TRADE POLICY VERSUS COMPETITION POLICY: SUBSTITUTES OR COMPLEMENTS?

BY

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Summary

This paper deals with the difference between trade policy and competition policy for domestic prices, wages, and employment when product and labour markets are imperfectly competitive. We show that in the presence of country-specific institutions like trade unions, trade policy and competition policy are no longer substitutes in disciplining product and labour market distortions. While both domestic entry and foreign imports affect domestic price-cost margins, they differ in their effectiveness and their impact on the domestic labour market. The results in this paper suggest that enforcement of competition policy without a sufficient degree of openness to imports is typically not a first-best outcome. While domestic entry increases union welfare, foreign imports reduce it. Competition policy in the presence of labour unions is insufficient to reduce labour market distortions, while international competition reduces both labour and product distortions.

Key words: import competition, domestic entry, monopoly union, Nash bargaining

1 INTRODUCTION

At present trade policy is regulated at the supranational level of the WTO[1] while competition policy is still very much under the auspices of national governments. One of the reasons for trade policy coordination is that individual countries may have unilateral incentives to deviate from free trade. Recently the same type of argument has been put forward regarding competition policy. A number of economists have started to advocate the introduction of a 'global' competition policy (Lloyd (1998)) to complement trade policy. This rests on the belief that the openness of a country is not a sufficient guarantee for product market competition and erosion of national monopolies. The discussion of these issues has largely focussed on the effects of both types of policies on the product market. In this paper I want to contribute to this debate by showing that when considering the effects of trade *versus* competition policy, attention should not be limited to the

product market but should also involve the implications for the labour market. The question I want to address here is whether in the face of imperfect labour markets, trade policy and competition policy are substitutes or complements.

For this purpose I use a very simple set-up. I will take off from a country which under autarky has two sectors, a perfectly competitive numeraire sector and an imperfectly competitive sector with a local monopoly. The government of that country can take one of the following two actions to regulate the monopoly. Either it can open its borders and allow foreign imports to flow in. In this case trade liberalization will discipline the local monopoly, assuming that the foreign firm continues to produce abroad. Or[2] the government can instead enforce competition policy to regulate the domestic monopoly by allowing domestic entry.[3] It will become clear that in the absence of labour market institutions the two courses of action are indeed substitutes. In both cases the monopoly is left for a Cournot duopoly which lowers prices and increases consumer welfare. However, we will see that in the presence of labour market institutions like for example a trade union, trade and competition policy are no longer substitutes. There effects on domestic prices, wages, and employment are very different.[4]

The results we present are robust with respect to the way the trade union is modelled. We consider both the case of a monopoly union, setting the wage for the entire imperfectly competitive home industry, and the case of Nash wage bargaining between the union and the home industry.[5] In the case of Nash wage bargaining we assume that the domestic firm(s) are committed to producing in the domestic country after the bargaining. This means we implicitly abstain from relocation possibilities.[6] This makes our analysis different from Zhao (1998) and Wes (1995). They show that when firms are not committed to their location (footloose), domestic firms can threaten the union to move elsewhere which makes the union weaker in the bargaining process and lowers domestic wages. In this paper we assume firms can commit to a location before bargaining takes place.

One conclusion that arises form this simple analysis is that when labour market institutions are country-specific, domestic competition policy without a sufficient degree of openness, will typically not be first-best. The reason is that *domestic competition* (inward FDI or domestic entry) erodes monopoly power in

2   A third course of action may consist in both opening borders and encouraging domestic or foreign entry by means of setting up local production facilities. However, in order to make a comparison we focus on the either/or issue in the two distinct cases.

3   Domestic entry can involve Foreign Direct Investment by foreign firms in the domestic country. Hence, not ownership but location is important when discussing domestic entry.

4   A different but equally interesting question which will not be explicitly dealt with here, is the way in which labour market imperfections may affect the contestability of markets as shown for example by Dewatripont (1988).

5   A monopoly union is a special case of Nash bargaining, namely where all the bargaining power lies with the union (Booth (1995)).

