Working Paper

INTERNATIONAL MONETARY FUND

WP/00/53

IMF Working Paper

Unionization and Strategic Trade Policy

Phillip Swagel and Ling Hui Tan

INTERNATIONAL MONETARY FUND

© 2000 International Monetary Fund WP/00/53

IMF Working Paper

European I Department and IMF Institute

Unionization and Strategic Trade Policy

Prepared by Phillip Swagel and Ling Hui Tan[1]

Authorized for distribution by Eric V. Clifton and Thomas Krueger

March 2000

Abstract

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

This paper examines the effect of unionization on welfare and trade policy in a model of duopolists competing in a third market. It shows that the traditional result that the presence of a union necessitates a stronger strategic trade policy to reach the optimal level of welfare depends on the mode of competition. With Bertrand duopolists, a union can be welfare-improving; it can also lead to a weaker trade policy, or even reverse the direction of the optimal policy. The results highlight the importance for trade policy of understanding the nature of firm behavior and the institutional features of the labor market.

JEL Classification Numbers: F13, J51

Keywords: strategic trade policy, trade union, wage bargaining

Author's E-Mail Address: pswagel@imf.org; ltan@imf.org

[1] We thank Eric Clifton, Mohsin S. Khan, Thomas Krueger and Saleh M. Nsouli for helpful comments.

Contents Page

I. Introduction

The literature on strategic trade policy has shown that in the presence of imperfect competition, activist use of trade and industrial policies can shift economic rents from foreign firms to domestic firms and thus increase home welfare.[2] Although this finding can be seen as providing justification for mercantilist policies such as import protection or export promotion, there is little empirical support for the existence of meaningful gains from strategic trade policy, and in any case practical application of such activist policies is beset with problems such as the difficulty of identifying the appropriate industry to target, judging the scope and magnitude of any policies, and the possibility of retaliation by trading partners that leaves all countries worse off. Moreover, extensions of the original and quite stylized theoretical framework underlying the strategic trade policy literature have shown that even the very possibility of welfare gains is sensitive to the specific assumptions made in the modeling framework.

This paper demonstrates that this caution about the use of strategic trade policies is vital in industries with imperfect competition in both product and labor markets—industries in which firms have price-setting power and workers are unionized—because the nature of optimal policy is sensitive to the institutional structure of labor market arrangements. While much of the literature on trade and labor markets focuses on the effect of trade on domestic wages and employment, a growing number of papers has also focused on the reverse linkage, namely, the effect of labor market characteristics on trade policy. Perhaps the best known work in the latter area is that of Brander and Spencer (1988), who show that in a model of Cournot duopolists (one domestic firm and one foreign firm producing a homogeneous product), the presence of a domestic union is welfare-reducing with no policy and necessitates a stronger strategic trade policy, i.e., a larger export subsidy, to reach the optimal level of welfare.[3]

This paper shows that the results of Brander and Spencer (1988) are not robust to the mode of competition between firms. With Bertrand duopolists in a Brander and Spencer (1985) trade model of duopolists competing in a third market, the existence of a union can actually raise rather than lower welfare (industry surplus) over the status quo, and can lead to a "weaker" (i.e., smaller) export subsidy than in the no-union case, or even completely reverse the direction of the optimal policy. This contrasts with the result for Cournot-acting firms,

---

[2] See Brander (1995) for a survey of the strategic trade policy literature.

[3] Asilis (1992) extends the static Brander-Spencer (1988) analysis to a multi-period context and shows that many of the results obtained in the static model are reversed once the dynamic nature of the strategic interactions between the firm and union are taken into account. Naylor (1999) extends the Brander-Spencer (1988) analysis by introducing a rival union abroad. Santoni (1996) extends the Brander-Spencer (1988) analysis by allowing the domestic firm and union to choose wages and employment in a two-stage Nash bargaining game.

where a union skims off part of the rents shifted by the strategic trade policy and necessitates a stronger policy (larger subsidy) to attain the welfare optimum. The results illustrate the points that understanding both the institutional features of the industry and the mode of firm competition is crucial for the formulation of strategic trade policy. In particular, all agents with strategic capability must be considered in formulating policy.

