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Trade Liberalization and Labor Unions

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Abstract

The present note builds a two-country model of Cournot oligopoly with country-specific labor unions. The impact of trade liberalization on wages and its consequent impact on union behavior and trade patterns are examined. We show that the union with relatively fewer number of firms will face the stronger pressure for wage moderation when trade is liberalized. We use this result to construct a simple example in which a country with higher autarky price becomes a net exporter of that good. We also discuss that our results are critically dependent on the mode of competition between firms.

Key words: trade liberalization, labor unions, trade patterns.

JEL Classification: F12, J51

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Introduction

The proliferation of trade liberalization through both economic integration (e.g., the European Union) and trade agreements (e.g., WTO) has spawned a vast literature on the implications of trade liberalization. As yet, however, little attention has been paid to the implications of trade liberalization for labor union behavior.

Huizinga (1993) was the first to analyze an imperfectly competitive two-country model where unions were present in both countries. He considered trade liberalization that involves a movement from autarky to free trade, and found that liberalization lowers wages and increases welfare in both countries. Along this line, Naylor (1998) considered the impact of small reductions in arbitrary tariffs. His focus was on the impact of trade liberalization on wage determination, and the analysis was restricted to the case of the integration of identical countries: each country has an identical market structure (one firm in each country) and same market size. This is a reasonable setting to emphasize the impact of trade liberalization on the unions' wage-setting behavior. What seems to be lacking, however, is the relationship between initial differences across the integrating countries and the nature of union behavior.[1]

In this note, we consider the case in which there are initial differences in the number of firms. We examine how these differences affect both union behavior and the nature of the trading equilibrium. We demonstrate that, through trade liberalization, the union with fewer firms faces a stronger pressure for wage moderation, and thus the firms' cost-competitiveness of the country is reinforced by this union behavior. Using this result we show, by constructing a simple example, that the autarky price does not predict the

trade patterns in the free trade equilibrium. We also discuss that our results are critically dependent on the assumption of Cournot competition between firms: the results cannot be extended to a Bertrand game.[2]

The basic model of trade liberalization is outlined in the next section. In Section 3, we construct a simple example which highlights the interaction between the union behavior and trade patterns.

1 The model

Suppose that there are two countries in the world: Home and Foreign. There are n Home firms, and n^* Foreign firms (asterisk indicates a Foreign variable). We assume that all firms in each country confront a country-specific monopoly union (Home union and Foreign union) which maximizes rents and represents all the workers employed in the firms.

The sequences of decision making is modeled as a two-stage game. In Stage-1, each union chooses a wage taking as given the wage set by the other union and taking into account the firms' labor demand function. In Stage-2, each firm chooses its output taking as given both the output decision of the other (not only other country's but also other domestic) firms and the wage set by the union. We solve the model by backward induction.

Firstly, let us consider Stage-2. We assume that the marginal product of labor is constant, and is normalised to unity. Thus, we can discuss output and employment interchangeably. The demand function for the integrated market is assumed to be linear and is given by

$$p = a - b(\sum_{i=1}^{n} l_i + \sum_{i=1}^{n^*} l_i^*), \tag{1}$$

where l_i and l_i^* are the employment level of the representative Home and Foreign firms, respectively. Each Home firm and Foreign chooses its input to maximize $\pi = (p-w)l$ and $\pi^* = (p-w^*)l^*$, respectively.[3] Solving first-order conditions in the familiar way (imposing symmetry on the optimal input for all firms in the same country) yields

$$l = \frac{a-(n^*+1)w+n^*w^*}{b(n+n^*+1)}, \tag{2}$$

$$l^* = \frac{a-(n+1)w^*+nw}{b(n+n^*+1)}. \tag{3}$$

Next, turn to Stage-1. We assume that each union maximizes its rents.[4] Hence, Home and Foreign payoff functions may be written as

$$U = (w-\bar{w})nl, \tag{4}$$

$$U^* = (w^*-\bar{w})n^*l^*, \tag{5}$$

where $\bar{w}$ is the competitive wage level that is common to both countries. In Stage-1 the Home union chooses its wage to maximize (4) taking into account (2). The Foreign union also solves a similar problem. The best response functions are

$$w = \frac{a+n^*w^*+(n^*+1)\bar{w}}{2(n^*+1)}, \tag{6}$$

$$w^* = \frac{a+nw+(n+1)\bar{w}}{2(n+1)}. \tag{7}$$

Solving (6) and (7) yields the Nash equilibrium level for wages:[5]

$$w = \frac{(2n+n^*+2)a+(n+1)(3n^*+2)\bar{w}}{3nn^*+4(n+n^*+1)}, \tag{8}$$

$$w^* = \frac{(2n^*+n+2)a+(n^*+1)(3n+2)\bar{w}}{3nn^*+4(n+n^*+1)}. \tag{9}$$

Now, from (8) and (9) we obtain the relationship between the number of firms and wages:

$$w - w^* = \frac{(n - n^*)(a - \bar{w})}{3nn^* + 4(n + n^* + 1)}. \tag{10}$$

This implies that, in the free trade equilibrium, the country with more firms will have a *higher* wage rate.