6   One reason for this could be that fixed costs in the domestic country are lower than elsewhere or that there are substantial transport costs to be paid when locating elsewhere.

the product market but leaves labour market distortions largely intact, *international competition* reduces both product and labour market distortions. As a result both prices and wages decrease to a larger extent than under domestic entry which is good for home consumers. A labour union is likely to welcome domestic entry but to oppose international competition while for domestic consumers the reverse is likely to hold.

This seems to suggest that competition policy and trade policy are not substitutes but rather complements to reduce labour market imperfections and to go towards more competitive markets.

This paper is structured as follows. In section II we provide a theoretical framework which captures the interaction between increased competition in the product market and imperfect labour markets. In section III we tentatively point out some policy implications. Section IV concludes the paper.

2 THEORETICAL FRAMEWORK

In this section we show how in the presence of trade unions and endogenous wage determination, the effects of national and international competition on the domestic labour market differ. To this end we use simple theoretical tools in which we reduce the monopoly power of a domestic incumbent firm by allowing entry.[7] The entrant into the domestic market can be either domestic or international.

By a *domestic competitor* we mean a firm with production facilities within the incumbent's country borders (irrespective of ownership) while an *international competitor* exports to the incumbent's relevant product market. In the national and international duopoly case we assume Cournot competition in the domestic product market.

2.1 *The Model*

In this simple model the difference between domestic entry and imports is the location of the competitor. In the first case, the competitor is located in the domestic country while in the second case the competitor is located abroad. In what follows it will become clear that the geographical location of a competitor matters when institutional settings like trade unions are country-specific. While different employment effects of domestic *versus* international competition with exo-

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7 Our aim is not to study the decision exports *versus* FDI by a foreign multinational (see Motta (1992), Smith (1987) and Zhao (1998)). Neither do we look at equilibrium market structures (see Horstmann and Markusen (1992)) or trade policy in the presence of unions (see Brander and Spencer (1988)). For a discussion of welfare effects of exports *versus* FDI see Bughin and Vannini (1995). Instead we focus on the distinction between national and international competition (which entails more than FD/exports) and the effects on domestic wages and employment which is relevant for governments when evaluating the effects of competition *versus* trade policy on labour markets.

genous wages in the domestic market seem obvious, we will show that this is no longer the case with endogenous wage determination.

Imagine a home country with two sectors. A perfectly competitive sector and an imperfectly competitive sector. In autarky a homogeneous good is produced in the imperfectly competitive sector by a monopolist. Demand for the good in the domestic product market is assumed to be linear and of the following form

$$P(Q) = a - Q \tag{1}$$

where Q reflects the monopolist's output. A reduction in monopoly power in this sector either occurs through entry of a domestically based competitor or through imports. We move from a domestic monopoly to a Cournot duopoly in both cases. In the case of a duopoly we use X to refer to the output of the incumbent (firm 1) and Y for the output of the entrant (firm 2). As explained earlier the distinction between national and international competition depends on location, not on ownership. Domestic entry could be a reflection of improved market access through competition policy while imports could be the result of trade liberalization.[8] Results are checked for wages in the imperfectly competitive sector, both for a monopoly union and for Nash bargaining. We assume employment to be set by the firm(s) as a function of the wage and product markets competition. The perfectly competitive sector acts as a numeraire with the wage and price levels equal to 1. Any labour needed by, or freed up from the imperfectly competitive sector is supplied or absorbed by the numeraire sector. The wage level abroad is assumed to be exogenous.

Further, was assume that one unit of labor (L) is needed to produce one unit of output (X) thereby not allowing for capital/labour substitution (similar to Brander and Spencer (1988) and Mezetti and Dinopoulos (1991)).

Wage setting in the imperfectly competitive sector of the home country occurs before employment decisions are made.[9] Bargaining between the union and the home firm(s) only involves wage bargaining, leaving the employment decision to the home industry.[10] Firm 1 represents the incumbent, while firm 2 is the entrant. In the case where the entrant (firm 2) is a foreign firm, the domestic union cannot influence the wage level in that firm. In this case the foreign wage ($\bar{W}_2$) is treated as exogenously given, but as we will show below, it does influence wage negotiations in the domestic country.

