Volume 32, Issue 1

Unionized monopoly regulation: strategic trade vs. domestic competition policies

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Abstract

This note analyzes the differences between strategic trade and domestic competition policies to regulate a unionized monopoly. In the presence of an industry-wide union, the entry of a domestic competitor does not reduce labor market distortions, while strategic trade policy reduces both labor and product markets distortions. The fixed cost for the domestic entrant and the foreign union sensitivity to employment determine which policy should be implemented to maximize national welfare.

1. Introduction

Which policy should a welfare-maximizing government adopt to regulate a unionized monopoly? Competition policy ensures market accessibility and contestability; it is mostly reliant on the competence of national governments. Trade policy assures competition from imports, allowing goods and services to flow freely within a country. The rules governing trade policy are in general supranational, the result of political issues at multilateral World Trade Organization (WTO) negotiations. Nonetheless, consistent with WTO obligations, each country may apply a tariff on imports, provided that this is lower than a certain level negotiated in WTO rounds.

Both policies increase product market competition. However, the impact on national economies is different because these policies operate through diverse channels. This note aims at analyzing this precise subject in the presence of national labor market institutions like industry-wide unions.

The framework is basic. From a situation where a monopolist dominates an industry in autarky, the domestic government has to choose whether to regulate it via market contestability, with the entry into the market of a firm; or via strategic trade policy, allowing imports from a unionized foreign country and applying an optimal tariff. The main results are as follows. Competition policy allows the domestic union to set the same wage as in autarky because it remains in a monopoly position in the labor market. On the other hand, strategic trade policy leads to wage moderation, since the national union suffers the foreign union's rivalry over jobs. The choice between the two policies for the government depends on the amount of the initial fixed cost for the entrant and the employment orientation of the foreign union. If the foreign union is sufficiently low employment-oriented and the fixed cost for the entrant is low, the competition policy dominates the strategic trade policy. As the foreign union sensitivity increases, the threshold level of the fixed cost making the entry profitable lessens, and the strategic trade policy dominates the competition policy.

This note relates to Vandenbussche and Konings (1998) and Vandenbussche (2000). These works analyze the differences between trade and competition policies. However, this note differs from the previous works in several aspects. Firstly, in the case of trade policy, the foreign wage is not exogenous: the foreign union sets its wage endogenously, competing over jobs with the domestic union, as in Naylor (1998). Secondly, it models explicitly the presence of tariff barriers and, therefore, the implementation of strategic trade policy, elements which are absent in Konings and Vandenbussche (1998) and Vandenbussche (2000). Thirdly, in this model, entry is costly. Thus, the fixed cost for the entrant alters the feasibility of the two policies.

The remainder of this note is as follows. Section 2 presents the formal model. Section 3 analyzes the policy implications on national welfare. Section 4 closes.

2. The Model

This section develops a partial equilibrium model to analyze the effects of domestic entry vs. strategic trade policy on national welfare in order to regulate a unionized monopoly.

In the Home country, there are two sectors: a perfectly competitive and an imperfectly competitive sector. In the imperfectly competitive sector, a monopolist operates, producing goods denoted x, using only one factor of production, labor, l, with linear technology and constant return to scale. Thus, each worker produces one unit of the goods, $l = x$: output and employment are equal. In the imperfectly competitive sector, an industry-wide monopoly union is active. The labor supply in the economy is assumed large enough to avoid corner solutions. Any labor required by, or freed up from the monopolized sector, is supplied or absorbed by the perfectly competitive sector, which acts as a buffer, where workers get the competitive wage, here normalized to zero. The product demand is linear. The Home government seeks to introduce competition in the monopolized industry. This may occur through: 1) the *competition channel*, namely the entry of a national firm in the sector considered. The entrant faces a fixed cost, denoted by F. The entrant's workforce ends under the

umbrella of the industry-wide Home union;[1] 2) the *trade channel*, namely the Home incumbent faces import competition in the Home market from a Foreign exporter producing the same goods, denoted y. Imports are initially zero due to a prohibitive tariff. However, the Home government chooses a tariff on imports, lower than the prohibitive one, to maximize domestic welfare. In other words, the national government strategically sets a tariff to extract part of the Foreign exporter's rents. In all cases, the sector moves from a monopoly to a duopoly. The structure of the Foreign labor market is similar to that of the Home country, but the Foreign union differs from the Home union in employment sensitivity. Lower scripts 1 and 2 refer to incumbent and entrant, respectively. The model is a three-stage game solved in the usual backward fashion. In the first stage, the Home government chooses the policy to regulate the unionized monopoly, setting the optimal tariff, in the case of strategic trade policy. In the second stage, unions set wages. In the third stage, firms compete à la Cournot in the Home market, determining production and employment levels (right-to-manage model). The analysis focuses on the Home country.

