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SHOULD A LARGE COUNTRY SUSTAIN Laissez faire in the long-run?

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SHOULD A LARGE COUNTRY SUSTAIN *Laissez Faire* IN THE LONG-RUN?

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Abstract

This paper analyses whether *laissez faire* is superior to tariff protection in the long-run, provided that the government of an importing country cannot precommit to an ex ante optimal tariff rate. We consider the cases of perfectly competitive foreign exporters and a monopolistic foreign exporter. In the case of perfect competition, the government should always choose *laissez faire*. However, in the case of monopoly, choosing *laissez faire* or tariff protection depends on the market size of the importing country.

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1. INTRODUCTION

It is generally agreed upon that the government of an importing country (hereafter, the home government) should choose a tariff policy rather than *laissez faire*. This proposition holds in the short-run, for given capacities or cost functions, regardless of the form of competition, either perfect or imperfect.¹⁾ But does the proposition hold if a firm is allowed to decide its capacity or cost function in the long-run?

Many strategic trade policy models have considered how tariff policies affect social welfare and the short- and long-run decision variables of firms, i.e., price, output, capacities, R&D investments, and so on, in the case of imperfect competition. For example, Helpman and Krugman (1985, eg. ch. 4), Spencer and Brander (1983), Reitzes (1991), all consider this issue. These models show that tariff policies increase the welfare, output, capacity, and R&D investment of the home country. But they assume that the home government can precommit to an ex ante optimal tariff rate. So, if the home government cannot, do their conclusions hold?

We will analyse whether the home government should choose tariff protection or *laissez faire*, provided that it cannot precommit to an ex ante optimal tariff rate, and that there is a time lag between production and trade decisions. The second assumption means that a firm first decides its capacity in the long-run (i.e., production decision), and then allocates the product to both markets in the short-run (i.e., trade decision). We will consider the cases of perfectly competitive foreign exporters (hereafter, perfect competition) and a monopolistic foreign exporter (hereafter, monopoly).²⁾

Lapan (1988), and Horiba and Tsutsui (1996) are closely related to our model. The former discusses an optimal tariff in the case of perfect competition using a general equilibrium analysis, assuming a time lag between production and trade decisions. It is proven in his model that the inability to precommitment leads to lower welfare in both countries. The latter assumes that a foreign monopolist decides its output in the short-run and its plant size in the long-run, and that the home government cannot precommit to an ex ante optimal tariff rate before the decision of plant size. They also consider two types of credible tariff policy: the discretionary tariff regime, in which the home government decides the optimal tariff rate after the decision of plant size, and the time-consistent tariff regime, in which the home government has no incentive to change the tariff rate, even though it announces the rate before the plant size decision is made. They show that *laissez faire* is superior to tariff policies both for the home country and a foreign monopolist, if the adjustment cost of plant size is sufficiently great.

We also assume that a firm first decides the production level and then distributes the output to the home and foreign markets, which are different sizes. Although Horiba and Tsutsui (1996) consider the short-run average cost to be U-shaped and the long-run average cost to be constant, we assume that the production cost is constant, and the distribution (or transfer) cost is zero. Following their lead, we also consider two types of tariff policy regime. In addition, as a reference, we discuss the case in which the home government can precommit to an ex ante optimal tariff rate.

We first show that in the case of perfect competition, the home government should necessarily choose *laissez faire*, even if it

can precommit, and secondly that in the case of monopoly, the home government should choose *laissez faire* if the market size of the home country is relatively large, but a time-consistent tariff policy if it is relatively small. Note that the home government always prefers a time-consistent tariff policy to a discretionary one as tariff protection. Although Horiba and Tsutsui (1996) insist on the affect of adjustment cost on the welfare and the long-run plant size decision, the home market size is an important factor in our model.

The next section presents our basic model. Section 3 analyses the case of perfect competition. Section 4 analyses the case of monopoly. Finally, section 5 summarizes our results and presents remaining problems.