The numeraire sector in the home country is perfectly competitive with profits equal to zero since both price and wage are equal to 1. Union activity can only

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8 *International* competition usually also refers to a rise in the mobility of capital across borders. However, FDI here classifies as an increase in *domestic* competition. Crucial in our definitions is whether the competitor is located within the borders of the country where labour unions are active.
9   This is the so-called 'right-to-manage' model.
10   There is considerable evidence to suggest that unions and firms do not bargain *simultaneously* over wages and employment (Booth (1995) p. 128).

take place in the imperfectly competitive sector where firm(s) make positive profits.

There is a lot of controversy as to what is the best way to model a union. Following Brander and Spencer (1988) and Mezetti and Dinopoulos (1991) we use a Stone-Geary utility function to model the union's utility in the imperfectly competitive sector.

$$U(W, L) = (W - W_a)^\epsilon \cdot L \tag{2}$$

The union's utility in (2) depends on both domestic wages (W) and employment (L) in the sector. Although the functional form chosen here is not the only alternative available, it has the advantage of being tractable and well behaved. Our results however do not depend on this specification for union utility. Common to most utility functions is that positive utility is derived from domestic wages (W) that lie above the 'fall back income' (W_a) or what workers get if they are not employed by the firms/sector. W_a is the wage in the numeraire sector which by definition is equal to one. L refers to the employment level, set by the firm(s) in a later stage of the model and ϵ is a parameter of wage preference. In order to simplify the calculations we will set ϵ equal to 1 where the union gives equal weight to wages and jobs. An alternative interpretation of $\epsilon = 1$ is that the union is risk-neutral and maximizes the total wage bill.

In the case of a monopoly union, in the first stage the union unilaterally sets the wage by maximising its utility as given in (2).

In the case of Nash wage bargaining between the union and the home industry, the first stage of this model involves a Nash bargaining process of the form

$$\Omega = (U(W) - U^0)^\beta \cdot (\pi(W) - \pi^0)^{1-\beta} \tag{3}$$

A bargaining process can be compared to a pie that needs to be divided between workers (in terms of the wages they get) and owners of the firm (in terms of the profits they get). How this pie will be divided depends on the bargaining strength of the two parties represented by a parameter β that lies between zero and 1. The stronger the union (β) the weaker the firm ($1 - \beta$) and *vice versa*. The two parties are non-cooperative in the sense that both the workers, represented by the union, and the owners, represented by the firm, try to secure the biggest share of the pie. The Nash product Ω in (3) consists of the utility of the union $U(w, L)$ above the threat point U^0 times the profit of the domestic firm $\pi(w, L)$ above the threat point π^0. Both threat points U^0 and π^0 are set equal to zero.

In what follows we first discuss the results under autarky (monopoly) and than consider what happens with additional entry (duopoly). We analyze endogenous wage setting and different types of entrants (national *versus* international).

2.2 *Autarky*

Suppose under autarky there is one domestic incumbent firm in the market, fully exploiting its market power in the product market. We assume all workers in the imperfectly competitive sector to be unionised and the fall back income (W_a) of workers in this sector to equal the wage in the perfectly competitive numeraire sector, which is one.

In order to limit the mathematical notation in the text, the equilibrium wage and employment level in the manufacturing sector under autarky are listed in the appendix. Here we will refer to them as the *initial state* of the economy of which, at the end of this section in Table 1, we offer a numerical example. The *initial state* of the economy is listed in column 1 for three different levels of the parameter β; $\beta = 0$ illustrates the absence of labour unions and the absence of a labour market distortion, rendering the wage in the imperfectly competitive sector equal to the wage in the numeraire sector; $\beta = 0.5$ illustrates the autarky situation under Nash bargaining where the home firm and union have equal bargaining power; and $\beta = 1$ gives the situation of a monopoly union, which is just a special case of Nash bargaining namely where all the bargaining power lies with the union, resulting in unilateral union wage setting.

The bottom rows of Table 1 numerically illustrate domestic welfare under autarky. We define domestic welfare as the sum of the incumbent's profits, consumer welfare and union rent. It can be seen that the introduction of a labour market distortion in the initial state of the economy reduces the welfare of all other agents apart from the union, leading to a domestic welfare loss. The Stone-Geary utility function of the union (equation 2) nicely illustrates the fact that as the union gets stronger, employment is sacrificed for higher ('insider') wages. Column 1 in Table 1 also illustrates that in contrast to what is generally believed by competition authorities, observing high prices in the market need not necessarily reflect high profits since it can reflect the 'pass-through' of wages into prices.

