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Product Market Integration and Wages in Unionized Countries

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Abstract

This paper studies the effects of product market integration on wages. We develop a two-country model of international trade with imperfectly competitive product markets and unionized labor markets. Integration is modelled as either a fall in fixed or variable trade costs. A reduction in fixed trade costs leads to an unambiguous decrease in wages, whereas a reduction in variable trade costs has an ambiguous effect on wages.

JEL Classification: F15, J5, L13

Keywords: Economic integration, Trade unions, International trade, Product market competition

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1 Introduction

It is often argued that European labor markets are strongly influenced by trade unions and as a consequence wages are above the competitive level. This has often been mentioned as an important reason for European unemployment rates being higher and more persistent than US unemployment rates. In Dowrick (1989) it has been shown that the ability of trade unions to achieve high wages depends on the degree of competition in the product market. Specifically, Dowrick shows that if there is an increase in the degree of competition in the goods market, then it spills over to the labor market, and wages are reduced. In practice, one way in which the degree of competition in goods market may rise, is through an increase in international trade due to product market integration. In the literature, it has also been confirmed that product market integration may give rise to lower wages (see e.g. Huizinga (1993) and Sørensen (1993)). However, recently Naylor (1998) has questioned the "established intuition" and he shows that a marginal increase in product market integration, modelled as a decrease in a trade cost, gives rise to higher wages in unionized labor markets. The purpose of our paper is to clarify how product market integration affect wages when labor markets are unionized and to set up a model which is sufficiently general to explain the different results of Huizinga, Sørensen and Naylor.

The models of Huizinga (1993), Sørensen (1993) and Naylor (1998) are all simple oligopoly models, and they are quite similar. Huizinga and Sørensen simply compare the extreme cases of no trade to the case of full trade without any trade costs. Contrary to that, Naylor considers the implications of a marginal reduction in trade costs. Since real world product market integration will evolve as marginal reductions in trade costs, it seems as if the empirical relevant result is the one found by Naylor.

In this paper however, we show that the model of Naylor is also a special case, and in a more general model, it is ambiguous whether wages increase or decrease due to product market integration. The main reason why Naylor finds an unambiguous effect on wages is that, in his model, product market integration does not affect the degree of competition in the goods market. One foreign and one domestic firm compete at the goods market before as well as after the reduction in trade costs. More generally, a reduction in trade costs may give rise to market entry in the sense that it may be optimal for new firms to start exporting. If this is the case, the degree of competition in the goods market increases, and along the lines predicted by Dowrick (1989), wages may decrease.

We divide trade costs into two types: i) variable trade costs, such as transport costs which are more or less proportional to the level of export, and ii) fixed trade costs that are independent of the quantity exported. This type may for instance be costs incurred from gathering information about foreign markets and product approval costs. We show that reductions in these two types of costs may have very different implications for wages. A reduction in fixed trade costs leads to an unambiguous decrease in wages, whereas a reduction in variable trade costs has an ambiguous effect on wages.

The rest of the paper is organized as follows. In section 2 we set up the model, and it is solved in section 3. In section 4 we find some static comparative results, and section 5 concludes.

2 The model

There are two symmetric countries, Home and Foreign, and there is a continuum of goods produced under Cournot competition[1]. Each good is produced by one firm in each country, and the goods are indexed on an interval, $[0, 1]$, and ranked with rising fixed costs of exporting (see below). Not all goods are exported due to differences in this fixed cost, and goods produced in Home with index $i \in [0, \lambda]$ are exported, whereas goods with $i \in]1-\lambda, 1]$ are only sold at the domestic market. Similarly, goods produced in Foreign with index $i \in [0, \lambda^*]$ are exported while goods $i \in]1-\lambda^*, 1]$ are only sold at the market in Foreign[2]. In addition to the fixed cost of trade there is a cost, t, per unit of the good exported. In line with Brander and Krugman (1983) it is assumed that each firm considers the markets separately (i.e. goods markets are segmented) and chooses a profit maximizing quantity for each market.

2.1 Demand

Demand in Home for a specific good is given by

[1] As in Huizinga (1993) and Naylor (1998) our model is partial equilibrium but it can easily be expressed as a general equilibrium model without any qualitative implications for the results (see e.g. Sørensen (1993)).