The next section sets out the basic analytical framework, after which the implications of labor market institutions for optimal policies are derived in Section III. Section IV considers extensions, followed by conclusions in Section V.

II. Basic Model

The model follows the setup of Brander and Spencer (1985), with one firm in the Home country and one firm in the Foreign country forming a duopoly in a third market. There is no domestic demand for the oligopolistic good, an assumption that allows the focus to rest solely on the role of strategic export policies. The two firms compete in prices. Assume also a simple constant returns to scale production structure, with one unit of labor required to produce one unit of output. Labor is homogeneous with a reservation wage of c, the value of its opportunity cost (which can be interpreted as the competitive wage prevailing in the rest of the economy). Denote the Home wage as w and the Foreign wage as w^*, where $w, w^* \geq c$. For simplicity, the wage setting process in the Foreign country is not explicitly modeled.

The Home firm faces a demand for its product, $Q(P, P^*)$, where P denotes its price and P^* denotes the price of the Foreign firm; letting subscripts denote partial derivatives, the usual stability conditions are assumed: $Q_P < 0$, $Q_{P*} > 0$, $Q_{PP} \geq 0$, and $Q_{PP*} \geq 0$. Similarly, the Foreign firm faces demand $Q^*(P, P^*)$, where $Q^*_{P*} < 0$, $Q^*_P > 0$, $Q^*_{P*P*} \geq 0$, and $Q^*_{P*P} \geq 0$.

The usual timing structure in the strategic trade policy literature is assumed: first the industry wage, w, at Home is determined (by the competitive market or by a union or by bargaining between the union and firm); then the firms set prices (and thereby employment). The equilibrium is solved backward as usual, beginning with the price competition stage. Alternative timing structures are considered below.

In the price competition stage, the Home firm sets its price P to maximize its profit, π, given the Foreign price P^* and wage w:

$$\pi(P; P^*, w) = (P - w)Q(P, P^*)$$

Similarly, the Foreign firm sets price P^* to maximize its profit given Home price P and wage w^*:

$$\pi^*(P^*; P, w^*) = (P^* - w^*)Q^*(P^*, P)$$

Profit maximization by the two firms results in the upward sloping best response functions $P(P^*, w)$ and $P^*(P, w^*)$. The intersection of the best response functions yields the Nash equilibrium prices: $P(w, w^*)$ and $P^*(w, w^*)$, where $P_w, P^*_w, P_{w^*}, P^*_{w^*} > 0$.

For concreteness, suppose that the demand functions are linear, so that:

$$\begin{aligned} Q(P,P^*) &= A - kP + P^* \\ Q^*(P^*,P) &= A - kP^* + P. \end{aligned} \tag{1}$$

It is assumed that $k > 1$, indicating that the products are imperfect substitutes.[4] The best response functions are then given by:

$$\begin{aligned} P(P^*,w) &= \frac{1}{2k}\left(A + kw + P^*\right) \\ P^*(P,w^*) &= \frac{1}{2k}\left(A + kw^* + P\right) \end{aligned} \tag{2}$$

The Home firm's equilibrium price and quantity are obtained by solving the equations in (2):

$$P(w,w^*) = \frac{1}{B}\left[(2k+1)A + 2k^2 w + kw^*\right] \tag{3}$$

and:

$$Q(w,w^*) = \begin{cases} \frac{k}{B}\left[(2k+1)A - (2k^2-1)w + kw^*\right] & \text{if } c \le w < w_0(w^*) \\ 0 & \text{if } w \ge w_0(w^*) \end{cases} \tag{4}$$

where $B = 4k^2 - 1$ and:

$$w_0(w^*) = \frac{(2k+1)A + kw^*}{2k^2 - 1}. \tag{5}$$

In order for any production to take place—for quantity demanded to be positive—the reservation wage must be less than the cutoff level, w_0, i.e.:

[4] Using other functional forms such as a constant elasticity of substitution does not change the results but precludes analytical solutions.

$$(2k^2-1)c < (2k+1)A + kw^*.$$

The equilibrium profit of the Home firm is thus:

$$\pi(w,w^*) = \begin{cases} \frac{k}{B^2}\left[(2k+1)A-(2k^2-1)w+kw^*\right]^2 & \text{if } c \le w < w_0(w^*) \\ 0 & \text{if } w \ge w_0(w^*) \end{cases}$$

Note that $\pi(w, w^*)$ is decreasing in w in the relevant range of w between c and w_0.