2.3 *National Competition*

When there is a new entrant which is located in the domestic market, a national duopoly arises. While algebraic solutions can be found in the appendix, in column 2 of Table 1 we numerically illustrate the effect of domestic entry on labour and product market variables for different levels of union strength.

The extra firm in the national market creates employment opportunities. Both in the cases of firm and sector-level Nash bargaining[11] and in the case of a monopoly union, wages from the autarky situation remain intact, but prices fall due to the 'product market competition effect.' As a result the incumbent's profits are squeezed. This can be summarized in the following two-results.

Result 1: Under the assumptions outlined above, an increase in national competition through domestic entry safeguards the union wage compared to autarky.
Proof: see appendix

Result 2: National Entry *raises* union welfare and home consumer welfare but *squeezes* the incumbent's profits.
Proof: see appendix

Intuitively, this result can be on the basis of Figure 1b. Entry lowers the price in the home market compared to autarky (from p^{aut} to p^{ent}), thereby increasing consumer surplus (areas a and b at the top of the figure) but reducing the incumbent's profits (areas a and c') and increasing union welfare (area d') through increased domestic employment in the imperfectly competitive sector.

In the bottom rows of Table 1 we numerically illustrate the changes in domestic welfare brought about by entry. When considering national entry we can have different welfare implications depending on the ownership of the entering firm. If the entrant is domestic, we include its profits into domestic welfare (DW2) next to the incumbent's profits, consumer welfare, and union rent. While if the entrant is foreign and reflects inward foreign direct investment (FDI) from abroad, the entrant's profits are excluded from domestic welfare (DW1). This leads us to formulate a third result.

Result 3: When national entry takes the form of inward FDI, domestic welfare is *reduced* when unions are absent but domestic welfare is *increased* when unions are sufficiently strong ($\beta > 0.4$). When the national entrant is domestic, domestic welfare is *always increased*.
Proof: see appendix

This result can easily be seen by comparing Figures 1b and 1a. In Figure 1a welfare changes of entry are shown in the absence of a labour market distortion. W_a is the wage in the numeraire sector. In Figure 1a, the *reduction* in the incum-

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11   In the case of firm-level bargaining we assume that each of the two symmetric national firms bargain over wage with the union at the firm level. We assume bargaining power to be equal across firms. Further, we assume that workers not employed by an individual firm are absorbed by the numeraire sector at a wage level equal to unity. Under those conditions, the equilibrium wage and employment are the same under firm-level than under sector level bargaining.

bent's profits (areas *a* and *c*) is larger than the *increase* in consumer welfare due to entry (areas *a* and *b*). This implies that when the entrant is a foreign firm (inward FDI) and repatriates its profits, the domestic country is worse off after entry. In the presence of a sufficiently strong home union ($\beta > 0.4$), however ($W > W_a$), entry is welfare-improving which can be seen from Figure 1b. There the *increase* in consumer welfare due to a lower price in the market (areas *a* and *b*) and the *increase* in union utility (area *d'*), when added together, will now be large enough to offset the *reduction* in the incumbent's profits as a result of entry (areas *a* and *c'*).

Let us now turn to the case where the domestic country opens its borders and allows import competition. The extra competitor on the domestic market is located abroad, which means it is not subject to domestic wage bargaining.

2.4 *International Competition*

When the entrant in the market is a foreign firm exporting to the domestic market, domestic unions no longer have power over the wage paid by the foreign firm. We assume that the foreign wage $\overline{W}_2$ is exogenously given.[12] However, the level of $\overline{W}_2$ will influence national wage negotiations since equilibrium output depends on $\overline{W}_2$ implying that national employment and profits are also a function of $\overline{W}_2$. The equilibrium wage and employment levels are given in the appendix. Note that $\dfrac{\partial W_1}{\partial W_2} > 0$ which implies that the higher/lower the foreign wage, the higher/lower the domestic wage.