2.1 The benchmark: monopoly in autarky

First, let us consider the benchmark case of monopoly in Home. The monopolist produces goods facing the following linear demand schedule

$$p_H = 1 - x_{1H}$$

where x_{1H} denotes the incumbent's production. The monopolist's profit maximization problem is

$$\Pi_{1H} = (1 - x_{1H} - w_H)x_{1H} \tag{1}$$

where w_H is the industry-wide wage fixed by the Home union. Taking as given the monopoly quantity, the Home union maximizes the total wage bill

$$\Omega_{1H} = w_H x_{1H}. \tag{2}$$

The integral under the product demand function gives the measure of the consumers' surplus, CS_H. Thus, the Home welfare is

$$NW_H = \Omega_{1H} + \Pi_{1H} + CS_H.$$

Table I summarizes the results.

2.2 Eliminating monopoly: domestic competition channel

The first policy option to regulate the unionized monopoly sector is market contestability, allowing the entry of a domestic firm. The industry passes from a monopoly to a duopoly. In this case, the demand function in the Home country is

$$p_H = 1 - x_{1H} - x_{2H}$$

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[1] There is, in theory, the option of the entry of an international competitor. However, since the international entrant will repatriate profits to the country of origin, under the hypotheses of this paper the Home government will always prefer a domestic entry to an international one.

where x_{1H} and x_{2H} are the incumbent and the entrant production levels, respectively. As a consequence, the profit function for the incumbent is

$$\Pi_{1H} = (1 - x_{1H} - x_{2H} - w_H)x_{1H}, \tag{3}$$

while for the entrant it is

$$\Pi_{2H} = (1 - x_{1H} - x_{2H} - w_H)x_{2H} - F. \tag{4}$$

Regarding the labor market, the utility function is

$$\Omega_H = w_H(x_{1H} + x_{2H}). \tag{5}$$

This is due to the presence of the industry-wide union setting a unique wage for Home workers. Table I reports the relevant findings.

2.3 Eliminating monopoly: international trade channel

Trade policy opens the country to imports. This is the alternative policy to regulate monopoly, which generates an international duopoly. As regards labor markets, now wages are interdependent: unions compete against each other over jobs. The Home government sets an optimal tariff on imports to extract part of the Foreign exporter's rents and maximize domestic welfare. The product demand is

$$p_H = 1 - x_{1H} - y_{2F}$$

where x_{1H} and y_{2F} are the incumbent production and imports from the Foreign country, respectively. The profit function of the Home incumbent firm is

$$\Pi_{1H} = (1 - x_{1H} - y_{2F} - w_H)x_{1H} \tag{6}$$

while the Foreign exporter's profits are

$$\Pi_{2F} = (1 - x_{1H} - y_{2F} - w_F - t)y_{2F} \tag{7}$$

subject to the constraint that $y_{2F} \geq 0$, where w_F is the Foreign union's industry-wide wage rate. Note that the Foreign exporter is the "entrant" in the relevant Home product market via trade. Therefore, imports have index 2. The Foreign firm pays a tariff t to export in Home. Thus, the Home government gets tariff revenues from imports computed in the national welfare. To analyze the impact of a different Foreign union orientation on Home outcomes, the utility function is (5) for the Home union, while the Foreign union has this utility function

$$\Omega_F = w_F y_{2F}^{\phi} \tag{8}$$

where $\phi \in [0, \infty)$ is the union sensitivity to employment (Dube and Reddy, 2006). Cournot competition between the two firms in Home leads to the following quantities

$$x_{1H} = (1/3)(1 + t + w_F - 2w_H), \quad y_{2F} = (1/3)(1 - 2t + w_H - 2w_F).$$