In this partial equilibrium setup with no Home consumption of the good involved, "welfare" is defined to be total industry rent (or surplus) minus the cost of trade policy. In the absence of trade policy, then, welfare is simply the sum of profit and labor rent, i.e., $R = (P-w)Q + (w-c)Q = (P-c)Q$. Hence, equilibrium Home welfare is given by:

$$R(w,w^*) = \begin{cases} \frac{k}{B^2}[(2k+1)A+2k^2w+kw^*-Bc][(2k+1)A-(2k^2-1)w+kw^*] \\ \qquad\qquad\qquad\qquad\qquad\qquad \text{if } c \le w < w_0(w^*) \\ 0 \qquad\qquad\qquad\qquad\qquad\qquad\;\; \text{if } w \ge w_0(w^*) \end{cases} \tag{6}$$

$R(w, w^*)$ is a concave function of w, with a maximum at $w_1(w^*)$, where:

$$w_1(w^*) = \frac{(2k+1)A+kw^*+(2k^2-1)Bc}{4k^2(2k^2-1)}. \tag{7}$$

Given the earlier assumption that $w_0 > c$, it follows that $w_1 > c$. The function $R(w, w^*)$ is illustrated in Figure 1.

A. No Union

Consider first the case of no union at Home. Assume the Home labor market is competitive, so the Home firm pays the competitive wage c. Hence, $w = c$ and the equilibrium prices are given by:

$$\begin{aligned} P &= \frac{1}{B}\left[(2k+1)A+2k^2c+kw^*\right] \\ P^* &= \frac{1}{B}\left[(2k+1)A+2k^2w^*+kc\right] \end{aligned} \tag{8}$$

Home welfare in this case is simply the profit of the Home firm (since there are no labor rents and no trade policy):

$$R^C = \frac{k}{B^2}\left[(2k+1)A-(2k^2-1)c+kw^*\right]^2 \tag{9}$$

As seen in Figure 1, Home welfare is below the maximum level, since $c < w_1$; i.e. the wage and thus price is less than the welfare-maximizing level.

B. Unionization at Home

Now suppose the workers in the oligopolistic industry form a monopoly labor union to press for a wage increase. As mentioned earlier, it is assumed that first, the union sets its wage, w, to maximize its objective function, then the firms set prices (and thereby employment). The equilibrium is solved backward as usual, beginning with the price competition stage in which wages are taken as given. The equilibrium price and quantity in stage two are derived as in equations (3) and (4) above. For stage one, two possible wage setting procedures are considered: unilateral wage setting by the union, or Nash bargaining between the union and the Home firm. In the case of unilateral wage setting, several different union objective functions are considered, including labor rent maximization, wage bill maximization, and profit sharing.

Union sets wages

The simplest wage-setting procedure is a monopoly union which unilaterally sets the wage, leaving the firm to choose its level of employment—the "right to manage" model. Assume that the union cares only about "insiders"—those workers actually employed in the unionized sector—and that its objective is to maximize its labor rent, LR, where:

$$LR = \begin{cases} (w-c)Q(w,w^*) & \text{if } c \le w < w_0(w^*) \\ 0 & \text{if } w \ge w_0(w^*) \end{cases}$$

This yields an interior solution which is the labor rent-maximizing wage:[5]

$$w^{LR} = \frac{1}{2(2k^2-1)}\left[(2k+1)A+(2k^2-1)c+kw^*\right] \tag{10}$$

[5] It follows from equation (7) that $w^{LR} > c$.

