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Export Subsidies and Market Structure in Imperfectly Competitive Markets

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This paper investigates the role of government in the determination of equilibrium market structure under imperfect competition. We show that market size, the degree of monopoly, and fixed cost for a plant are crucial. Multinational firms are likely to emerge in an economy with large markets, but the degree of monopoly may restrict this possibility. A higher degree of monopoly creates an incentive for governments to subsidize, and intra-industry trade may occur even in an economy with large markets.

JEL Classification Numbers: F12, F23, L13
Key Words: Market Structure, Export Subsidy, Market Size, Degree of Monopoly

1. Introduction

The theory of the multinational firm and intra-industry trade have been significant in the field of international trade. In particular, *new trade theory* (*i.e.,* an industrial-organization approach to trade)[1] literature explains how the market structure (*i.e.,* the way trade is monopoly/duopoly by national or multinational firms)[2] is endogenously determined given imperfectly competitive markets. The main focus is on the market structure that results from the strategic behavior of firms. Several papers discuss trade policies (Rowthorn, 1992; Horstmann and Markusen, 1992) and mostly interpret these as the effect of shifts in exogenous parameters on a given market structure.

On the other hand, it is widely known that trade policy may change a firm's strategy drastically; *e.g.,* tariff-jumping FDI as shown in Eaton and Grossman (1986) and Brander and Spencer (1987). Taking this into account, the existence of government may affect the market structure significantly. That is, trade policies may change the behavior of firms drastically.

The purpose of this paper is to clarify the role of government in the determination of market structure under imperfect competition. In our model, an export subsidy is considered as an available trade policy. We use a *strategic*

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1) Markusen (1995) provides a detailed survey of new trade theory.

2) We use this term in the same sense as Horstmann and Markusen (1992).

trade policy framework to incorporate government into the game. We consider a three-stage game among governments and firms[3]. The subgame perfect equilibrium provides the outputs, the optimal subsidy level, and the market structure.

We show that the market size, the market's degree of monopoly, and the fixed cost for a plant are critical in the determination of market structure. As shown in Rowthorn (1992), multinational firms are likely to emerge in an economy with large markets. However, the degree of monopoly may restrict this result. When the degree of monopoly is high, the government has an incentive to subsidize the domestic firm that chooses to exporting. As a result, a national firm duopoly (*i.e.,* each firm locates in its home country and exports products to the foreign country) is likely to appear in an economy with a high degree of monopoly even if markets are large. Therefore, the government may play a role in restricting the chance of multinational duopoly (*i.e.,* foreign direct investment).

This paper is related to the literature on new trade theory and strategic trade policy. Among the new trade theory literature, Horstmann and Markusen (1992) and Rowthorn (1992) are seminal works that analyze how market structure is determined endogenously under international imperfect competition. Markusen and Venables (1998, 2000) use a general equilibrium analysis to incorporate asymmetries into this issue. As we have already pointed out, their common focus is on a market structure determined by firms' strategic behavior. In contrast, the main focus in the strategic trade policy literature is to find an optimal trade policy and to examine its effects in imperfectly competitive markets[4]. Brander and Spencer (1984, 1985) analyze import tariffs and export subsidies given on international Cournot duopoly and show that the optimal tariff and subsidy are positive. Many studies have been conducted in strategic trade policy[5]. This paper combines features of the above two streams; we focus on optimal trade policy and equilibrium market structure simultaneously.

Markusen, et al. (1995) has a motivation similar to this research. They focus on competition in environmental policies when plant locations are endogenous. Our motivation is, however, different from theirs in several respects. First, we deal with a different policy, export subsidy. Second, we include "mul-

3) Brander and Spencer (1985) explained this type of game structure as 'firms play Nash against all other players and governments play Stackelberg against firms and Nash against other governments'.

4) For survey of strategic trade policy, see Brander (1995).

5) Recently, Janeba (1998) analyzes tax competition when firms can choose their production locations, and Ishii (2001) investigates the optimal level for an export subsidy and an import tariff when firms have overseas production-plants. Our analysis is different from theirs in that we allow firms to have multiple plants.

tinationalization" in the firm's possible strategies, while they do not consider multinational firms. And, finally, we explicitly show the effects of parameters on market structure.

This paper is organized as follows; In section 2, we provide the basic setup for our analysis. In section 3, we find the Cournot-Nash outputs and consider the production-mode strategies (*i.e.,* the number of plants) chosen by firms and the optimal export subsidy levels determined by governments. In section 4, we analyze how market structure is determined in a situation where the governments implement export subsidy policies. Section 5 concludes.