2. THE BASIC MODEL

To simplify our analysis, let us assume that there is no firm in the home country. Thus, only a foreign firm supplies to both markets. The inverse demand functions of both markets are given by

$$P = a - (1/s)q, \quad (1)$$

$$P' = a - q', \quad (2)$$

where P (P') is the price, q (q') is the demand of the home (foreign) market. s stands for the relative market size of the home country. If $s > (<) 1$, then the home market is greater (smaller) than the foreign.

Next, the profit function of a representative foreign firm is given by

$$\begin{aligned}\Pi^* &= (P - t)q + P^*q^* - c^*X^*, \\ q + q^* &= X^*,\end{aligned}\tag{3}$$

where t is an import tariff rate, $t = 0$ (> 0) under *laissez faire* (a tariff policy), c^* ($< a$) is a production cost, and X^* is the production level, i.e., the capacity. We assume that there is no distribution (or transfer) cost.

As mentioned above, a foreign firm first decides the total output, X^* , (i.e., production decision) and then allocates the product to both markets, q and q^* (i.e., trade decision). We can derive a subgame perfect equilibrium by backward induction. First, suppose the case of the discretionary tariff policy regime. At the final stage, a foreign firm allocates the product to both markets, given the total output and the tariff rate. At the second stage, the home government chooses an optimal tariff rate, given the total output. At the first stage, a foreign firm decides the total output. Next, suppose the case of a time-consistent tariff policy regime. At the final stage, a foreign firm allocates the product to both markets, given the total output and the tariff rate. At the third stage, the home government charges the ex ante announced tariff rate, since it does not have any incentive to renege on it. At the second stage, a foreign firm decides the total output, given the ex ante announced tariff rate. At the first stage, the home government announces a tariff rate. Needless to say, the tariff decision by the home government is omitted under *laissez faire*.

3. A PERFECT COMPETITION CASE

3.1 *Laissez Faire*

Suppose a representative foreign firm in the case of perfect competition. Since $P = P^*$ holds under *laissez faire* given X^* , we have an optimal allocation in both markets as follows:

$$q = \frac{s}{1+s} X^*, \text{ and } q^* = \frac{1}{1+s} X^*. \quad (4)$$

Taking into account (3) and (4), an optimal production level of the firm under *laissez faire* is given by zero profit condition. That is,

$$X^{*f} = (1+s)A, \quad A = a - c^* > 0, \quad (5)$$

where f denotes "*Laissez Faire*". Thus, the import amount under *laissez faire* is

$$q^f = sA. \quad (6)$$

Therefore, the welfare of the home country under *laissez faire* is

$$W^f = \frac{s}{2} A^2. \quad (7)$$

3.2 Tariff Protection

3.2.1 Precommitment

In the following analysis, as a reference, let us show the case where the home government is able to precommit to an ex ante optimal tariff rate in the long-run.

Since $P = P^* + t$ holds under tariff protection given X^* , we have an optimal allocation in both markets as follows:

$$q = \frac{s}{1+s} X^* - \frac{s}{1+s} t, \text{ and } q^* = \frac{1}{1+s} X^* + \frac{s}{1+s} t, \quad (8)$$

Taking into account (3) and (8), an optimal production level of the firm under tariff protection is given by zero profit condition. That is,

$$X^{pc}(t) = (1+s)A - st, \quad (9)$$

where pc denotes "precommitment". Note that the firm decides the production level given an ex ante tariff rate in this case. From (8) and (9), the import amount under tariff protection is given by

$$q^{pc}(t) = sA - st. \quad (10)$$

The welfare function is given by

$$W^{pc}(t) = \frac{1}{2s} q^{pc}(t)^2 + tq^{pc}(t). \quad (11)$$

Taking into account (10), the first order condition of (11) is given by

$$\frac{\partial W^{pc}}{\partial t} = \frac{1}{s} q^{pc} \frac{\partial q^{pc}}{\partial t} + q^{pc} + t \frac{\partial q^{pc}}{\partial t} = -st < 0. \quad (12)$$

(12) means that an ex ante optimal tariff rate is zero. Thus, the home government should choose *laissez faire*, even if it can precommit to the optimal tariff rate, when there is a time lag between production and trade decisions.