Since the Home firm's profit is decreasing in w (in the relevant range), its equilibrium profit in the presence of such a union has to be lower than with no union. With the linear functional form, it can be calculated that:

$$\pi^{LR} = \frac{k}{2B^2}\left[(2k+1)A-(2k^2-1)c+kw^*\right]^2$$

which turns out to equal half the equilibrium profit in the no-union case.[6]

Note that the monopoly wage that maximizes labor rent, w^{LR}, exceeds w_1, the wage that maximizes Home welfare (i.e., the joint surplus of the Home firm and union). Furthermore, it can be shown that $w_2 < w^{LR} < w_0$ in Figure 1, where:

$$w_2(w^*,c) = \frac{(2k+1)A+kw^*+(2k^2-1)c}{2k^2(2k^2-1)}. \tag{11}$$

As shown in Figure 1, w_2 is the wage at which Home welfare is the same as with Home wage equal to c, the wage in the no-union case. It thus follows that Home welfare is lower with the labor rent-maximizing union than without. The labor rent-maximizing wage set by the union is "too high" in the sense that it forces the Home firm to raise its price to such an extent that sales revenue is reduced, resulting in a lower surplus at Home. This surplus is shared between the Home firm (profit) and the unionized workers (labor rent). Note that unionization at Home unambiguously benefits the Foreign firm by allowing it to charge a higher price, P^*, resulting in higher profit, π^*.

Next consider a profit sharing scheme between the union and Home firm, under which the union receives a fraction, θ, of the firm's profit, where $0 \le \theta \le 1$. The union now maximizes PS, the sum of labor rent and its profit share:

$$PS = \begin{cases} (w-c)Q(w,w^*)+\theta\pi(w,w^*) & \text{if } c \le w < w_0(w^*) \\ 0 & \text{if } w \ge w_0(w^*). \end{cases}$$

The resulting wage is given by:

$$w^{PS} = \frac{[(2k+1)A+kw^*][B-2\theta(2k^2-1)]+B(2k^2-1)c}{2(2k^2-1)[B-\theta(2k^2-1)]} \tag{12}$$

[6] This stems from the use of linear functional forms.

Clearly, if $\theta = 1$—the union receives all profits—then *PS* will equal the welfare level $R(w, w^*)$ given in equation (6) and the wage chosen by the union will equal w_1, the welfare-maximizing wage. The welfare optimum is reached because the union's objective of profit-maximization matches that of society. If $\theta = 0$ then we are back to the case of a labor rent maximizing monopoly union which sets a wage, w^{LR}. Between these extremes, with $0 < \theta < 1$, the wage set by the union, w^{PS}, will lie somewhere between w_1 and w^{LR}. Hence, profit sharing will always result in a lower wage and greater Home welfare than would be the case with a labor rent maximizing monopoly union. This point is made by Fung (1995).

Does a profit sharing union result in greater Home welfare compared with the case where there is no union at all? This depends on the amount of profit-sharing—if the union receives a large enough share, it would have sufficient incentive to moderate its wage demands. In terms of Figure 1, the profit-sharing wage must be between w_1, the wage where the union gets all profits, and w_{LR}, where the union is a monopoly. Since $\partial w^{PS}/\partial\theta < 0$, it can be shown that $w_1 \leq w^{PS} \leq w_2$ if $\theta_1 \leq \theta \leq 1$ where:

$$\theta_1 > \frac{B(k^2-1)[(2k+1)A+kw^*+(2k^2-1)c]}{(2k^2-1)^2[(2k+1)A+kw^*-c]} .$$

Profit-sharing will result in higher welfare relative to the no-union case so long as the union's share is between θ_1 and 1. In other words, if the profit share is sufficiently large, the resulting wage will be higher than the competitive wage, enabling the Home firm to precommit to a higher price in stage two, but not a wage so high as to lead to a reduction in sales revenue in stage two.

If it is assumed instead that the union's objective function is to maximize the wage bill, *WB*, where:

$$WB = \begin{cases} wQ(w,w^*) & \text{if } c \leq w < w_0(w^*) \\ 0 & \text{if } w \geq w_0(w^*) \end{cases}$$

then its optimal wage will be:

$$w^{WB} = \frac{(2k+1)A+kw^*}{2(2k^2-1)} \tag{13}$$

Clearly, $w_2 < w^{WB} < w^{LR}$ so that whereas wage bill maximization results in a lower wage than labor rent maximization, the resulting wage is still "too high" in the sense that Home welfare, $R(w^{WB}, w^*)$ is lower than in the no-union case.