[2] The cost structure of goods are identical in Home and Foreign as the countries are symmetric. Accordingly, goods are ranked in the same order so that good i in Home is indeed the same as good i in Foreign.

$$q_i = a - bp_i, \tag{1}$$

and in Foreign it is

$$q_i^* = a - bp_i^*. \tag{2}$$

The price at the domestic market for a good for which there is competition from Foreign is then

$$\begin{aligned} p_i &= \frac{a}{b} - \frac{1}{b}(y_i + x_i^*) \\ &= \alpha - \beta(y_i + x_i^*), \qquad i \leq \lambda^*, \end{aligned} \tag{3}$$

where the quantity y_i denotes the amount of good i produced in Home and sold at the domestic market. x_i^* is the amount of good i exported from Foreign to Home. For products that are not subject to Foreign competition the price becomes

$$p_i = \alpha - \beta y_i, \qquad i > \lambda^*. \tag{4}$$

Similarly, in Foreign the price of goods for which there is import from Home is given as

$$p_i^* = \alpha - \beta\left(y_i^* + x_i\right), \qquad i \leq \lambda, \tag{5}$$

where y_i^* is the amount sold by a Foreign producer, and x_i is the amount sold by a Home producer at the Foreign market. For goods that do not face competition from Home firms, the price is

$$p_i^* = \alpha - \beta y_i^*, \qquad i > \lambda. \tag{6}$$

2.2 Firms

Each firm chooses whether to engage in export and operate at the foreign market as well as at the domestic market or just to sell goods at the domestic market. However, in order to export, the firm has to pay a fixed set up cost. This cost may be due to information gathering concerning the foreign market, or it may be costs of product approval in the foreign country. We could easily introduce fixed set up costs that must be payed in order to operate at the domestic market, but for simplicity we ignore these costs and instead assume that there is room for one firm producing each good in each country. As noted earlier, the fixed set up cost of exporting differs among firms, and the firms are ranked so that the cost is increasing in the index number of the firm. Specifically, the fixed set up cost for Home firms is given as

$$C_i = C(i, Z), \qquad \frac{\partial C_i}{\partial i} > 0, \qquad i \in [0, 1], \tag{7}$$

where Z is a vector of variables, for instance globalization variables that make access to information about foreign markets easier[3]. There is a similar cost function for firms located in Foreign.

The profit of an exporting firm in Home producing good i is given as

$$\pi_i = p_i y_i + p_i^* x_i - w l_i - t x_i - C_i, \qquad i \leq \lambda, \tag{8}$$

where l_i is labor input, w is the wage rate in Home and t is variable trade costs. The profit of a non-exporting firm in Home is

$$\pi_i = p_i y_i - w l_i, \qquad i > \lambda, \tag{9}$$

and similar profit expressions hold for the firms in Foreign.

The labor input is simply taken to be equal to production, i.e.

$$l_i = y_i + x_i, \qquad i \leq \lambda \tag{10}$$

$$l_i = y_i, \qquad i > \lambda \tag{11}$$

and analogous expressions hold for Foreign labor input.

2.3 Wage and employment

We assume that in each country there is a single trade union that covers all sectors and hence supplies workers to all firms. The trade union seeks to maximize the total income of trade union members[4] which is equivalent to maximizing

$$\Omega = (w - \overline{w})L. \tag{12}$$

[3] Z is taken to be exogenous and identical across countries, so that the ranking of goods in Home and Foreign is not altered by changes in Z.

[4] For a given number of trade union members, this is equivalent to maximizing the expected income of a representative trade union member where the probability of employment is equal to employment divided by the number of trade union members.

$L = \int_0^1 l_i di$ is total employment in Home, and $\overline{w}$ is the alternative income of trade union members which may be determined by unemployment benefits, the wage in alternative employment or disutility of work. $\overline{w}$ is identical across countries, and the objective function of the Foreign trade union takes a similar form.

For simplicity we assume that the Home (Foreign) trade union unilaterally sets the wage in Home (Foreign), i.e. we apply the monopoly union model (see e.g. Oswald (1985)).

