



# Endogenous domestic market structure and the effects of a trade cost reduction in a unionised industry

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## ABSTRACT

In contrast to the existing partial equilibrium literature considering the effects of a trade cost reduction on unionised wage under a given market structure, we show the effects by determining the domestic market structure endogenously. A lower trade cost reduces the number of active domestic firms, but it increases unionised wage in the active domestic firms under decentralised unions. Although a lower trade cost increases wage in the active domestic firms, it reduces domestic employment and total union utility at the free entry equilibrium. So, a trade cost reduction benefits domestic employed workers by increasing the unionised wage, but its effect on the total domestic workers is not favourable. If there is a centralised union, a lower trade cost reduces the number of active domestic firms, unionised wage, domestic employment and union utility.

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## 1. Introduction

Government policies and/or technological progress are reducing trade costs<sup>1</sup> significantly in recent decades. While the general belief is that a trade cost reduction benefits the consumers and increases welfare of the importing country, there is concern about its adverse effects on wages. While the earlier literature has focused on competitive labour markets (Stolper and Samuelson, 1941),<sup>2</sup> recent literature uncovers the effects on the unionised wage also. This concern is more severe in Europe, where the presence of labour unions is prominent in many countries. As documented in OECD (2004), the proportion of workforce under union agreements was 67% in Europe, while it was 14% in the USA.

Rodrik (1997) points out that globalisation reduces the power of the trade unions and creates an adverse wage effect. As documented in Niblett (2005), the negative perception in the European Union towards increased globalisation is an important reason for the rejection of the European Constitution by French and Dutch voters. The theoretical results of Huizinga (1993) and Sørensen (1993) confirm this concern, yet there are other views suggesting that a trade cost reduction may

increase the unionised wage. The factors attributed so far to the beneficial wage effect of a trade cost reduction are two-way trade cost reduction (Naylor, 1998, 1999; Gürkthzgen, 2002;<sup>3</sup> Munch and Skaksen, 2002), “efficient union-firm bargaining”<sup>4</sup> (Gaston and Trefler, 1995), open shop unions (Bastos et al., 2009), trade in intermediate and final goods (Mukherjee and Liu, forthcoming) and formal–informal productions (Maiti and Mukherjee, forthcoming). The empirical evidence on this topic, although scarce, is also mixed (see, Gaston and Trefler, 1995; Konings and Vandenbussche, 1995).

The theoretical papers with partial equilibrium analysis provide interesting insights on this topic, yet they are restrictive by considering a given market structure.<sup>5</sup> We offer a new perspective by considering free entry in the domestic country, thus determining the domestic market structure endogenously. We consider decentralised (or firm-specific) and centralised (or an industry-wide) labour unionisation structures for our analysis.<sup>6</sup> We show that a trade cost reduction

<sup>3</sup> Gürkthzgen (2002) shows that a unilateral trade cost reduction by an importing country can reduce unionised wage in that country if the products are complements.

<sup>4</sup> The “efficient bargaining” model, which stipulates that the firms and unions bargain over wages and employment, is an alternative to the right-to-manage model, where the firms and unions bargain only over wages. See, Layard et al. (1991) for arguments in favour of the right-to-manage models.

<sup>5</sup> Although Bastos and Kreickemeier (2009) provide a general equilibrium analysis to show that a lower trade cost may increase domestic unionised wage, the two-way trade like that of Naylor (1998, 1999), Gürkthzgen (2002), and Munch and Skaksen (2002) is responsible for their result.

<sup>6</sup> While the decentralised wage setting may be relevant, e.g., in Japan and North America, the centralised wage setting is relevant, e.g., in Germany and Scandinavia.

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<sup>1</sup> The general term “trade cost” is used to represent different types of trade barriers (Anderson and van Wincoop, 2003). For example, it captures both the policy induced trade cost such as tariff and the non-policy induced trade cost such as transportation cost.

<sup>2</sup> See, e.g., Krugman et al. (2012) for a discussion on trade and factor prices in a competitive model.

reduces the number of active domestic firms, irrespective of the unionisation structure. However, it increases the unionised wage in the active domestic firms under decentralised unions, while it reduces the unionised wage under a centralised union.

A lower trade cost creates two opposing effects under decentralised unions. For a given number of domestic firms, it reduces domestic wage, but it increases concentration in the domestic industry by reducing the number of active domestic firms. Fewer domestic firms following trade cost reduction tend to increase the unionised wage in the active domestic firms. We find that the latter effect dominates the former, and a unilateral trade cost reduction increases the unionised wage.

Under a centralised union, wage is positively related to trade cost, irrespective of the number of domestic firms. While the above-mentioned wage reducing effect of a lower trade cost remains under a centralised union, it does not create the wage increasing effect. Thus, a trade cost reduction reduces the unionised wage under a centralised union. Therefore, the relation between a lower trade cost and domestic unionised wage depends on the unionisation structure.

We also show that a lower trade cost reduces domestic employment and total union utility at the free entry equilibrium, irrespective of the unionisation structure. So, a trade cost reduction may benefit domestic employed workers by increasing the unionised wage, but its effect on the total domestic workers is not favourable.

The remainder of the paper is organised as follows. Section 2 describes the model and derives the results under decentralised unions. Section 3 determines the effects of a trade cost reduction under a centralised union. Section 4 concludes.