Nash bargaining

Finally, suppose that instead of a monopoly union, the Home wage in stage one is determined by bargaining between the Home firm and labor union. Following Brander and Spencer (1988), the Nash bargaining setup may be utilized, with the firm and union choosing w to maximize the Nash product:

$$\Pi(w,c,w^*) = [(w-c)Q(P,P^*)]^{\beta}[(P-w)Q(P,P^*)]^{1-\beta}$$

Given $P(w,w^*)$ and $P^*(w,w^*)$, the parameter β indicates the bargaining strength of the union, and $1-\beta$, the bargaining strength of the firm, with $0 \le \beta \le 1$. The first term in the square brackets represents the union's payoff net of its opportunity cost or fall-back position, which is represented by the competitive wage c. The second term represents the firm's payoff net of its opportunity cost, which is assumed to be zero (normal profits.)

This yields three solutions:

$$w^{NB} = c$$

$$w^{NB} = w_0$$

$$w^{NB} = \frac{\beta(2k+1)A + \beta k w^* + (2k^2-1)(2-\beta)c}{2(2k^2-1)}$$

Clearly, when $\beta = 0$ so that the firm holds all bargaining power, then $w^{NB} = c$ which is the no-union equilibrium; in the opposite case of $\beta = 1$, the wage outcome is $w^{NB} = w^{LR}$, the (welfare-worsening) monopoly union equilibrium that maximizes labor rents. For wage bargaining to result in higher welfare than in the no-union situation, β has to be such that $c < w^{NB} < w_2$, that is; $0 < \beta < 1/k^2$. If the distribution of bargaining power is such that $\beta < 1/(2k^2)$, then wage bargaining results in the optimal level of Home welfare—the welfare level that would result if a benevolent social planner had set the wage at w_1 in stage one to maximize total Home profit plus labor rent.

The conclusion from these cases is that unionization can be welfare-improving for the Home country as long as the union is not too powerful and raises wages by too much. This is because in a Bertrand duopoly, price competition is "too fierce," so the union can play the welfare-improving role of raising costs and thus prices and surplus. But this is welfare-improving only if the union does not go too far.

III. UNIONIZATION AND TRADE POLICY

The preceding analysis yields clear implications for trade policy. Suppose the Home government seeks to maximize Home welfare by means of strategic trade policy. For

simplicity, this is modeled as a per unit subsidy, s. Hence, the Home firm's profit function is now given by:

$$\pi(P;P^*,w) = (P+s-w)(A-kP+P^*)$$

Since the subsidy is per unit of both labor and output, one can think of the effective wage facing the Home firm as $w-s$.[7]

Further assume the timing structure is such that: the Home government sets the subsidy first (stage zero) so as to maximize welfare, now defined to be profit plus labor rent minus the cost of the subsidy; then the Home wage is determined (stage one) taking s as given; and finally, the Home firm sets its price (and thereby employment), taking w and s as given.

Given this timing structure, it is clear from Figure 1 that the optimal subsidy is negative for $c \leq w < w_1$, zero for $w = w_1$, and positive for $w_1 < w < w_0$. The optimal trade policy in the absence of a union (when Home wage equals the competitive wage, c) is an export tax; this is the familiar Eaton-Grossman (1986) result. The Home and Foreign firms, being Bertrand duopolists, would both like to increase their profits by raising their price. However, neither is able to do so unilaterally for fear of being undercut by its rival. By imposing a tax on its firm, the Home government essentially enables its own firm to commit to a higher price—it shifts the Home firm's best response function outward so that both P and P^* increase. Home and Foreign firms gain at the expense of the consumers in the third market.

From the previous section, it is known that wage setting by a monopoly union (whether the objective is to maximize labor rent, labor rent plus profit share, or the wage bill) always leads to a wage higher than w_1. Accordingly, the optimal trade policy under these circumstances is an export subsidy to bring firm costs and thus prices back down to the welfare-maximizing level. The introduction of a monopoly union thus leads to a reversal of the optimal trade policy prescription.