3.2.2 Non-precommitment: Discretionary and Time-Consistent Tariff

We are now in a position to show the case where the home government cannot precommit to an ex ante optimal tariff rate in the long-run. Here we will treat the cases of a discretionary

tariff regime, dt, and a time-consistent tariff regime, tc. Note that at the final stage, i.e., the trade decision stage, in both tariff policy regimes, we have the same result discussed above, (8).

First, let us show the case of a discretionary tariff regime, dt. Taking into account (8), the welfare function under dt is given by

$$W^{dt}(X^*, t) = \frac{1}{2s} q(X^*, t)^2 + tq(X^*, t). \quad (13)$$

Note that the home government chooses the tariff rate given the production level. Thus, we derive

$$\frac{\partial W^{dt}}{\partial t} = \frac{s}{1+s} q(X^*, t) - \frac{s}{1+s} t = 0. \quad (14)$$

The discretionary tariff rate is given by a function of the production level, that is,

$$t^{dt}(X^*) = \frac{s}{1+2s} X^*. \quad (15)$$

(14) or (15) imply that a tariff policy is superior to *laissez faire*, given the production level, i.e., in the short-run. This result is well known in a standard trade policy model.

Taking into account (3), (8), and (15), an optimal production level for a firm under dt is given by zero profit condition. That is,

$$X^{*dt} = \frac{1+2s}{1+s} A. \quad (16)$$

From (15) and (16), the optimal discretionary tariff rate is

$$t^{dt} = \frac{s}{1+s} A (= q^{dt}), \quad (17)$$

Therefore, taking into account (8), (13), (16), and (17), the welfare of the home country under dt is

$$W^{dt} = \frac{s(1 + 2s)}{2(1 + s)^2} A^2. \quad (18)$$

Secondly, let us show the case of a time-consistent tariff regime, tc. Let t^{tc} denote the time-consistent tariff rate so that the home government has no incentive to change it. Thus, from (14), we derive

$$t^{tc} = \frac{s}{1 + 2s} X^*(t^{tc}), \quad (19)$$

where $X^*(t^{tc})$ is the production level under tc. Given the tariff rate, the production level is given by zero profit condition. That is,

$$X^*(t^{tc}) = \frac{1 + 2s}{1 + s} A (= X^{dt}). \quad (20)$$

(19) and (20) derive the optimal time-consistent tariff rate as follows:

$$t^{tc} = \frac{s}{1 + s} A (= t^{dt}), \quad (21)$$

(20) and (21) imply as follows:

$$W^{tc} = \frac{s(1 + 2s)}{2(1 + s)^2} A^2 (= W^{dt}). \quad (22)$$

Thus, we can say that the welfare in both tariff regimes is identical.

Although the tariff rates in both regimes, (17) and (21), are positive, if the home government can precommit to an optimal

tariff rate, the rate is zero, i.e., *laissez faire*.

From (7), (18), and (22), we obtain as follows:

$$W^f > W^{dt} = W^{tc}. \quad (23)$$

Therefore, we can present **Proposition 1** as follows:

Proposition 1. In the case of perfect competition, the home government should choose *laissez faire* in the long-run.

In the case of perfect competition, in which a foreign exporter does not have market power, *laissez faire* is superior to tariff policies in the long-run, even if the home government can precommit to an ex ante optimal tariff rate. This result is similar to Lapan (1988, **Proposition 1**).