2.4 Game structure

The structure of actions in the model can most easily be described as a sequential game evolving over three stages. In stage 1, each firm decides whether it wants to pay the fixed set up cost, C_i, and become an exporting firm. In stage 2 the trade union in each country chooses the wage rate. Since the wages in the two countries are interdependent, we take the outcome to be a Bertrand-Nash equilibrium in wages. Finally, in stage 3, firms determine output, and when Foreign and Home firms supply to the same market, they engage in Cournot competition so that the outcome is a Cournot-Nash equilibrium.

3 Solving the model

In stage 3, firms have decided whether or not to enter the market abroad and wages have been determined. Hence, maximizing profits for the Home and Foreign firm in sector i (i.e. (8)), and solving for the Cournot-Nash equilibrium yields the following quantity produced by a Home firm and sold at the market in Home:

$$y_i = \frac{\alpha + w^* - 2w + t}{3\beta}, \qquad i \leq \lambda^*. \tag{13}$$

The quantity sold by a Foreign firm in Home is

$$x_i^* = \frac{\alpha + w - 2w^* - 2t}{3\beta}, \qquad i \leq \lambda^*. \tag{14}$$

Similarly, the quantity sold by a Home firm at the market in Foreign can be found to be

$$x_i = \frac{\alpha + w^* - 2w - 2t}{3\beta}, \qquad i \leq \lambda. \tag{15}$$

By maximizing (9), production in Home of goods for which there is no foreign competition amounts to

$$y_i = \frac{\alpha - w}{2\beta}, \qquad i > \lambda^*. \tag{16}$$

Prices at markets in Home are now easily found to be

$$p_i = \frac{\alpha + w + w^* + t}{3}, \qquad i \leq \lambda^*, \tag{17}$$

and

$$p_i = \frac{\alpha + w}{2}, \qquad i > \lambda^*. \tag{18}$$

Similarly, prices in Foreign are

$$p_i^* = \frac{\alpha + w + w^* + t}{3}, \qquad i \leq \lambda, \tag{19}$$

and

$$p_i^* = \frac{\alpha + w^*}{2}, \qquad i > \lambda^*. \tag{20}$$

Total labor demand in Home turns out to be

$$L = \lambda^* \frac{\alpha + w^* - 2w + t}{3\beta} + (1 - \lambda^*)\frac{\alpha - w}{2\beta} + \lambda \frac{\alpha + w^* - 2w - 2t}{3\beta}. \tag{21}$$

In stage 2 the trade union in Home maximizes (12) taking into account that total employment is determined as in (21), and the first order condition becomes:

$$(2\lambda - \lambda^* + 3)\alpha + 2(\lambda + \lambda^*)w^* - 2(4\lambda + \lambda^* + 3)w - 2(2\lambda - \lambda^*)t + (4\lambda + \lambda^* + 3)\bar{w} = 0. \tag{22}$$

There is a similar first order condition for the trade union in Foreign, but before solving for the equilibrium wage rates, let us turn to stage 1.

In stage 1 each firm decides whether to pay the fixed set up cost C_i thereby being able to export its product. The variable profit of a firm in Home from exporting is given as

$$\pi_i^{ex} = (p_i^* - w - t)\, x_i, \tag{23}$$

where p_i^* and x_i is determined as in (19) and (15) respectively. Then if $\pi_i^{ex} \geq C_i$, the firm finds it optimal to export, whereas if $\pi_i^{ex} < C_i$ the firm chooses just to operate at the local market. Now λ can be found as the index of the firm for which the variable profit from exporting exactly covers the fixed set up cost, i.e.

$$\pi_{\lambda}^{ex} = C(\lambda, Z), \tag{24}$$

and we will assume that this defines a unique value of λ[5].