2. The Model

The basic setup is illustrated in Figure 1. We focus on two countries ; labeled country 1 and country 2. These countries are assumed to be identical in all respects. Each country has a product market, called market 1 and market 2. We provide an inverse demand function for market i $(i=1,2)$ as a linear function $P_i=a-X_i/b$, where a and b are positive constants, and X_i is the total output of market i. Each country has a single resident firm[6] called firm 1 and firm 2. These firms produce homogeneous products for supply to both markets. Each market is duopolisticaly competitive given that both firms enter the market. The government of each country offers a per-unit subsidy to the exporting domestic firm. Each of them determines the subsidy level s_i that maximizes domestic welfare.

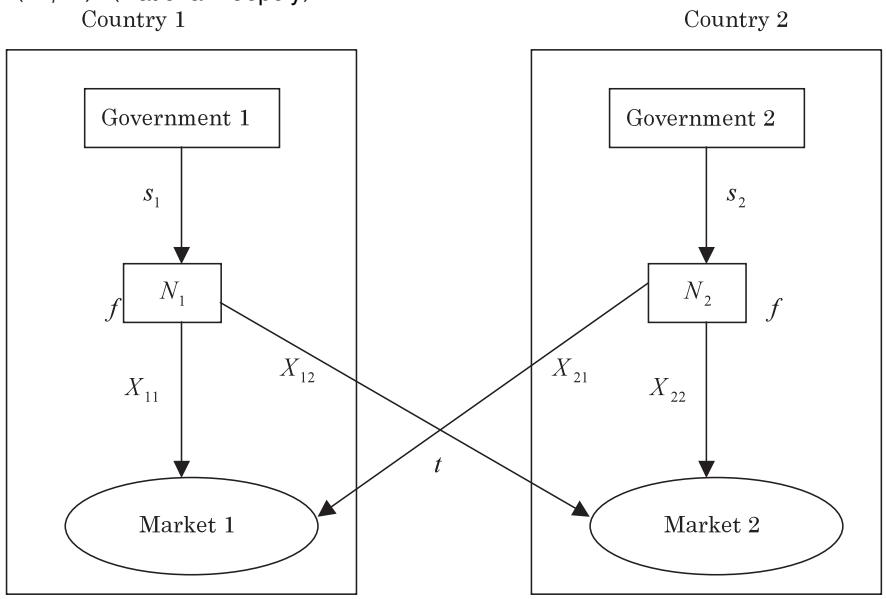
We consider a three-stage game. In the first stage, each government chooses whether or not to offer an export subsidy. If a government chooses "offering", it announces the subsidy level s_i. Otherwise, it announces "not offering", which is equivalent to announcing $s_i=0$. In the second stage, each firm decides whether or not to enter the market. When a firm enters, it chooses the number of plants; either one or two. Assume that when the firm chooses one plant, it sets up the plant in its home country and that each firm can possess at most one plant in a country. Then, choosing two plants means having a plant both in the home and foreign country. We thus call the former (one plant) choice *national* and the latter (two plants) choice *multinational*. Since not entering the market corresponds to choosing zero plant, we restate that firms choose the number of plants (or *production-mode strategies*) in the second stage. In the third and final stage, the governments subsidize and Cournot competition occurs in each market.

In the second stage, given export subsidy levels, firm i $(i=1,2)$ only enters if its profit is positive. If the firm enters, it chooses either national or multina-

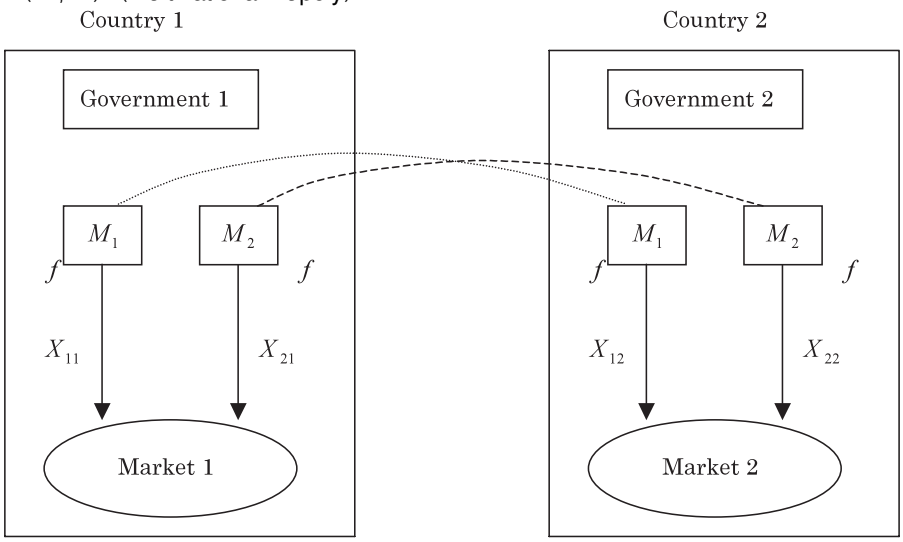
6) Even if there are $n>1$ firms in each industry $(n\in\mathbb{N})$, our results are qualitatively unchanged insofar as we consider symmetric firms.