The economic implication of this result is that when the home government uses a tariff policy in the short-run, i.e., at a given production level, the welfare of the home country is better off due to the effect of the terms of trade. But, in the long-run, foreign firms will limit exports due to a tariff policy, so that the amount of imports decreases. The resulting decrease of consumer surplus outweighs the gains from tariff revenue, so that welfare under a tariff policy is lower than that under *laissez faire*.³⁾

4. A FOREIGN MONOPOLIST CASE

4.1 *Laissez Faire*

Suppose that both markets are controlled by a foreign monopolist. Given the total output, X^* , the foreign monopolist decides to

allocate for both markets under *laissez faire* as follows:

$$\begin{aligned}\frac{\partial \Pi^*}{\partial q} &= P + \frac{\partial P}{\partial q} q - P^* + \frac{\partial P^*}{\partial q} (X^* - q) \\ &= - \frac{2(1 + s)}{s} q + 2X^* = 0.\end{aligned}\tag{24}$$

Thus, we have

$$q = \frac{s}{1 + s} X^*, \text{ and } q^* = \frac{1}{1 + s} X^*.\tag{25}$$

Surprisingly, sales in both markets in this case are equal to those in the case of perfect competition. But, according to the following standard analysis, taking into account (3) and (25), we show the profit function as follows:

$$\Pi^* = (A - \frac{1}{1 + s} X^*) X^*.\tag{26}$$

Thus, the production level under *laissez faire* is given by

$$X^{*f} = (1 + s)A/2.\tag{27}$$

From (25) and (27), the import amount under *laissez faire* is

$$q^f = sA/2.\tag{28}$$

Therefore, the welfare of the home country under *laissez faire* is

$$W^f = \frac{s}{8} A^2.\tag{29}$$

4.2 Tariff Protection

4.2.1 Precommitment: A simple case of the Brander and Spencer model

In a way similar to section 3, we will confirm that tariff

protection is superior to *laissez faire*, if the home government can precommit to an ex ante optimal tariff rate in the long-run. Taking into account (3), (24), and $t > 0$, we have

$$q = \frac{s}{1+s} X^* - \frac{s}{2(1+s)} t, \quad (30)$$

$$q^* = \frac{1}{1+s} X^* + \frac{s}{2(1+s)} t.$$

Substituting (30) into (3), a foreign monopolist chooses an optimal production level, given the tariff rate. Thus, we derive

$$X^{p^c}(t) = \frac{1+s}{2} A - \frac{s}{2} t. \quad (31)$$

From (30) and (31), the import amount under tariff protection is given by

$$q^{p^c}(t) = \frac{s}{2} \{A - t\}. \quad (32)$$

The welfare function is given by

$$W^{p^c}(t) = \frac{1}{2s} q^{p^c}(t)^2 + t q^{p^c}(t). \quad (33)$$

Taking into account (32), the first order condition of (33) is given by

$$\begin{aligned} \frac{\partial W^{p^c}}{\partial t} &= \frac{1}{s} q^{p^c} \frac{\partial q^{p^c}}{\partial t} + q^{p^c} + t \frac{\partial q^{p^c}}{\partial t} \\ &= \frac{1}{2} \{q^{p^c} - st\} = 0. \end{aligned} \quad (34)$$

Thus, an optimal tariff rate is given by

$$t^{p^c} = A/3. \quad (35)$$

Therefore, the welfare of the home country under precommitment is

given by

$$W^{p.c.} = \frac{s}{6} A^2 (> W^f). \quad (36)$$

(36) means that a tariff policy is superior to *laissez faire*, if the home government can precommit in the long-run. See Brander and Spencer (1984, *Proposition 1*).

4.2.2 Non-precommitment: Discretionary and Time-Consistent Tariff

Let us consider the case where the home government cannot precommit to an ex ante optimal tariff rate in the long-run, and that a foreign firm is a monopolist. Again we also consider the cases of a discretionary tariff regime, dt, and a time-consistent tariff regime, tc. Note that at the final stage, i.e., the trade decision stage, in both regimes, we have the same result discussed above, (30).

