The University of Nottingham

research paper series

Theory and Methods

Research Paper 2010/25

Endogenous Domestic Market Structure and the Effects of Trade Liberalisation in a Unionised Industry

By

Arijit Mukherjee

The Centre acknowledges financial support from The Leverhulme Trust under Programme Grant F/00 114/AM

GEP

Leverhulme Centre for Research on Globalisation and Economic Policy

The Author

Arijit Mukherjee, Associate Professor & Reader, School of Economics, and Internal Fellow of The Leverhulme Centre for Research in Globalisation and Economic Policy, University of Nottingham, UK, and Member of CESifo, Germany.

Endogenous Domestic Market Structure and the Effects of Trade Liberalisation in a Unionised Industry

By

Arijit Mukherjee

Abstract:

We offer a new perspective to the unionised wage effects of unilateral trade liberalisation by considering endogenous domestic market structure. Hence, in contrast to the existing works, which focus on the short-run effects of trade liberalisation on unionised wage, we focus on more long-run effects by considering the effects of trade liberalisation on the domestic market structure. Trade liberalisation reduces the number of active domestic firms, but it increases domestic unionised wage in the active domestic firms. Although trade liberalisation increases wage in the active domestic firms, it reduces domestic employment and total union utility at the free entry equilibrium. So, trade liberalisation benefits domestic employed workers by increasing unionised wage, but its effect on total domestic workers is not favourable.

Key words: Free entry; Labour union; Trade liberalisation

JEL Classifications: F12; J50; L11

Outline:
Section 1: Introduction
Section 2: The basic Model
Section 3: Conclusion

Non-Technical Summary

Government policies and/or technological progress are reducing trade costs significantly in recent decades. While the general belief is that trade liberalisation benefits the consumers and increases welfare of the importing country, there is concern about its adverse effects on trade unions and wages. However, there are other views, which suggest that trade liberalisation may increase unionised wage. The factors attributed to the beneficial wage effect of trade liberalisation are two-way trade liberalisation, "efficient union-firm bargaining", Bertrand competition, open shop unions and formal-informal productions. The existing literature provides interesting insights, yet they are restrictive by considering an exogenous market structure. Hence, they show the short-run effects of trade liberalisation on unionised wage.

We offer a new perspective by considering free entry in the domestic country, thus focusing on more long-run effects of trade liberalisation through its effect on the domestic market structure. We show that trade liberalisation reduces the number of active domestic firms, but it increases the unionised wage in the active domestic firms. Trade liberalisation creates an adverse wage effect in the short-run, which is characterised by a given number of domestic firms, but it creates a favourable long-run wage effect in the active domestic firms by reducing the equilibrium number of domestic firms. Although trade liberalisation increases wage in the active domestic firms, we show that it reduces domestic employment and total union utility at the free entry equilibrium. So, trade liberalisation benefits domestic employed workers by increasing unionised wage, but its effect on total domestic workers is not favourable.

Endogenous domestic market structure and the effects of trade liberalisation in a unionised industry

1. Introduction

Government policies and/or technological progress are reducing trade costs significantly in recent decades. While the general belief is that trade liberalisation benefits the consumers and increases welfare of the importing country, there is concern about its adverse effects on trade unions and wages. This concern is more severe in countries such as 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 reduce the power of the trade unions and create 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), which show that unionised wage is higher under autarky than under free trade, confirm this concern.

However, there are other views, which suggest that trade liberalisation may increase unionised wage. The factors attributed to the beneficial wage effect of trade liberalisation are two-way trade liberalisation (Naylor, 1998 and 1999, Munch and

Skaksen, 2002 and Bastos and Kreickemeier, 2009), "efficient union-firm bargaining"[1] (Gaston and Trefler, 1995), Bertrand competition (Gūrthzgen, 2002), open shop unions (Bastos et al., 2009) and formal-informal productions (Maiti and Mukherjee, 2010). The empirical evidence on this topic, although scarce, is also mixed (see, Gaston and Trefler, 1995 and Konings and Vandenbussche, 1995). These papers provide interesting insights, yet they are restrictive by considering an exogenous market structure. Hence, they show the short-run effects of trade liberalisation on unionised wage.