Table I *Summaries of the relevant variables in Home country*

	Wage	Production	Price	Union utility	Profits	Consumers' surplus	National Welfare
Monopoly	$\dfrac{1}{2}$	$\dfrac{1}{4}$	$\dfrac{3}{4}$	$\dfrac{1}{8}$	$\dfrac{1}{16}$	$\dfrac{1}{32}$	$\dfrac{7}{32}$
Domestic Competition	$\dfrac{1}{2}$	$\dfrac{1}{3}$	$\dfrac{2}{3}$	$\dfrac{1}{6}$	$\dfrac{1}{18}-F$	$\dfrac{1}{18}$	$\dfrac{5}{18}-F$
International Trade, Strategic Trade Policy	$\dfrac{7(3+2\phi)}{(49+41\phi)}$	$\dfrac{14(3+2\phi)}{3(49+41\phi)}$	$\dfrac{35(3+2\phi)}{3(49+41\phi)}$	$\dfrac{2}{3}\left[\dfrac{7(3+2\phi)}{(49+41\phi)}\right]^2$	$\left[\dfrac{14(3+2\phi)}{3(49+41\phi)}\right]^2$	$\dfrac{1}{18}\left[\dfrac{(42+53\phi)}{(49+41\phi)}\right]^2$	$\dfrac{(72+73\phi)}{6(49+41\phi)}$ *

* NW= Union Utility + Profits + Consumer surplus + tariff revenues

Putting Cournot quantities into the utility functions, the unions' maximization problems are

$$w_H = \arg\max_{w_H} \left\{ \Omega_H = (1/3)w_H(1+t+w_F-2w_H) \right\}, \quad w_F = \arg\max_{w_F} \left\{ \Omega_F = (1/3)w_F(1-2t+w_H-2w_F)^\phi \right\}$$

for the Home and the Foreign union, respectively. The solutions lead to the reaction functions

$$w_H = (1/4)(1+w_F+t), \quad w_F = (1/2)[(1+w_H-2t)/(1+\phi)]. \tag{9}$$

Combining the expressions in (9), the Bertrand competitive equilibrium wage in Home country is

$$w_H = [3+2\phi(1+t)]/(7+8\phi) = \Phi. \tag{10}$$

Condition $y_{2F} \geq 0$ and the equilibrium wage in Home establish that international trade occurs if

$$\bar{t} \leq 5/7 \approx .714. \tag{11}$$

For $t > \bar{t}$, the tariff is so high that domestic imports are zero: the Foreign firm cannot export. Note that the tariff barrier is independent of the parameter ϕ. Using equation (10), it is possible to derive the following expressions for Home production, prices, union utility, profits and consumers' surplus

$$x_{1H} = (2/3)\Phi; \ p_H = (5/3)\Phi; \ \Omega_H = (2/3)\Phi^2; \ \Pi_H = [(2/3)\Phi]^2; \ CS_H = (2/9)\{\Phi - [3\phi(3-t)]/(7+8\phi)\}^2.$$

Therefore, in the first stage of the game, the Home government sets the optimal tariff to maximize domestic welfare to solve this problem

$$t = \arg\max_{t} \left\{ NW_H = [(46+60t-82t^2)\phi^2 + (68+90t-98t^2)\phi+36]/[3(7+8\phi)]^2 \right\}$$

whose solution is

$$t^* = (15/2)[(3+2\phi)/(49+41\phi)] \tag{12}$$

The optimal tariff depends on the Foreign union's sensitivity to employment, with $dt^*/d\phi < 0$: the higher the sensitivity to employment, the lower the Foreign wage and, therefore, the price of the

imported goods. Since the rents of the Foreign exporter are lower, the National government sets a lower tariff. From (11) and (12), it can easily be verified that, for $\phi \in [0, \infty)$, $t^* < \bar{t}$: no matter how much the Foreign union cares about employment, there is always an optimal tariff, lower than the prohibitive level, that the domestic government can set to extract part of the Foreign exporter's rents. Substitutions of (12) into the relevant values for the Home country lead to the results in Table I.

3. Policy implications and welfare

Increasing market contestability (the entry of a national firm: the competitive channel) and the opening to international trade (the trade channel) in the monopoly sector of the Home economy are means of introducing competition. Both channels imply a shift from a monopoly to a duopoly in the product market. However, if an industry-wide union operates in the Home country, the impact of the two policies are different. In the case of competitive policies, the new entrant creates job opportunities, but the wage level remains unchanged because the overall workforce is under the domestic umbrella of the union. As a consequence, union utility rises, the price falls because of increased market competition, and this, in turns, results in an increased consumer surplus. Monopolist profits are squeezed. The welfare level is higher than in the case of autarky. The key factor in the competitive policy for the Home government resides exclusively in the likelihood of undertaking the initial investment F to enter into the market. In this analysis, the sunk cost of the investment for the domestic competitor is $0 \leq F \leq 1/36$. A different case is that of the strategic trade policy: introducing competition via exports exposes Home workers to wage competition from the Foreign country. As a consequence, Home wages are lowered. This can be summarized as follows.