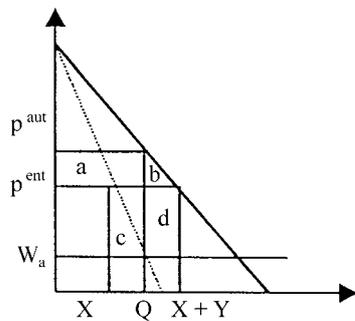The results of international competition can be summarised in Results 4 and 5.

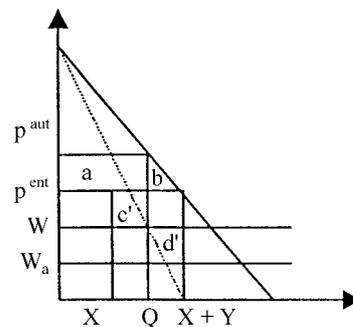Figure 1a – Inward FDI without unions   Figure 1b – Inward FDI with unions

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12   A lower wage abroad can be due to many reasons. In a traditional trade framework, differences in wages are explained by differences in factor endowments. A lower wage abroad would suggest that the foreign country is relatively more endowed with labour.

Result 4: International competition, where the competitor is located abroad, lowers domestic wages and domestic employment in the imperfectly competitive sector compared to autarky, leaving home unions worse off compared to autarky and compared to national competition.
Proof: see appendix

Result 5: The extent to which imports affect domestic employment depends on the foreign wage level and domestic union power. The higher the wage level abroad and the lower the domestic union power, the more domestic employment in the imperfectly competitive sector is safeguarded.
Proof: see appendix

In Table 1 we illustrate the effects of international competition on labour market variables and welfare in the last three columns for increasing levels of the foreign wage levels.

3 POLICY IMPLICATIONS

In the previous section we discussed two channels through which monopoly power of a domestic incumbent can be eroded: imports and national entry. The former resides under trade policy, the latter under competition policy. We showed that in the presence of labour market institutions which are country-specific, both types of policies can have very different effects on prices, wages, and employment. Another way of looking at the results derived here is that the geographical location of competitors matters in the presence of domestic unions and endogenous wage formation.

With a union setting the wage for the entire sector (sector-level bargaining or monopoly union) wages remain intact after domestic entry. As a result, prices remain much higher after domestic entry compared to international entry, since firms want to pass through the high wages of consumers.

In the case of imports from abroad, the wage level of the competitor in the market is out of reach of the domestic union which disciplines domestic wages. The effect on domestic jobs depends on the wage level of the trade partner and the strength of the domestic union. The reduction in employment in the imperfectly competitive sector is larger, the lower the wage in the partner country and the stronger the power of domestic unions.

The results in this paper suggest that the enforcement of competition policy without a sufficient degree of openness to imports, is typically not a first-best outcome. Relaxation of the assumptions we made and the specific functional forms we used, would not alter this conclusion.

When the World Trade Organization (WTO) is functioning properly, the free flow of imports seems the best way to guarantee consumer welfare and profitability of domestic firms. The reason is that imports will not only lower domestic

TABLE 1 – NATIONAL AND INTERNATIONAL COMPETITION IN THE DOMESTIC MARKET

Domestic	AUTARKY (1)			NATIONAL ENTRY (2)			(3) $W_2 = 1$			INTERNATIONAL ENTRY (4) $W_2 = 4$		(5) $W_2 = 6$	
	$\beta=0$	$\beta=0.5$	$\beta=1$	$\beta=0$	$\beta=0.5$	$\beta=1$	$\beta=0$	$\beta=0.5$	$\beta=1$	$\beta=0.5$	$\beta=1$	$\beta=0.5$	$\beta=1$
Wage	1	3.25	5.5	1	3.25	5.5	1	2.12	3.25	2.5	4	2.75	4.5
Empl.	4.5	3.37	2.25	6	4.5	3	3	2.25	1.5	3	2	3.5	2.3
Price	5.5	6.62	7.75	4	5.5	7	4	4.37	4.75	5.5	6	6.25	6.8
Profits/firm	20.25	11.39	5.06	9	5.06	2.25	9	5.06	2.25	9	4	12.25	5.4
CS	10.12	5.69	2.53	18	10.12	4.5	18	15.8	13.7	10.12	8	7	5.01
UR	0	7.59	10.12	0	10.12	13.5	0	2.53	3.37	4.5	6	6.12	8.1
DW1	30.3	24.6	17.71	27	25.3	20.2	27	23.4	19.4	23.6	18	25.4	18.62
DW2	30.3	24.6	17.71	36	30.3	22.5	–	–	–	–	–	–	–