First, let us show the case of a discretionary tariff regime, dt. Taking into account (13) and (30), the discretionary tariff is a function of the production level of a foreign monopolist, that is,

$$t(X^*) = \frac{2 + 4s}{3 + 4s} X^*. \quad (37)$$

Substituting (37) into (30), we have

$$q^{dt}(X^*) = \frac{2s}{3 + 4s} X^*, \text{ and } q^{tc}(X^*) = \frac{3 + 2s}{3 + 4s} X^*. \quad (38)$$

Taking into account (37) and (38), we derive an optimal production level under dt as follows:

$$X^{*dt} = \frac{(3 + 4s)^2}{2(9 + 20s + 12s^2)} A. \quad (39)$$

Thus, from (37) and (39), the optimal discretionary tariff rate is given by

$$t^{dt} = \frac{(1 + 2s)(3 + 4s)}{9 + 20s + 12s^2} A. \quad (40)$$

Therefore, taking into account (13) and (40), the welfare of the home country under dt is

$$W^{dt} = \frac{s(3 + 4s)^3}{2(9 + 20s + 12s^2)^2} A^2. \quad (41)$$

Secondly, we analyze the case of a time-consistent tariff regime, tc. From (37), we derive

$$t^{tc} = \frac{2 + 4s}{3 + 4s} X^*(t^{tc}), \quad (42)$$

where $X^*(t^{tc})$ is the production level given the time-consistent tariff rate. Given the tariff rate, a foreign monopolist will choose its production level as follows:

$$X^{*tc} = \frac{3 + 4s}{2(3 + 2s)} A (> X^{dt}). \quad (43)$$

(42) and (43) derive the optimal time-consistent tariff rate as follows:

$$t^{tc} = \frac{1 + 2s}{3 + 2s} A (> t^{dt}), \quad (44)$$

Thus, taking into account (30), (43), and (44), the welfare of the home country under tc is given by

$$W^{tc} = \frac{s(3 + 4s)}{2(3 + 2s)^2} A^{2.5} \quad (45)$$

4.3 *Laissez Faire* VS Tariff Protection

First, from (41) and (45), it holds that $W^{tc} > W^{dt}$. Thus, the

home government prefers a time-consistent tariff policy to a discretionary tariff policy.

Next, from (29) and (45), we can derive as follows:

$$W^f > (<) W^{t^c} \leftrightarrow s > (<) 3/2. \quad (46)$$

Thus, we can present **Proposition 2** as follows:

Proposition 2. Suppose the case of a foreign exporter with market power. If the market size of the home country is greater than that of the foreign market, $s > 3/2$, the home government should choose *laissez faire*. Otherwise, it should choose a time-consistent tariff policy.

The economic implication of this proposition is as follows: From (27) and (43), we understand that the greater the market size, the greater the difference in the production level between the *laissez faire* and the time-consistent tariff regime. Suppose that the home country with a sufficiently large market, i.e., $s > 3/2$, charges a tariff. The foreign monopolist will decide a production level lower than that under *laissez faire*. This reduces imports to the home country. Since the reduction in the consumer surplus outweighs the gains from tariff revenue, the welfare of the home country decreases. On the other hand, suppose that the home country is relatively small, i.e., $s < 3/2$. Then, even if the government uses a tariff policy, the extent of decrease in the production level is not so great. Thus, the welfare of the home country increases due to the gains from tariff revenue, even though the consumer surplus decreases.

5. CONCLUSION

Although our model is very simple, we have derived some interesting results as follows: First, *Laissez faire* is always superior to tariff protection in the case of a foreign exporter without market power, i.e., perfect competition, even if the home government can precommit to the ex ante optimal tariff rate in the long-run. Secondly, whether the home government should choose tariff protection or *laissez faire* depends on the relative market size in the case of a foreign exporter with market power, i.e., monopoly. Then it has been shown that the home government should choose *laissez faire* if the market size is relatively large, but a time-consistent tariff policy if the market size is relatively small. For example, this result may imply that a non-oil producing developing country should use a tariff policy for OPEC, while a non-oil producing developed country should not, in the long-run.

From **Propositions 1 and 2**, we may suggest that an importing country with a large market size should sustain *laissez faire* in the long-run.