Result 1: Trade policy reduces Home wages. Wage competition is fierce when the employment orientation of the Foreign union increases.

Proof: Under strategic trade policy, the Home wage in (10) is lower than $w = 1/2$, the wage under competition policy, for $\phi \in [0, \infty)$. Differentiation of (10) evaluated at t^* with respect to Foreign union employment sensitivity yields $\partial w_H / \partial \phi |_{t^*} = -175 / (49 + 41\phi)^2 < 0$: an increase in the Foreign union's employment sensitivity depresses Home wages.□

While strategic trade policy induces wage moderation, the effects on production (and employment) are not so clear cut.

Result 2: Strategic trade policy creates more jobs with respect to autarky if $\phi \leq \phi^T = 21/11$. However, for $\phi \in [0, \phi^T]$, Home employment $x_{1H}^{t^*} \in [2/7, 1/4] < x_{1H} = 1/3$: employment under competitive policy is always higher than with strategic trade policy.

Proof: Directly from Table I.□

Strategic trade policy creates new job opportunities only if the Foreign union attaches to employment a value lower than the threshold ϕ^T. In particular, for $\phi = 1$ (identical employment orientations for Home and Foreign unions), $x_{1H} = 7/27 \approx .26$. From Result 1, it follows that the Foreign union employment sensitivity induces wage moderation in Home. This factor, in normal cases, translates to *increasing* employment. However, as the Foreign union sensitivity increases, Foreign wages decrease more rapidly than Home wages. This, in turn, increases the demand for imports, driving down the price in Home. Nonetheless, the presence of a tariff does not assure that,

Figure 1 *Employment and price in the imperfectly competitive sector of the Home economy under the different policies*
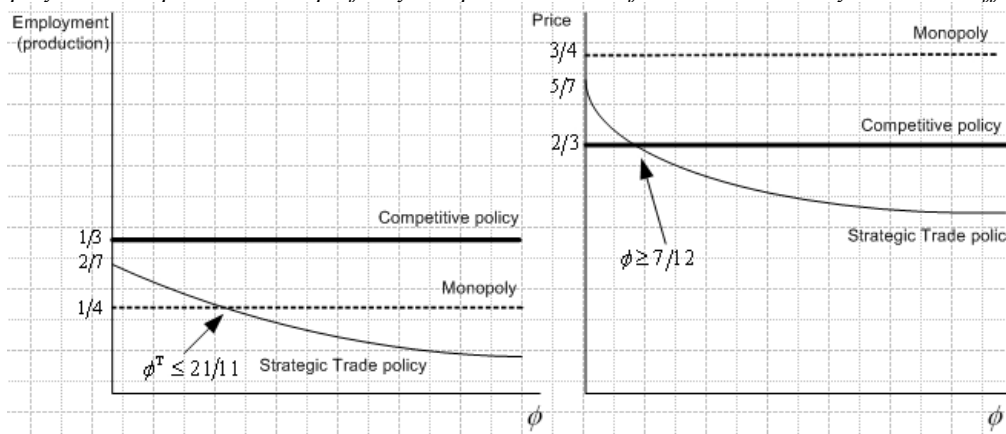
under strategic trade policy, the price level is the lowest affordable.

Result 3: If $\phi \geq 7/12$, the price with strategic trade policy is lower than with competitive policy.

Proof: Directly from Table I. $\square$

The price under strategic trade policy is lower than under competitive policy if the Foreign union is sufficiently employment-oriented: in that case, the demand for imports is relatively strong. Since $7/12 \approx .58 < 1$, this situation also occurs when unions are symmetrical. Figure 1 exemplifies Results 2 and 3. As regards the Home union, the simple payoffs comparison in Table I shows that the utility level under strategic trade policy is lower than under competition policy, $\forall \phi \in [0, \infty)$. The rationale is clear: the competition policy creates more jobs than the strategic trade policy, and workers of the domestic entrant become union members, getting the same wage rate as in monopoly.

Both policies aim at regulating the monopolized sector. The competition policy clearly reduces the incumbent's profits; however, these can be higher with the trade policy than in autarky. A corollary of Result 2 is that the Home incumbent's profits with strategic trade policy are higher than under monopoly if $\phi^{t^*} \leq \phi^T = 21/11$: this is simply because $\Pi_{1H} = (x_{1H})^2$. Moreover, consumers benefit from a low price and higher demand than in monopoly. A corollary of Result 3 is that consumers' surplus in Home is higher under strategic trade policy than under competitive policy if $\phi \geq 7/12$. The Home government's choice about the regulation policy of the monopoly industry should consider the national welfare as a whole, which depends on the fixed cost of entry and the Foreign union sensitivity. Figure 2 shows the Home national welfare in the (F, ϕ)–space.