When wages are determined by a Nash bargaining process, Brander and Spencer (1988) show that with a Cournot duopoly, the optimal government policy is an export subsidy in the absence of a union, and a higher export subsidy in the presence of the union. This is due to the fact that with Cournot duopolists the union always reduces producer surplus and furthermore, it "skims off" part of the rents that are obtained from the rent-shifting subsidy. By contrast, when the duopolists compete in prices instead of quantities, the bargaining strength of the union relative to the firm determines whether the optimal policy is an export tax or an export subsidy. The coefficient of bargaining power, β, is linearly related to the

---

[7] Alternatively, one can assume an ad valorem subsidy, s', which would make the effective wage $w/(1+s')$. This would complicate the calculations somewhat without changing the nature of the results. Note that the trade policy is modeled in partial equilibrium, with no cost to the government of raising revenues to fund any export subsidy.

outcome for the wage w, with a stronger union getting a larger wage and thus requiring a smaller export tax or possibly an export subsidy. With linear demands, the optimal direction of trade policy intervention is as follows:

$$\begin{array}{ll} s<0 & \text{for } 0 \leq \beta < \dfrac{1}{2k^2} \\ s=0 & \text{for } \beta = \dfrac{1}{2k^2} \\ s>0 & \text{for } \dfrac{1}{2k^2} < \beta \leq 1 \end{array}$$

If the union is relatively weak, the Home wage will be too low relative to the welfare-maximizing wage, w_1, so that an export tax will be required to raise the effective wage facing the firm toward w_1 (the union helps the Home country by raising wages but not enough). Conversely, if the union is overly strong, the Home wage will be too high relative w_1 so that an export subsidy will be required to reduce the effective wage facing the firm toward w_1. For β equal to $1/2k^2$, there is no need for government intervention.

Finally, note that for a given β, the optimal trade policy is more likely to be an export subsidy the less substitutable are Home and Foreign products (i.e., the higher is k). This is because the Home firm has greater market power under such circumstances, so that a given wage increase translates into a larger price increase than with more substitutability. At the same time, a high k implies a greater demand reduction in response to this price increase, so the wage increase brought about by the union is more likely to be welfare-reducing and thus require a larger subsidy.

IV. Extensions

In this section, two variations on the basic model are considered: a different structure of bargaining, and a change in the timing structure of decisions by firms, union, and government.

A. Efficient Bargaining

This section examines the implications for strategic trade policy with efficient bargaining between the union and the firm. As discussed by McDonald and Solow (1981), the wage-setting procedures considered in Section III are inefficient because they result in wage bargains that lie off the contract curve. Under efficient bargaining, the firm and union bargain simultaneously over wage and employment. The Nash product Π is maximized with respect to w and P at Home, yielding a Home best response function of:

$$w(P^*,c) = c + \frac{\beta}{2k}\left(A + P^* - kc\right)$$

$$P(P^*,c) = \frac{1}{2k}\left(A + P^* + kc\right)$$

The Foreign firm's best response function is unchanged since its wage setting is left unmodeled.

The Home firm and union pick w and P (and hence employment) simultaneously under efficient bargaining, eliminating the second stage and consequently the opportunity of the wage to act as a commitment variable. The game is now back to a one-shot Bertrand competition, with no role for the union in raising wages and thus prices and surplus. The intersection of the best response functions thus yields the same equilibrium prices as in the no-union case, with the same total Home surplus as in the no-union case. The difference between the efficient bargaining case and the no-union case is that this surplus is now shared between the firm and the unionized workers. The equilibrium wage exceeds c by an amount that depends on the bargaining power of the union, β:

$$w^{EB} = \frac{\beta[(2k+1)A + kw^*] + [B - \beta(2k^2 - 1)c]}{B}$$

When the union has no power, i.e. $\beta = 0$, then $w^{EB} = c$; when it has all the power, i.e. $\beta = 1$, then $w^{EB} = [(2k^2 - 1)w_0 + 2k^2 c]/B$, but this is less than the wage for a monopoly wage setting union, w^{LR}. The optimal trade policy in either case is an export tax of the same magnitude as the no-union case.

B. Change in Timing Structure

How would the results change if the timing structure is such that the government sets policy only after the wage has been determined? Matsuyama (1990) considers such a case with Cournot competition and concludes that the firm and union have an incentive to sign an inefficient contract and thus force the government to provide a subsidy to achieve the welfare maximum.

It can be shown that this "management-labor conspiracy" occurs under Bertrand competition as well. The timing is now such that the wage is determined first (stage zero), then the government sets the subsidy (stage one), and finally the firms compete in prices (stage two).