Notes: a) $a = 10$, $W_a = 1$

b) The critical value for the foreign wage is $W_2^{crit} = 64$

c) The Entrant's profit is (not) included into the Domestic Welfare DW2 (DW1) in case of Entry

prices but will reduce wages even more. Import competition erodes monopoly power in the labour market *and* in the product market while an increase in domestic competition largely leaves the labour market distortion in place, making the product market competition effect less effective. In other words, the extent to which product market competition spills over the consumers depends on how effective product market competition is in dealing with labour market distortions. This paper suggests that trade liberalisation more than competition policy is able to achieve that.

4 CONCLUSION

The purpose of this paper was to contribute to the debate on the relationship between trade policy and competition policy. For this purpose we constructed a simple partial equilibrium and static framework where we vary the degree of price competition in the product market (by moving from a monopoly situation under autarky to a national or international Cournot duopoly). While both trade liberalization (through increased imports) and competition policy (through improved market contestability) reduce product market competition by eroding mark-ups, their effects on prices, wages, and employment differ.

Under the conditions outlined in this paper we found that competition policy is far less effective in dealing with labour market distortions than trade liberalization. The free flow of imports has a disciplining effect on domestic wages, which typically results in product market prices that are lower than in the case of domestic entry.

Our results further showed that while competition always lowers monopoly profits, profits are squeezed more under national entry than in the case of imports. The reason is that imports next to domestic prices reduce wages even more. Hence, domestic incumbents are likely to prefer trade liberalization to competition policy. For unions and domestic workers, the opposite applies. They would prefer the implementation of competition policy since national entry squeezes profits more than wages.

The results in this paper clearly show that in the presence of country-specific labour market institutions, trade policy and competition policy are complements rather than substitutes in reducing product and labour market distortions.

APPENDIX

AUTARK: initial state of the economy (monopoly in the product market)

Using the production function $Q = L$ whereby Q is the monopoly output, the union's utility in the domestic country is given by:

$$U(W, L) = (W - W_a) \cdot L = (W - 1) \cdot \frac{(a - W\ )}{2} \quad \text{with} \quad W_a = 1.$$

The domestic firm's profits are given by:

$$\pi = \frac{(a - W)^2}{4}\ . \tag{A.2}$$

The Nash bargaining product is then given by:

$$\Omega = [U - U^0]^\beta \cdot [\pi - \pi^0]^{(1-\beta)}$$
$$= \left[(W - 1) \cdot \left(\frac{(a - W)}{2} \right) \right]^\beta \cdot \left[\frac{(a = W)^2}{4} \right]^{(1-\beta)},$$
$$\text{where} \quad U^0, \pi^0 = 0. \tag{A.3}$$

The first-order condition of the Nash bargaining product gives four solutions for the equilibrium wage in the domestic sector under autarky:

$$\frac{\partial \ln \Omega}{\partial W} = 0 \Leftrightarrow$$

$$W = a \tag{a}$$

$$W = \frac{1}{2} \left(1 + a - \sqrt{1 - 40^{\frac{1}{\beta}} - 2a + a^2} \right) \tag{b}$$

$$W = \frac{1}{2} \left(1 + a + \sqrt{1 - 40^{\frac{1}{\beta}} - 2a + a^2} \right) \tag{c}$$

$$W = 1 - \frac{\beta}{2} + \frac{a\beta}{2} \tag{d} \tag{A.4}$$

Solutions (a) to (c) are boundary solutions: they are independent of bargaining power and render the NBP equal to zero which is why we eliminate them as plausible solutions and turn to solution (d) as the equilibrium wage. This wage level is a positive linear function of the bargaining power.

