F^A}{\alpha_F^A} = p^A = 1 \quad \text{or} \quad w_H^A = \alpha_H^A \quad \text{and} \quad w_F^A = \alpha_F^A. \quad (3)$$

A manufacturing firm in country  $j$  requires a single unit of capital at price  $r_j$  irrespective of the output level, and  $1/\alpha_j$  units of labour at price  $w_j$  per unit of output. There is imperfect labour mobility between sectors, and the CRS sector absorbs all labour which is not hired by the manufacturing firms. The representative country  $j$  manufacturing firm's cost for producing  $x$  units of output is

$$C_j(x) = r_j + \frac{w_j}{\alpha_j} x.$$

The ratio  $w_j/\alpha_j$  corresponds to the manufacturing unit labour cost in country  $j$ .

Manufacturing firms operate under monopolistic competition and set prices at a fixed markup  $\eta = \frac{\sigma}{\sigma-1}$  over marginal costs. Exports are subject to iceberg transport costs  $\tau > 1$ , so

$$\begin{aligned} p_{jj}(i) &= p_{jj} = \eta w_j / \alpha_j & j \in \{H, F\} & \quad \text{(local sales)} \\ p_{jk}(i) &= p_{jj} = \tau \eta w_j / \alpha_j = \tau p_{jj} & j, k \in \{H, F\}, \quad j \neq k & \quad \text{(exports)}. \end{aligned} \quad (4)$$

Without loss of generality, the mass of capital (and thus the mass of firms and manufacturing varieties) is normalised to one ( $n^w = 1$ ). Write  $n$  for the endogenous mass and share of manufacturing firms located in  $H$ . Use  $\phi = \tau^{1-\sigma}$  as the standard measure of 'trade freeness'. Define  $c \equiv \left( \frac{w_H}{\alpha_H} / \frac{w_F}{\alpha_F} \right)^{\sigma-1}$  as a measure of the relative unit labour

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