We offer a new perspective by considering free entry in the domestic country, thus focusing on more long-run effects of trade liberalisation through its effect on the domestic market structure. We show that trade liberalisation reduces the number of active domestic firms, but it increases the unionised wage in the active domestic firms. Trade liberalisation creates two opposing effects. For a given number of domestic firms, it reduces domestic wage. However, it increases concentration in the domestic industry by reducing the number of active domestic firms, thus creating a new effect. Fewer domestic firms following trade liberalisation tends to increase the unionised wage in the active domestic firms. We find that the latter effect dominates the former, and a unilateral trade liberalisation increases unionised wage. Thus, we show that if we ignore all the factors creating the beneficial wage effects of trade liberalisation in the existing papers, endogenous domestic market structure can be responsible for higher unionised wage following a unilateral trade liberalisation. We suggest that trade liberalisation creates an adverse wage effect in the short-run, which is characterised by

[1] 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 right-to-manage models.

a given number of domestic firms, but it creates a favourable long-run wage effect in the active domestic firms by reducing the equilibrium number of domestic firms.

Although trade liberalisation increases wage in the active domestic firms, we show that it reduces domestic employment and total union utility at the free entry equilibrium. So, trade liberalisation benefits domestic employed workers by increasing unionised wage, but its effect on total domestic workers is not favourable.

The reminder of the paper is organised as follows. Section 2 describes the basic model and derives the results. Section 3 concludes.

2. The basic model

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 is 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 a homogeneous product. However, the domestic firms decide whether to enter the market. We consider free entry in the domestic country, where entry requires a fixed entry cost K^2. The entry cost can be viewed as a fixed investment or the opportunity cost of entering the market. The number of domestic firms entering the market is determined endogenously by the zero profit condition. Entry in the domestic country occurs until the net positive profit of a domestic entrant is positive. For analytical convenience, we will consider the number of firms as a continuous variable, unless specified otherwise.

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.[2] 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. 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 and Bastos and Kreickemeier, 2009). For simplicity, we assume that each domestic firm requires one worker to produce one unit of output.[3] We also normalise the reservation wage of the domestic workers to zero.

The inverse market demand function in the domestic country is $P = 1 - q$, where P is price and q is the total output sold.

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

[2] Assuming that production requires only labour, we can normalize the labour coefficient of the foreign firm to zero to make its marginal cost of production equal to zero.
[3] The higher labour coefficients of the domestic firms compared to the foreign firm may represent imperfect knowledge spillover.

unionised wage paid by the *i*th domestic firm is w_i, $i = 2,3,...,n+1$, the equilibrium output of the *i*th domestic firm can be found as

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

The *i*th labour union therefore determines w_i by maximizing the following expression:[4]

$$\underset{w_i}{Max} \frac{w_i(1-(n+1)w_i + t + \sum_{\substack{j=2 \\ i \neq j}}^{n+1} w_j)}{n+2}, \; i = 2,3,...,n+1. \qquad (3)$$

The equilibrium wage can be found as

$$w_i^* = \frac{1+t}{n+3}, \quad i = 2,3,...,n+1. \qquad (4)$$

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

It also follows from (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, we get the net equilibrium profit of the *i*th domestic firm as

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

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

[4] We will consider a more general union objective function in the Appendix.

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

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

Proposition 1: *Trade liberalisation reduces the free entry equilibrium number of domestic firms.*

Proof: We get that $\frac{\partial n^*}{\partial t} = \frac{1}{2}\left(1+\frac{1-3K+t}{\sqrt{(1+t)^2-6K(1+t)+K^2}}\right) > 0$. ■

The reason for the above result is as follows. Trade liberalisation reduces competitiveness of the domestic firms, thus reducing their net profits from entering the market and reduces the free entry equilibrium number of domestic firms.

The equilibrium domestic unionised wage at the free entry equilibrium is then

$$w^* = \frac{2K(1+t)}{(1+t)+K+\sqrt{(1+t)^2-6K(1+t)+K^2}}. \qquad (7)$$

Proposition 2: *Trade liberalisation increases domestic unionised wage at the free entry equilibrium.*

Proof: We get from (7) that $\frac{\partial w^*}{\partial t} = \frac{1}{4}\left(1-\frac{1-3K+t}{\sqrt{(1+t)^2-6K(1+t)+K^2}}\right) < 0$.