The second-order derivative of the NBP in the optimum wage level is equal to

$$\left. \frac{\partial^2 \Omega}{\partial W \partial W} \right|_{W = 1 - \frac{\beta}{2} + \frac{a \cdot \beta}{2}} \Leftrightarrow$$

$$\frac{2^{-1+\beta}(-2+\beta)\left((-1+a)^2(-2+\beta)^2\right)^{-\beta}(-(-1+a)^2(-2+\beta)\beta)^{\beta}}{\beta}$$

which for reasonable parameter values is negative, suggesting that the solution of the NBP for the wage is an optimum.

Equilibrium output/employment is then given by:

$$Q^* = L^* = \frac{(a-1)\cdot(2-\beta)}{4}\,. \tag{A.5}$$

Consumer surplus under autarky is then given by the following:

$$CS = \frac{[Q^*]^2}{2}\,. \tag{A.6}$$

Domestic welfare is than the sum of union utility, domestic profits and consumer welfare:

$$DW = U + \pi + CS. \tag{A.7}$$

NATIONAL COURNOT COMPETITION

Using the production function $L = X + Y$ whereby X and Y represent duopoly output of incumbent and entrant respectively, the domestic union's utility is given by:

$$U(W, L) = (W-1)\cdot\frac{2\cdot(a-W)}{3}\,. \tag{A.8}$$

By comparing (A.8) with (A.1), we see that national entry raises union welfare by $(W-1)\cdot\dfrac{(a-W)}{6}$. This is proof of the first part of Result 2 in the text.

Domestic profits for each of the two firms are:

$$\pi_i = \frac{(a-W)^2}{9} \quad \text{with} \quad i = 1,2. \tag{A.9}$$

By comparing (A.9) with (A.2) we see that national entry squeezes the incumbent's profits with $\dfrac{5\cdot(a-W)^2}{36}$, which is proof of the third part of Result 2 in the text.

The first-order condition of the Nash bargaining product results in 4 solutions:

$$\frac{\partial \ln \Omega}{\partial W} = 0 \Leftrightarrow$$

$$W = a \qquad\qquad\qquad\qquad\qquad \text{(a)}$$

$$W = \frac{1}{2}\left(1 + a - \sqrt{1 - 40^{\frac{1}{\beta}} - 2a + a^2}\right) \qquad \text{(b)}$$

$$W = \frac{1}{2}\left(1 + a + \sqrt{1 - 40^{\frac{1}{\beta}} - 2a + a^2}\right) \qquad \text{(c)}$$

$$W = 1 - \frac{\beta}{2} + \frac{a\beta}{2} \qquad\qquad\qquad \text{(d)} \qquad\qquad \text{(A.10)}$$

Solutions (a) to (c) are boundary solutions: they are independent of bargaining power and render the NBP equal to zero which is why we eliminate them as plausible solutions and turn to solution (d) as the equilibrium wage. This wage level is a positive linear function of the bargaining power and is equal to the wage under autarky for all levels of the bargaining parameter.

Note also that the wage level under national competition (A.10 (d)) is equal to the wage level under autarky (A.4 (d)). This is proof of Result 1 in the text.

The yields the following solution for domestic employment:

$$L_1^* = L_2^* = \frac{(a-1) \cdot (2-\beta)}{6}. \qquad\qquad\qquad \text{(A.11)}$$

Note that firm-level bargaining, whereby in the union utility function (A.8) industry employment is replaced by firm-level employment. $\frac{(a-W)}{3}$, equilibrium wage and employment per firm are the same as under sector-level bargaining.

Consumer surplus under 'national competition' is then given by:

$$CS = \frac{[X+Y]^2}{2} = \frac{[L_1^* + L_2^*]^2}{2}. \qquad\qquad\qquad \text{(A.12)}$$

It is easy to see that *CS* under national entry in (A.12) is larger than under autarky (A.6), knowing that output/employment is higher under national entry than under autarky $(X + Y > Q)$. This is proof of the second part of Result 2 in the text.

The proof of Result 3 in the text is given on the basis of the table below. The following table gives an overview of domestic welfare in 'autarky' *versus* 'national entry' both in the presence and absence of unions. In the same case of national entry we further distinguish between a domestic and a foreign (FDI) entrant. In case of the former, the entrant's profits belong to welfare, whereas in case of an FDI the entrant's profits are excluded from domestic welfare.