Proposition 1: *If two countries liberalize trade, the union with fewer firms will choose a lower wage level compared to the other country's union.*

Proposition 1 describes the critical result on wage moderation. Increased product market competition implies an inward shift of the labor demand curve for each union, which works to moderate each union's wage-setting behavior. Differences in the number of firms determine the relative pressure for wage moderation: the larger the number of the other country's firms, the larger the inward shift of the labor demand curve.[6]

The number of *domestic* firms, on the other hand, does not affect wage-setting behavior. This is true under autarky because, even if the number of domestic firm increases, total employment is equal to union's membership (cf. (6) with $n^* = 0$). However, under international oligopoly, the number of domestic firm does affect wage-setting behavior since it determines the relative shift of the labor demand curves. This result emerges as a special feature of the asymmetric unionized oligopoly. If the number of firms in each country is the same, then there is an equalization of union-set wages, which confirms the findings of previous studies'.[7] When we consider the nature of trading equilibrium, this point plays a crucial role.

2 Labor unions and trade patterns

In this section, we construct a simple example to illustrate the impact of union behavior on trade patterns. Assume that each country's demand function before trade is as follows:[8]

$$\begin{aligned} p &= a - \frac{b}{m}(nl), \\ p^* &= a - \frac{b}{m^*}(n^* l^*), \\ m + m^* &= 1, \end{aligned}$$

where m (m^*) is the parameter of the market size. Also assume that $n < n^*$. In this case, the autarky wage rate becomes

$$w^A = w^{*A} = \frac{a + \bar{w}}{2},$$

where A refers to the equilibrium value in autarky. Note that the number of domestic firms does not affect the equilibrium wage rates. Substituting these wage rates into firms' first order conditions and demand functions, we obtain that

$$p^A = \frac{a + nw^A}{n+1} > \frac{a + n^* w^{*A}}{n^* + 1} = p^{*A}, \textit{given } n < n^* \textit{ and } w^A = w^{*A}.$$

Turning to trading equilibrium, using Proposition 1, it follows that $w^T < w^{*T}$ (where w^T and w^{*T} are the equilibrium wage rates when trade is liberalized). Now, through the differences in union behavior, Home firms obtain a cost advantage in the Stage-2 Cournot game and produce more than Foreign firms, i.e., $l^T > l^{*T}$. We can easily show that there are some cases in which $nl^T/(nl^T + n^* l^{*T}) > m/(m + m^*)$ holds and the Home country becomes a net exporter of the good.[9] [10] This leads to the following proposition.

Proposition 2: *In the presence of labor unions, a country with a higher autarky price may be an exporter of the good in a trading equilibrium.*

Our results on trade patterns differ from those obtained in the standard trade models with imperfectly competitive markets.[11] In those models, a country with a larger number of firms will have a lower autarky price and become a net exporter. In our example with labor unions, however, trade liberalization affects unions' wage-setting behavior which also has a reinforcing effect on trade patterns: a country with a smaller number of firms and a higher autarky price becomes a net exporter. The point we wish to emphasize is the interaction between trade liberalization and union behavior. If we suppose an initial differences in the number of firms, it becomes important to consider not only the unions' wage-setting behavior but also its impact on trade patterns.

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Notes

1. Huizinga (1993, p. 253) notes that the firm and the union in the smaller market can be shown to gain from integration relative to the case of equal market size and vice versa. However, differences in market structure are not

examined in his paper. Naylor (1998, p. 1263) also notes the importance of initial differences in the number of firms.

2. See Note 6.

3. We drop the subscript i hereafter.

4. For the discussion of the union objectives, see Oswald (1985) and Booth (1995, ch. 4).

5. The case of $n = n^* = 1$ corresponds to Huizinga (1993).

6. The result does not hold if the firms play a Bertrand game. Since the marginal cost for each firm is the wage set in each country, the firms with a higher wage rate will exit the market. Knowing this, each union will set the same wage rate when trade is liberalized.

7. See, for example, Huizinga (1993).

8. By combining these demand functions, we can obtain the demand function for the integrated market as (1).

9. The share of Home demand in the trading equilibrium is $m/(m + m^*)$.

10. An example is $m = 1/3, m^* = 2/3, n = 1, n^* = 2$, i.e., Foreign market size is twice as large as Home and Foreign has more firms. In this case, equilibrium outputs become $l^T = 9(a - \bar{w})/44b > 7(a - \bar{w})/44b = l^{*T}$. Thus, $l^T/(l^T + 2l^{*T}) > 1/3$ holds and Home country becomes a net exporter.

11. See, for example, Helpman and Krugman (1985, ch. 5).

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