The firms in Foreign face exactly the same problem, and since the two countries are symmetric, it follows that $\lambda^* = \lambda$. Wage rates must be identical across countries for the same reason, and using these facts in (22), implies that the wage rate in the Bertrand-Nash equilibrium of stage 2 becomes

$$w = w^* = \frac{(3+\lambda)\alpha + (3+5\lambda)\overline{w} - 2\lambda t}{6(1+\lambda)}. \tag{25}$$

By substituting for price, wage and quantity in (23), it follows from (24) that λ in equilibrium is determined by the following condition:

$$\frac{1}{9\beta}\left(\frac{(3+5\lambda)(\alpha-\overline{w}) - 12t - 10\lambda t}{6(1+\lambda)}\right)^2 = C(\lambda, Z). \tag{26}$$

The left hand side of this expression is labelled MB as it is the marginal benefit of increasing λ in the sense that it is the variable profit from exporting of the marginal firm that chooses to become an exporting firm, i.e.

$$MB = \frac{1}{9\beta}\left(\frac{(3+5\lambda)(\alpha-\overline{w}) - 12t - 10\lambda t}{6(1+\lambda)}\right)^2. \tag{27}$$

Similarly, $C(\lambda, Z)$ can be interpreted as the marginal cost of increasing λ. $C(\lambda, Z)$ is increasing in λ by construction, and from (27), it is easily found that MB is also increasing in λ. As illustrated in Figure 1, we assume that $\frac{\partial MB}{\partial \lambda} < \frac{\partial C(\lambda,Z)}{\partial \lambda}$ as this is necessary in order to have a stable equilibrium. If λ is lower than the equilibrium value, λ^e, then $MB > C(\lambda, Z)$, and more firms have an incentive to engage in export implying that λ increases towards the equilibrium. Conversely, when $MB < C(\lambda, Z)$, λ decreases.

4 Static comparative analysis

It is very easy to replicate the results in Huizinga (1993), Sørensen (1993) and Naylor (1998). Naylor assumes that $\lambda = 1$, which in our model is the case if $C(i, Z)$ is so

[5]Since we have no restrictions on C_i except that it is increasing in i, we cannot in general rule out the possibility for multiple solutions.

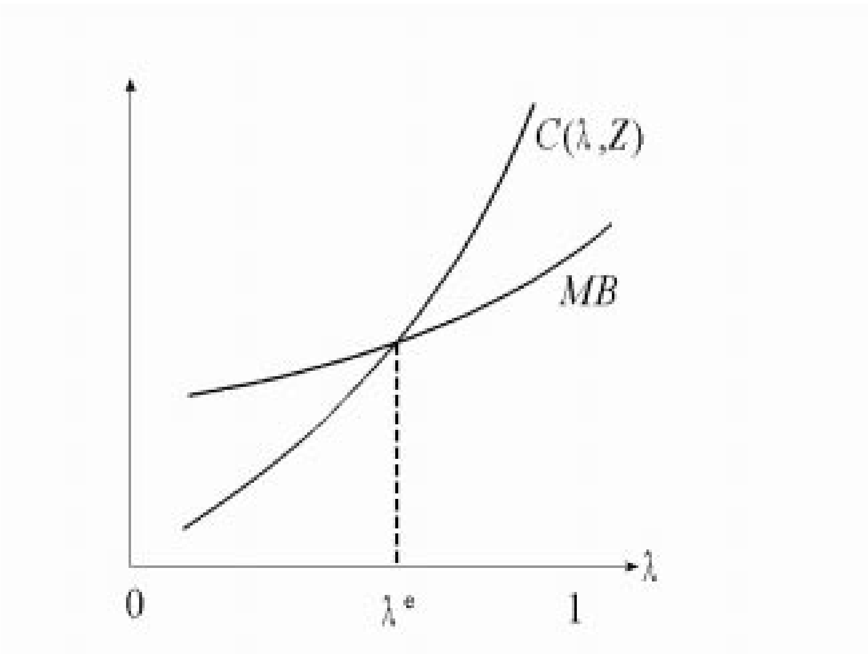

Figure 1: Marginal benefit and fixed costs of trade as a function of λ.

low that all firms find it profitable to export their goods. Differentiating the wage rate in (25) yields

$$\left.\frac{\partial w}{\partial t}\right|_{\lambda=1} = -\frac{1}{6}. \tag{28}$$

This is exactly the Naylor result, i.e. product market integration in the sense that t decreases leads to higher wages. The intuition is that, for given wages the firms face lower costs on export goods, which tends to increase labor demand. The trade unions then exploit the higher labor demand to obtain higher wages.