Figure 2 *Home National Welfare*
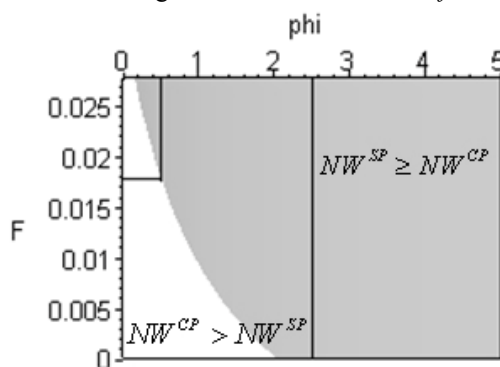
Notice that, on the vertical axis, $F \in [0,1/36]$. It can easily be derived that $NW^{CP} > NW^{SP}$ if $F < F^T = (1/18)[(29 - 14\phi)/(49 + 41\phi)]$, while $NW^{SP} \geq NW^{CP}$ for $F \geq F^T$, where the upper scripts stand for "competition policy" and "strategic trade policy". As can also be observed from Figure 2, $dF^T/d\phi < 0$: a high sensitivity to employment of the Foreign union lowers the Foreign wage and increases the Home imports, lowering the profitability of the industry and, therefore, the amount of the fixed cost that can be sustained by the potential entrant. Hence, for the Home government it is advantageous to introduce competition by promoting market contestability policies only if the cost of the initial investment is sufficiently low. The fixed cost, in turn, is low if the Foreign union sensitivity over employment is also low. In this case, domestic competition increases Home production, and the reduction in price generates an increase in consumers' surplus so as to offset the losses in tariff revenues, despite wages being higher than with strategic trade policy. In particular, for $\phi = 1$ (Home and Foreign unions symmetrical), it can be verified that competition policy ensures a higher national welfare than the strategic trade policy if $0 \leq F < 1/108$. Analytical inspection of the welfare components reveals the rationale: for $0 \leq F < 1/108$, $\Pi^{SP} - \Pi^{CP} < \Omega^{CP} - \Omega^{SP}$, while, for $1/108 \leq F \leq 1/36$, it occurs that $\Pi^{SP} - \Pi^{CP} \geq \Omega^{CP} - \Omega^{SP}$. In other words, if the fixed cost is below $F < 1/108$, the union rent differential, under the two policies, more than offsets the profit differential. Simple arithmetic allows the evaluation that, in this specific case, the cost of the entrant's initial investment should not be larger than 1/3 (33%) of the profits.

On the other hand, when $F \geq F^T$, despite the fact that market entry is still profitable for the domestic competitor, the Home government adopts the strategic trade policy. The monopoly sector is regulated by trade openness, the Home union faces wage competition from the Foreign union, and hence moderates its wage demand, driving down the price and increasing consumers' surplus. Nevertheless, the Home government recovers additional revenues by applying the optimal tariff, extracting rents from the Foreign exporter. These revenues are large enough to increase the overall national welfare, and can be subsequently redistributed to those economic agents affected by the choice of implementing the strategic trade policy. The Home government has to consider all these elements in taking the appropriate decision to afford the highest national welfare level.

4. Conclusions

This note has analyzed the effects on domestic welfare of two different policies that a government may apply to introduce competition in a unionized monopolized industry: competition and strategic trade and policies. Both policies shift the product market from monopoly to duopoly: the former, through market contestability; the latter, via import competition. The competition policy allows the domestic industry-wide union to maintain the same wage as in monopoly. On the other hand, trade openness leads to wage moderation: the Home union competes over jobs with the Foreign one. As a result, the impact of the two policies on price, employment and welfare differs.

The domestic government implements the competition policy if the foreign union has a sufficiently low employment sensitivity and the cost of the initial investment for the entrant is low. As the foreign union sensitivity increases, the value of the threshold of the fixed cost which makes entry into the Home market profitable lowers. As a consequence, the government prefers the strategic trade policy, which ensures a national welfare level higher than that of the competition policy.

The findings of this work relate to the simplifying hypothesis that the Home union's employment sensitivity is invariable. This assumption should be relaxed to obtain a better evaluation of the policy effects on the national economy. Additionally, Bertrand competition in the product market may alter some of the results, requiring further research.

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