Figure 1 . Model Setting

(1) (1, 1) (National Duopoly)



(2) (2, 2) (Multinational Dupoly)



tional. The firm must pay a fixed cost, f, per plant[7]. In addition, the firm must incur a per-unit transport cost, t, when it exports the product to the foreign market. However, at the same time, the firm is subsidized for exporting.

7) Several papers which examine multinational firms (*e.g.,* Horstmann and Makusen, 1992; Markusen and Venables, 1998, 2000) separate the fixed cost into a firm-specific cost and a plant-specific cost. The former includes, for example, management skills, advertising and marketing skills, and the latter is considered as the cost of constructing a plant. However, for simplicity, we assume that the firm-specific cost is zero or is included in the plant-specific cost.

Assume that one unit of labor produces one unit of output. Let w_i be the wage level in country i $(i=1,2)$. Since we consider two identical countries, we have $w_1=w_2=w$. Then, the cost for a national firm and a multinational firm are

$$C_i^n = wX_{ii}+(w+t-s_i)X_{ij}+f, \tag{1}$$
$$C_i^m = wX_{ii}+wX_{ij}+2f, \tag{2}$$

respectively, where superscripts n and m express whether firm i chooses national or multinational and X_{ij} is output produced by firm i and consumed in country j $(i,j=1,2)$. Equations (1) and (2) show that choosing national means saving f but incurring t, and choosing multinational means saving t but incurring f. Thus, the profit of a national firm and a multinational firm are respectively

$$\Pi_i^n = (P_i-w)X_{ii}+(P_j-w-t+s_i)X_{ij}-f, \tag{3}$$
$$\Pi_i^m = (P_i-w)X_{ii}+(P_j-w)X_{ij}-2f, \tag{4}$$

for $i,j=1,2, i\neq j$. Needless to say, if firm i does not enter, the profit is zero.

3. The Equilibrium Solutions

In this section, we solve the three-stage game backwardly. First, we find the Cournot-Nash equilibrium outputs, and then, examine how the number of plants is determined by the firms. Finally, we focus on the optimal export subsidy determined by each government.

3.1 Outputs and profits

The market structure is determined by the number of plants chosen in the second stage. Since each firm has three strategies, 0, 1 or 2, there are nine regions, which may be characterized by (h,k) where h and k stand for the number of plants owned by firm 1 and 2, respectively $(h,k=0,1,2)$. Denoting profit and output for the market structure (h,k) as $\Pi_i(h,k)$ and $X_i(h,k)$, we drop the superscript n and m in the following.

In this paper, we confine our attention to market structure under the symmetric case (*i.e.,* two identical countries). Thus, we rule out the values of parameters for which either firm chooses zero plants[8]. In particular, we focus on

8) Markusen et al. (1995) show that market structures in which only one firm enters (corresponding to $(1,0)/(0,1)$) never be a Nash equilibrium in the game including the governments because the government has an incentive to attract firms. Therefore, we rule out the possibilities of $(1,0)/(0,1)$ and $(2,0)/(0,2)$ in our analysis. Note that we still include $(0,0)$ because this is a symmetric situation ; no firm is willing to enter the market as long as their profits are negative.

Table 1 . Cournot-Nash Outputs

F_1 \ F_2	1	2
1	$X_{11}=\frac{(a-w-s_2+t)b}{3}$ $X_{12}=\frac{(a-w+2s_1-2t)b}{3}$ $X_{21}=\frac{(a-w+2s_2-2t)b}{3}$ $X_{22}=\frac{(a-w-s_1+t)b}{3}$	$X_{11}=\frac{(a-w)b}{3}$ $X_{12}=\frac{(a-w+2s_1-2t)b}{3}$ $X_{21}=\frac{(a-w)b}{3}$ $X_{22}=\frac{(a-w-s_1+t)b}{3}$
2	$X_{11}=\frac{(a-w-s_2+t)b}{3}$ $X_{12}=\frac{(a-w)b}{3}$ $X_{21}=\frac{(a-w+2s_2-2t)b}{3}$ $X_{22}=\frac{(a-w)b}{3}$	$X_{11}=\frac{(a-w)b}{3}$ $X_{12}=\frac{(a-w)b}{3}$ $X_{21}=\frac{(a-w)b}{3}$ $X_{22}=\frac{(a-w)b}{3}$