In Huizinga (1993) and Sørensen (1993) there are no variable export costs (i.e. $t = 0$). Moreover, they compare the case where $\lambda = 1$ to the case where $\lambda = 0$, which in our model can be interpreted as a comparison of the case where $C(i, Z)$ is sufficiently low to ensure that all firms export, to the case where $C(i, Z)$ is sufficiently high so that no firms export. By using (25), we find that

$$w|_{t=0,\lambda=1} - w|_{t=0,\lambda=0} = -\frac{\alpha - \overline{w}}{6} < 0. \tag{29}$$

Since $\alpha > \overline{w}$[6] it follows that product market integration leads to a decrease in the

[6] Otherwise there would be no production as the marginal cost of producing one unit would

wage rate. The reason is here that firms in the two countries start to compete at a common market, and this increase in the degree of competition spills over to the labor market.

The result of Huizinga and Sørensen can easily be generalized. More specifically, any change in the Z variables that reduces the fixed cost of trade, $C(i, Z)$, tends to increase the share of goods that are traded, λ. This is also seen in Figure 1; there will be a downward shift in the $C(i, Z)$ function implying a higher equilibrium value of λ (unless $\lambda = 1$ in which case λ will be unchanged). A higher λ in turn, affects the equilibrium wage rate, (25), in the following way:

$$\frac{\partial w}{\partial \lambda} = -\frac{\alpha - \overline{w} + t}{3\left(1+\lambda\right)^2} < 0, \tag{30}$$

i.e. the wage rate must fall. An increase in λ corresponds to more goods being subject to international competition. This is taken into account by the trade unions, so more competition at the product markets again spills over to the labor market.

As mentioned above, Naylor assumes that λ is given and independent of t, but this is in our more general set up not the case. From (27) it follows that MB rises if t falls, and when the MB curve shifts upwards, it is easily seen from Figure 1 that λ rises ($\frac{\partial \lambda}{\partial t} \leq 0$). I.e. when the variable cost of trade falls, then more firms find that the variable profit from exporting is sufficient to cover the fixed cost. Now, by totally differentiating the equilibrium wage rate, (25), we find that

$$\begin{aligned} \frac{dw}{dt} &= \frac{\partial w}{\partial t} + \frac{\partial w}{\partial \lambda}\frac{\partial \lambda}{\partial t} \\ &= -\frac{1}{6} - \frac{\alpha - \overline{w} + t}{3\left(1+\lambda\right)^2}\frac{\partial \lambda}{\partial t}. \end{aligned} \tag{31}$$

A reduction in variable trade costs, t, has two effects on the wage rate. First, there is the direct Naylor effect, $\frac{\partial w}{\partial t}$, which tends to increase wages. Second, there is the indirect effect, $\frac{\partial w}{\partial \lambda}\frac{\partial \lambda}{\partial t}$, which has a negative impact on wages through spill over effects to the labor market, that arise from the introduction of international competition for some goods. Hence, the sign of $\frac{dw}{dt}$ is ambiguous as it for instance depends on the magnitude of $\frac{\partial \lambda}{\partial t}$. If a change in t has a great effect on λ, then product market integration, modelled as a decrease in t, gives rise to lower wages. Contrary to that, if λ is not affected very much by a change in t, then we have the result of Naylor, that a reduction in t reduces wages.

always be higher than the price.

5 Conclusion

In this paper, we have developed a very general framework in which to analyze the relationship between wages and product market integration in unionized countries. Our model encompasses both the trade cost model of Naylor (1998) and the market access models of Huizinga (1993) and Sørensen (1993). We have shown that product market integration, modelled as a reduction in trade costs, has an ambiguous effect on wages determined by trade unions. A reduction of fixed costs of exporting leads to an unambiguous decrease in wages, while a reduction in variable trade costs has an ambiguous effect on wages.

By focusing solely on one industry in which reciprocal intra-industry trade prevails, Naylor (1998) overlooks the fact that some industries potentially find it optimal to start engaging in two-way trade when variable trade costs are reduced. If a reduction in variable trade cost makes it profitable for many firms to start engaging in intra industry trade then wages falls. The reason is an increasing degree of competition at the goods markets which is taken into account by the trade unions thereby creating a spill over effect to the labor market. On the other hand, if there is only a few goods for which there will be entry from abroad, then wages increase due to higher demand for labor as also shown in Naylor (1998).

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