As already mentioned, trade liberalisation creates two opposing effects. On the one hand, it tends to reduce unionised wage for a given number of domestic firms. On

the other hand, it tends to increase unionised wage in the active domestic firms by reducing the number of domestic firms. On the balance, the latter effect dominates, and trade liberalisation increases unionised wage in the active domestic firms.

We show in the *Appendix* that the above mentioned trade-off holds even under a more general union objective function, where the unions give different weights on wage and employment, and bargain with the firms for wages. Unfortunately, due to the complex expression, we cannot derive an analytical expression like Proposition 2 under the general union objective function.

Now we want to see the effects of trade liberalisation on domestic employment and total union utility.

At the free entry equilibrium, the equilibrium output of an active domestic firm is *K*, which is also equal to the equilibrium employment in an active domestic firm. Hence, total domestic employment at the free entry equilibrium is $E^* = n^* K$. Since n^* reduces with trade liberalisation, we get that trade liberalisation reduces domestic employment at the free entry equilibrium, i.e., $\frac{\partial E^*}{\partial t} > 0$.

Finally, total union utility at the free entry equilibrium is $U^* = n^* w^* K$. We get that $\frac{\partial U^*}{\partial t} = \frac{1}{4}\left(1 + \frac{3(1-3K+t)}{\sqrt{(1+t)^2 - 6K(1+t) + K^2}}\right) > 0$. Trade liberalisation reduces the equilibrium number of domestic firms, yet it increases the wage in the active domestic firms. We get that the number of firm effect dominates the wage effect, and trade liberalisation reduces total union utility.

We summarise the above discussion in the following proposition.

Proposition 4: *Trade liberalisation reduces domestic employment and total union utility at the free entry equilibrium.*

3. Conclusion

Many countries are liberalising their trade policies, which create concern about their effects on domestic labour markets and have attracted significant attention from the researchers. Although the existing literature has provided several important insights, it is restrictive by considering an exogenously given market structure. We provide a new perspective to this literature by considering free entry in the domestic country, thus focusing on endogenous market structure. Thus, our paper focuses on more long-run effects of trade liberalisation.

We show that even if trade liberalisation creates an adverse short-run wage effect, it creates a favourable long-run wage effect in the active domestic firms by reducing the equilibrium number of domestic firms. While trade liberalisation benefits domestic employed workers by increasing unionised wage, its effect on total domestic workers is not favourable, since it reduces domestic employment and total union utility.

Appendix

A general union objective function: We show in the Appendix that the trade-off mentioned for Proposition 2 holds under a more general union objective function, where the unions give different weights on wage and employment, and bargain with the firms for wages.

If there are *n* domestic firms, wage in the *i*th domestic firm is determined by maximising the following expression:

$$\underset{w_i}{Max}\left[w_i^{\delta}\left(\frac{1-(n+1)w_i+t+\sum_{\substack{j=2\\ i\neq j}}^{n+1} w_j}{n+2} \right)^{(1-\delta)} \right]^{\beta} \left[\frac{1-(n+1)w_i+t+\sum_{\substack{j=2\\ i\neq j}}^{n+1} w_j}{n+2} \right]^{2(1-\beta)}, \; i=2,3,...,n+1, \qquad \text{(A1)}$$

where $\delta \in (0, 0.5]$ ($(1-\delta)$)[5] is the weight given by each union to wage (employment) and $\beta \in (0,1]$ ($(1-\beta)$) is the bargaining power of each union (firm).

We get that the equilibrium wage is

$$w_i^* = \frac{\beta\delta(1+t)}{(n+1)(2-\beta)-\beta\delta(n-1)}, \qquad i=2,3,...,n+1. \qquad \text{(A2)}$$

It is immediate from (A2) that, given *n*, a lower *t* reduces w_i^*. We also get that $\frac{\partial w_i^*}{\partial n} = -\frac{\beta\delta(2-\beta-\beta\delta)(1+t)}{[(n+1)(2-\beta)-\beta\delta(n-1)]^2} < 0$, which implies that, ceteris paribus, as the number of domestic firms reduces, it increases the unionised wage in the active domestic firms.