There are some remaining issues. First, we will attempt to extend our result the case of general demand and cost functions, although we assumed very simple demand and cost functions. Secondly, we can test the case that home firms exist. Thirdly, we can extend our model to the case of asymmetric information. That is, the home government may be better informed about demand or market size than a foreign monopolist. Collie (1994) has presented a signaling model in which the home government can use the tariff to indicate demand. He has shown that the tariff in the signaling equilibrium is larger than the optimal tariff under

complete information, and that the welfare in the signaling equilibrium can be lower than that when the home government is uncertain about demand. It was assumed in his model that a foreign monopolist only exports its output to the home market given unconstrained capacity. Our next paper will reconsider Collie's signaling model, assuming capacity constraints.

Footnotes

1) Tariff protection is superior to *laissez faire* in the short-run in the case of imperfect competition, unless the marginal revenue curve is less steeply sloped than demand (see Brander and Spencer (1984)).

2) Although we do not know of any previous models which analyze the effectiveness of tariff policies in the long-run in the case of perfect competition except Lapan (1988), we will discuss such a case. As mentioned above, it is important to know whether the home government precommits to a tariff policy in the case of imperfect competition. This is because the home government has strategic advantages over a foreign exporter if it can precommit. Otherwise, the decision of a foreign exporter strategically affects the tariff policy. However, in the case of perfect competition, the short- or long-run decision of a foreign exporter does not directly affect the tariff policy.

3) Let us show the effect of tariff policies on the welfare of the foreign country in the long-run. From (4) and (5), the welfare of a foreign country under *laissez faire* is given by

$$W^f = \frac{1}{2} q^f{}^2 = A^2/2.$$

On the other hand, under both tariff regimes, taking into account (8), (20), and (21), the welfare is given by

$$W^{dt} = W^{tc} = \frac{1}{2} q^{dt}{}^2 = \frac{1}{2} q^{tc}{}^2 = A^2/2.$$

Therefore, we have $W^f = W^{dt} = W^{tc}$.

In the long-run, tariff policies do not affect the welfare of the foreign country in the case of perfect competition. On the other hand, a tariff policy reduces the welfare of a foreign country in the short-run. Considered with **Proposition 1**, this result implies that distortion occurs in the home market, but not in the foreign market, in the long-run.

4) Taking into account (7) and (29), we can see that monopoly is inferior to perfect competition in the home country under *laissez faire*. The welfare of the foreign country is given by

$$W^f = \frac{1}{2} q^{f2} + \Pi^f = \frac{3 + 2s}{8} A^2.$$

Thus, taking into account footnote 3 and the above equation, we derive as follows:

$$W^f[\text{mono}] > (<) W^f[\text{perfect}] \leftrightarrow s > (<) 1/2.$$

This implies that monopoly is not necessarily inferior to perfect competition in the foreign country under *laissez faire*. In the case of a foreign monopoly, there is a non-zero producer surplus, i.e., a monopoly profit, although the consumer surplus is less than that in the case of perfect competition.

5) We can easily show that $W^{pc} > W^{tc}$. This implies that the welfare of the home country is better off with a credible commitment.

Next, we can derive the welfare of the foreign country under dt and tc as follows:

$$W^{dt} = \frac{1}{2} q^{dt2} + \Pi^{dt} = \frac{(3 + 4s)^2 (27 + 52s + 28s^2)}{8(9 + 20s + 12s^2)^2} A^2,$$

$$W^{tc} = \frac{1}{2} q^{tc2} + \Pi^{tc} = \frac{27 + 44s + 12s^2}{8(3 + 2s)^2} A^2.$$

Taking into account footnote 4, we derive $W^f > W^{dt}$, and $W^f > W^{tc}$. Also, it holds that $\Pi^f > \Pi^{dt} > \Pi^{tc}$, and that $CS^f = CS^{tc} > CS^{dt}$, where CS^* ($= 1/2q^{*2}$) is the consumer surplus in the foreign country. Thus, it is clear that *laissez faire* is superior to tariff policies for the foreign country and the foreign monopolist.

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