Domestic Welfare	Without Union	With Union
Autarky	$\dfrac{3 \cdot (a-1)^2}{8}$ (a)	$\dfrac{1 \cdot (a-1)^2 \cdot (2-\beta) \cdot (6+\beta)}{32}$ (b)
National Entry		
Domestic	$\dfrac{4 \cdot (a-1)^2}{9}$ (c)	$\dfrac{1 \cdot (a-1)^2 \cdot (2-\beta) \cdot (4+\beta)}{18}$ (d)
FDI	$\dfrac{1 \cdot (a-1)^2}{3}$ (e)	$\dfrac{1 \cdot (a-1)^2 \cdot (2-\beta) \cdot (2+\beta)}{12}$ (f)

From this table we can now prove Result 3 in the text. It can be checked that FDI lowers domestic welfare in the absence of unions $(a > e)$, while it raised domestic welfare in the presence of unions, when unions are sufficiently strong $(f > b$ for values of $\beta > 0.4)$.

In addition it can be checked from the results in this table that domestic entry always raises domestic welfare both in the absence of unions $(c > a)$ and in the presence of unions $(d > b)$.

INTERNATIONAL COURNOT COMPETITION

Domestic union utility is given by:

$$U_1(W, L) = (W_1 - W_a) \cdot L_1 = (W_1 - 1) \cdot \frac{(a - 2 \cdot W1 + \overline{W}_2)}{3} . \tag{A.13}$$

Domestic firms' profits are:

$$\pi_1 = \frac{(a - 2 \cdot W_1 + \overline{W}_2)^2}{9} . \tag{A.14}$$

The equilibrium domestic wages that follow from the f.o.c. of the Nash bargaining product are equal to:

$$\frac{\partial \ln \Omega}{\partial W_1} = 0 \Leftrightarrow$$

$$W = \frac{a + \overline{W}_2}{2} \qquad\qquad\qquad\qquad\qquad \text{(a)}$$

$$W = \frac{1}{4}\left(2 + a + \overline{W}_2 - \sqrt{(-2 - a - \overline{W}_2)^2 - 8a + \overline{W}_2}\right) \qquad \text{(b)}$$

$$W = \frac{1}{4}\left(2 + a + \overline{W}_2 + \sqrt{(-2 - a - \overline{W}_2)^2 - 8(a + \overline{W}_2)}\right) \qquad \text{(c)}$$

$$W = 1 - \frac{\beta}{2} + \frac{a\beta}{4} + \frac{\overline{W}_2\beta}{4} \qquad\qquad\qquad \text{(d)} \qquad \text{(A.15)}$$

Solutions (a) to (c) are boundary solutions: they are independent of bargaining power and render the NBP equal to zero which is why we eliminate them as plausible solutions and turn to solution (d) as the equilibrium wage. This wage level is a positive linear function of the bargaining power.

The second derivative of the NBP with regard to domestic wage is negative for reasonable values of the parameters, suggesting that the solution of the NBP for the wage is indeed an optimum.

This result for the equilibrium domestic output/employment is equal to:

$$X^* = L_1^* = \frac{(a + \overline{W}_2 - 2) \cdot (2 - \beta)}{6} . \qquad\qquad\qquad \text{(A.16)}$$

In order to prove Result 4, we have to show that the wage under autarky and under national competition (A.10 (d) = (A.4 (d)) is always higher than under international competition (A.11 (d)). Subtracting the two wage levels yields:

$$\frac{a \cdot \beta}{4} - \frac{\overline{W}_2 \cdot \beta}{2} \quad \text{which is larger than zero when} \quad a > \overline{W}_2.$$

Since it has to be such that $a > \overline{W}_2$ in order for the foreign firm to be able to sell on the domestic market, we have shown that the wage under international competition is always smaller than under national competition and autarky.

In order to prove Result 5 we have to show that domestic employment under international competition is increasing in the foreign wage level and decreasing in the domestic bargaining power.

Taking the derivative of (A.16) with regard to the foreign wage level yields:

$$\frac{\partial X^*}{\partial W_2} = \frac{(2 - \beta)}{6} > 0.$$

Taking the derivative of (A.16) with regard to the domestic bargaining power yields:

$$\frac{\partial X^*}{\partial \beta} = \frac{(a + \overline{W}_2 - 2)}{6} < 0.$$

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