[5] We may consider $\delta \in (0,1]$. However, it seems more reasonable to consider that the unions pay more attention to employment compared to wage. Hence, we consider $\delta \in (0, 0.5]$. Also note that the presence of union has no real meaning if either $\delta = 0$ or $\beta = 0$, since the equilibrium wages in these situations are equal to the reservation wages irrespective of the number of firms and the trade cost.

Given the wage in (A2), the net equilibrium profit of the *i*th active domestic firm is

$$\pi_i^* = \frac{(1+t)^2(n+1)^2(2-\beta-\beta\delta)^2}{(n+2)^2[(n+1)(2-\beta)-\beta\delta(n-1)]^2} - K^2, \quad i = 2,3,...,n+1. \tag{A3}$$

The free entry equilibrium number of domestic firms is determined by $\pi_i^* = 0$. It is immediate from (A3) that a lower *t* reduces the net profits of the active domestic firms, which implies that a lower *t* reduces the free entry equilibrium number of domestic firms.

The above discussion gives us the trade-off mentioned for Proposition 2. On the one hand, given *n*, a lower *t* reduces w_i^*. On the other hand, a lower *t* tends to increase w_i^* by reducing the free entry equilibrium number of domestic firms. Proposition 2 considers a situation where the unions have full bargaining power and give the same weights on wage and employment. In this situation, we can clearly show that the above-mentioned second effect dominates the first effect, and a lower *t* increases the unionised wage in the active domestic firms.

References

Bastos, P. and U. Kreickemeier, 2009, "Unions, competition and international trade in general equilibrium", *Journal of International Economics*, 78, 238-47.

Bastos, P., U. Kreickemeier and P. Wright, 2009, "Oligopoly, open shop unions and trade liberalisation", *International Journal of Industrial Organization,* 27, 679-686.

Bughin, J and S. Vannini, 1995, 'Strategic direct investment under unionized oligopoly', *International Journal of Industrial Organization*, 13: 127-45.

Gaston, N. and D. Trefler, 1995, "Union wage sensitivity to trade and protection: theory and evidence", *Journal of International Economics*, 39, 1-25.

Gūrthzgen, N., 2002, "Trade liberalisation and union wages in a differentiated Bertrand duopoly", *Open Economies Review*, 13, 133-51.

Huizinga, H.P., 1993, "International market integration and union wage bargaining", *Scandinavian Journal of Economics*, 95(2), 249-255.

Layard, R., S. Nickell and R. Jackman, 1991, *Unemployment, macroeconomic performance and the labour market*, Oxford University Press, Oxford.

López, M. C. and R. A. Naylor, 2004, 'The Cournot-Bertrand profit differential: a reversal result in a differentiated duopoly with wage bargaining', *European Economic Review*, 48: 681-96.

Maiti, D. and A. Mukherjee, 2010, "Trade cost reduction, subcontracting and unionised wage", *Mimeo*, University of Nottingham.

Munch, J.R. and Skaksen, J.R., 2002, "Product market integration and wages in unionised countries", *Scandinavian Journal of Economics*, 104: 289-99.

Naylor, R., 1998, "International trade and economic integration when labour markets are generally unionised", *European Economic Review*, 42, 1251–1267.

Naylor, R., 1999, "Union wage strategies and international trade", *Economic Journal*, 109, 102–125.

Niblett, R., 2005, "Shock therapy", *CSIS Euro Focus 11*, June 3.

OECD, 2004, 'Wage-setting institutions and outcomes', *OECD Employment Outlook*, 127-81, Ch. 3.

Rodrik D., 1997, "Has globalisation gone too far?", *Institute for International Economics*, 128 p, Washington D.C.

Sørensen, J.R., 1993, "Integration of product markets when labour markets are unionised", *Recherches Economique de Louvain*, 59: 485-502.

Vannini, S. and J. Bughin, 2000, 'To be (unionized) or not to be? a case for cost-raising strategies under Cournot oligopoly', *European Economic Review*, 44: 1763-81.