## 2. The case of decentralised unions

Assume that there is a foreign firm (firm 1), which has invented a technology and wants to sell the product in another country, called domestic country. There are a large number of firms in the domestic country. The domestic firms get the technical know-how of the foreign technology through knowledge spillover. These firms can compete in the domestic country with homogeneous products. However, the domestic firms decide whether or not to enter the market. If a domestic firm enters, it needs to incur a fixed cost,  $K^2$ . We consider free entry in the domestic country. The number of domestic firms entering the market is determined endogenously by the zero profit condition.

We consider that the marginal cost of production of firm 1 is constant, thus considering a perfectly competitive foreign labour market. We normalise firm 1's marginal cost of production to zero.<sup>7</sup> However, firm 1 faces a per-unit trade cost (either due to transportation cost or due to domestic tariff)  $t$ .

We assume that the labour market in the domestic country is unionised. This section considers decentralised unionisation structure, where each domestic firm is paired with a domestic labour union, which determines the wage and the corresponding firm hires workers according to its requirement. Hence, we consider a right-to-manage model of labour union (see, e.g., Bughin and Vannini, 1995; Vannini and Bughin, 2000; López and Naylor, 2004; Mukherjee et al., 2008; Bastos and Kreickemeier, 2009). For simplicity, we assume that each domestic firm requires one worker to produce one unit of output.<sup>8</sup> We normalise the reservation wage of the domestic workers to zero.

The inverse market demand function in the domestic country is

$$P = 1 - q, \tag{1}$$

where  $P$  is price and  $q$  is the total output.

We consider the following game. Given the trade cost, at stage 1, the domestic firms decide whether to enter the market. At stage 2, each

domestic firm that enters the market is paired with a labour union, which determines wage for the paired domestic firm. At stage 3, firm 1 and the domestic firms compete like Cournot oligopolists. We solve the game through backward induction.

If  $n$  domestic firms enter the market (denoting them from 2 to  $(n + 1)$ ) and the unionised wage paid by the  $i$ th domestic firm is  $w_i$ ,  $i = 2, 3, \dots, n + 1$ , the equilibrium output of the  $i$ th domestic firm can be found as

$$q_i^* = \frac{1 - (n + 1)w_i + t + \sum_{\substack{j=2 \\ i \neq j}}^{n+1} w_j}{n + 2}. \tag{2}$$

Since we consider that each domestic firm requires one worker to produce one unit of output, the equilibrium output of the  $i$ th firm in Eq. (2) also shows the equilibrium labour demand faced by the  $i$ th firm specific labour union. Following several previous papers with labour unions, such as Vannini and Bughin (2000), Leahy and Montagna (2000), Naylor (2002), Haucap and Wey (2004), Mukherjee (2008, 2010), Mukherjee et al. (2008) and Manasakis and Petrakis (2009), we assume that the labour union gives the same weight on wage and employment. Hence, the utility of the  $i$ th labour union is  $U_i = w_i q_i^*$ , due to our normalisation of the workers' reservation wages.<sup>9</sup>

To show our results in the simplest way, we assume that the labour unions have full bargaining power in determining the wages.<sup>10</sup> Hence, the  $i$ th labour union determines  $w_i$  by maximising the following expression:

$$\text{Max}_{w_i} \left( \frac{w_i \left( 1 - (n + 1)w_i + t + \sum_{\substack{j=2 \\ i \neq j}}^{n+1} w_j \right)}{n + 2} \right), i = 2, 3, \dots, n + 1. \tag{3}$$

The equilibrium wage can be found as

$$w_i^* = \frac{1 + t}{n + 3}, i = 2, 3, \dots, n + 1. \tag{4}$$

It is clear from Eq. (4) that if the number of domestic firms is exogenous, a trade cost reduction (i.e., a lower  $t$ ) reduces domestic unionised wage, which is in line with the existing literature. This suggests an adverse wage effect.

It also follows from Eq. (4) that if  $n$  reduces, i.e., the number of domestic firms falls, the wage in each active domestic firm increases.

Given the equilibrium outputs and wage, the net equilibrium profit of the  $i$ th domestic firm is

$$\pi_i^* = \frac{(1 + t)^2 (n + 1)^2}{(n + 2)^2 (n + 3)^2} - K^2, i = 2, 3, \dots, n + 1. \tag{5}$$

Free entry equilibrium number of domestic firms is determined by  $\pi_i^* = 0$ , which gives the equilibrium number of domestic firms as

$$n^* = \frac{1 - 5K + t + \sqrt{1 - 6K + K^2 + 2t - 6Kt + t^2}}{2K}. \tag{6}$$

We assume that at least one domestic firm always enters the market, which implies that  $1 - 6\sqrt{2}K + t > 0$ .

<sup>7</sup> Assuming that production requires only labour, we can normalise the labour coefficient of the foreign firm to zero to make its marginal cost of production equal to zero.

<sup>8</sup> The higher labour coefficients of the domestic firms compared to the foreign firm may represent imperfect knowledge spillover.

<sup>9</sup> With a positive reservation wage, the union utility function is  $U_i = (w_i - \bar{w})q_i^*$ . For simplicity, we normalise  $\bar{w}$  to zero.

<sup>10</sup> See, e.g., Cahuc and Zylberberg (2004) for a discussion on union bargaining. Our qualitative results hold even if the firms and the unions bargain for wages.

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