As mentioned earlier, one can think of $w - s$ as the effective wage facing the Home firm in stage two. Hence, the equilibrium prices from stage two are:

$$P(w,s,w^*) = \frac{1}{B}\left[(2k+1)A + 2k^2(w-s) + kw^*\right]$$

$$P^*(w^*,w,s) = \frac{1}{B}\left[(2k+1)A + 2k^2 w^* + k(w-s)\right]$$

In stage one, the Home government sets s to maximize Home welfare, $(P-c)Q$, resulting in:

$$s = w - \left[\frac{(2k+1)A + kw^{*} + (2k^{2}-1)Bc}{4k^{2}(2k^{2}-1)} \right] = w - w_{1}$$

Note that s varies one for one with w. In other words, the government will set a subsidy to "correct" whatever wage is determined in stage zero so as to arrive at the optimum Home welfare which results when $w = w_1$. Knowing this, the firm and/or union in stage zero will simply set the highest wage possible. To see this, note that the Nash product to be maximized in stage zero is:

$$\begin{aligned} \Pi(w; c, w^{*}) &= [(w-c)Q]^{\beta}[(P-(w-s))Q]^{1-\beta} \\ &= (w-c)^{\beta}(P-w_{1}))^{1-\beta}Q \end{aligned}$$

which is monotonically increasing in w since P, w_1, and Q are independent of w. Therefore, under this timing structure where the government is unable to precommit to its trade policy, it will always end up giving an export subsidy.

V. Conclusion

This paper shows that the strategic trade policy implications of unionization are less clear-cut with Bertrand duopolists than in the Cournot case examined by Brander and Spencer (1988). In the partial equilibrium model considered here, assuming no domestic consumption of the good involved, welfare may be defined as the sum of profit earned by the Home firm and labor rent earned by workers in the Home firm, less the direct cost to the Home government of trade policy, if any. Under certain conditions, a union might actually raise welfare at home, since it acts as a commitment device which allows firms to set higher prices. Notwithstanding this result, in many cases the resulting wage is set "too high" compared to that which maximizes Home welfare and accordingly, the optimal policy is an export subsidy (which represents a reversal in the direction of optimal trade policy relative to the status quo with no union). However, if wages are set by Nash bargaining between the firm and a relatively weak union, then the optimal policy could be an export tax which is smaller than that required in the absence of a union.

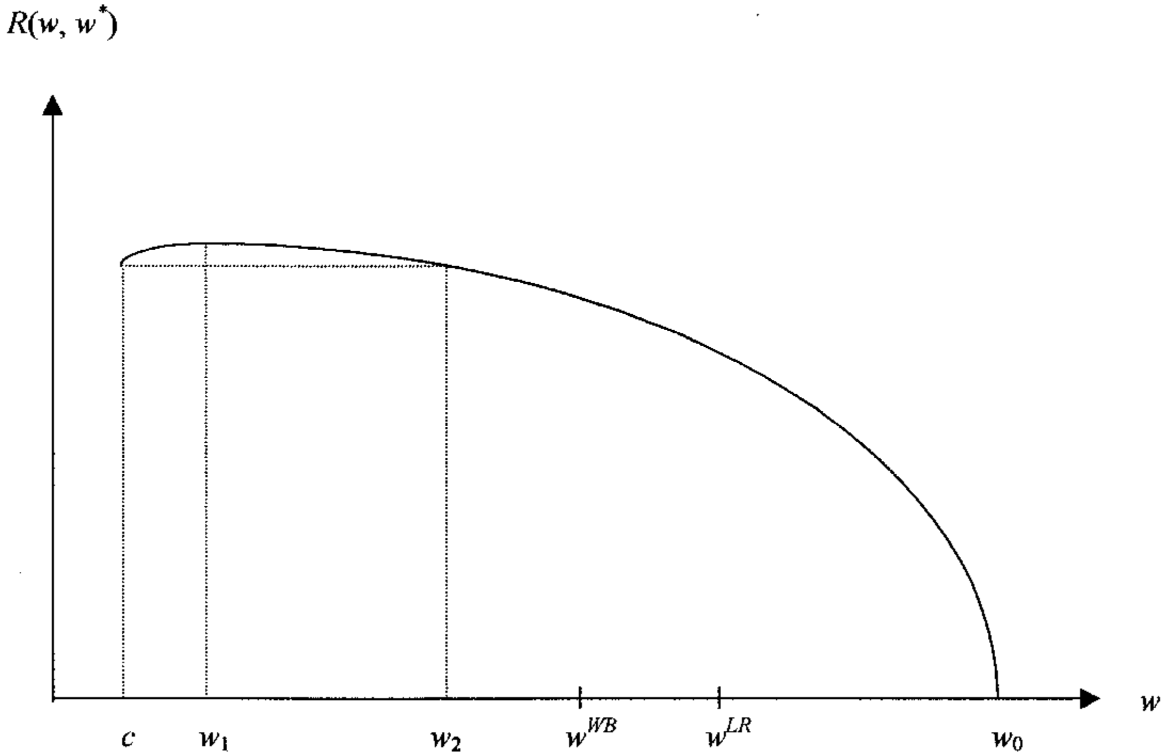
The results are demonstrated using the stylized framework popularized by Brander and Spencer (1985) of competition in a third market, so that there is no adverse welfare effect on domestic consumption from higher wages and prices brought about by the union. The additional consideration of domestic consumption and thus consumer surplus would warrant a weaker policy (lower production tax or higher production subsidy), since the gains to industry rent from higher prices in the home and foreign markets would be offset by the usual welfare-reducing distortion in domestic consumption. With sufficiently large foreign markets

relative to home consumption, however, the union's role in bringing about higher prices could still increase total home welfare.[8]

The principal result of this paper is that both the mode of product market competition and the institutional setup of the labor market matter for the design of strategic trade policy. These details are shown to affect not just the amount of the trade policy required but also its direction. Depending on whether oligopolistic firms compete in prices or quantities and whether labor unions in these industries determine wages unilaterally or through bargaining (and how much bargaining power they wield), the optimal strategic trade policy could be an export tax, an export subsidy, or even no policy at all. The implication, therefore, is that unless policymakers are able to obtain detailed information on the industry structure, intensity of competition between firms, and the relative bargaining strengths of labor unions and firms, rent shifting through strategic trade policy may not be a feasible consideration. Indeed, insufficient information could easily lead to an incorrect policy recommendation, leaving firms and workers worse off than under free trade.

[8] Welfare would, in this case, equal the sum of firm profits, labor rent, consumer surplus, and the revenue (cost) of the strategic tax (subsidy).

Figure 1. Home Welfare



References

Asilis, C.M., 1992, "Unionization in a Dynamic Oligopolistic Model of International Trade," Estudios Económicos 7, 181–208.

Brander, J., 1996, "Strategic Trade Policy," in G. Grossman and K. Rogoff (eds), *Handbook of International Economics*, Vol. III., Amsterdam: Elsevier, 1395–1456.

Brander, J. and B. Spencer, 1988, "Unionized Oligopoly and International Trade Policy," *Journal of International Economics*, 24, 217–234.

Brander, J. and B. Spencer, 1985, "Export Subsidies and International Market Share Rivalry," *Journal of International Economics,* 18, 83–100.

Eaton, J. and G. Grossman, 1986, "Optimal Trade and Industrial Policy Under Oligopoly," *Quarterly Journal of Economics* 100, 383–406.

Fung, K.C., 1997, "How Labor Markets Affect Trade Policies and Trade: The Case of the Foreign Labor Union," *Working Paper* 384, University of California, Santa Cruz.

Fung, K.C., 1995, "Rent Shifting and Rent Sharing: A Reexamination of the Strategic Industrial Policy Problem," *Canadian Journal of Economics* 28, 450–462.

Matsuyama, K., 1990, "Export Subsidies as an Outcome of the Management-labor Conspiracy," *Quarterly Journal of Economics* 105, 803–813.

McDonald, I. and R. Solow, 1981, "Wage Bargaining and Employment," *American Economic Review* 71, 896–908.

Naylor, R., 1999, "Union Wage Strategies and International Trade," *The Economic Journal* 109, 102–125.

Santoni, M., 1996, "Union-oligopoly Sequential Bargaining: Trade and Industrial Policies," *Oxford Economic Papers* 48, 640–663.