Table 2 . Payoff Matrix

F_1 \ F_2	1	2
1	$\frac{(a-w-s_2+t)^2b}{9}+\frac{(a-w+2s_1-2t)^2b}{9}-f$ $\frac{(a-w+2s_2-2t)^2b}{9}+\frac{(a-w-s_1+t)^2b}{9}-2f$	$\frac{(a-w)^2b}{9}+\frac{(a-w+2s_1-2t)^2b}{9}-f$ $\frac{(a-w)^2b}{9}+\frac{(a-w-s_1+t)^2b}{9}-2f$
2	$\frac{(a-w-s_2+t)^2b}{9}+\frac{(a-w)^2b}{9}-2f$ $\frac{(a-w+2s_2-2t)^2b}{9}+\frac{(a-w)^2b}{9}-f$	$\frac{(a-w)^2b}{9}+\frac{(a-w)^2b}{9}-2f$ $\frac{(a-w)^2b}{9}+\frac{(a-w)^2b}{9}-2f$

the four market structures: $(h,k)=(1,1)$, $(1,2)$, $(2,1)$, and $(2,2)$ where both firms enter the market. Each firm maximizes profit regarding the other firm's output as given.

From equations (3) and (4), the first order conditions are: if firm i is national,

$$\frac{\partial \Pi_i}{\partial X_{ii}}=a-\frac{2X_{ii}}{b}-\frac{X_{ji}}{b}-w=0 \tag{5a}$$

$$\frac{\partial \Pi_i}{\partial X_{ij}}=a-\frac{2X_{ij}}{b}-\frac{X_{jj}}{b}-w+s_i-t=0, \tag{5b}$$

and if firm i is multinational,

$$\frac{\partial \Pi_i}{\partial X_{ii}}=a-\frac{2X_{ii}}{b}-\frac{X_{ji}}{b}-w=0 \tag{6a}$$

$$\frac{\partial \Pi_i}{\partial X_{ij}} = a - \frac{2X_{ij}}{b} - \frac{X_{ji}}{b} - w = 0. \tag{6b}$$

We obtain the equilibrium outputs $X_{ii}^*(h, k)$ and $X_{ij}^*(h, k)$ $(i,j=1,2, i \neq j, h,k=1,2)$ from equations (5.a), (5.b), (6.a) and (6.b). All the equilibrium outputs are summarized in Table 1. Note that when firm j is national, the outputs in country i are functions of the subsidy in country j, because each government subsidizes for domestic exports.

Substituting the outputs into equations (3) and (4), we obtain the equilibrium profits

$$\Pi_i(1,k) = \frac{(X_{ii}(1,k))^2}{b} + \frac{(X_{ij}(1,k))^2}{b} - f \tag{7a}$$

$$\Pi_i(2,k) = \frac{(X_{ii}(2,k))^2}{b} + \frac{(X_{ij}(2,k))^2}{b} - 2f. \tag{7b}$$

for $i,j=1,2, i \neq j$, and $k=1,2$. All the equilibrium payoffs are summarized in Table 2. Note that if $\Pi_i(h,k)$ for any $h,k=1,2$ are negative, firm i does not enter the market.

3.2 Production-mode strategies

In the second stage, each firm compares the profits of a national strategy with a multinational strategy and chooses the number of plants. According to the profits in Table 2, firm i determines its strategy based on the equation

$$\Pi_i(1,1) - \Pi_i(2,1) = \Pi_i(1,2) - \Pi_i(2,2)$$

$$= \frac{(a-w+2s_i-2t)^2 b}{9} - \frac{(a-w)^2 b}{9} + f. \tag{8}$$

If equation (8) is positive (*resp.* negative), firm i chooses national (*resp.* multinational). Assume that firm i chooses multinational when equation (8) is equal to zero. Setting (8) equal to zero and solving the equation, we obtain

$$\bar{s}_i = \frac{-a+w+2t+\sqrt{(a-w)^2-9f/b}}{2}, \tag{9}$$

which is the threshold value[9] for firm i; *i.e.,* for $s_i \leqslant \bar{s}_i$ (*resp.* $s_i > \bar{s}_i$), multinational (*resp.* national) is profitable for firm i.

9) We also obtain $s_i = \left(-a+w+2t-\sqrt{(a-w)^2-9f/b}\right)/2$ as another solution, but it is eliminated because s_i must be greater than or equal to $(-a+w+2t)/2$ from the nonnegativity of equilibrium outputs.

3.3 Export subsidies

In the first stage, each government decides whether or not to offer export subsidies. Then, the government needs to calculate the optimal subsidy for maximizing welfare. Here, we concentrate on finding the optimal subsidy level, s_i^*.

As mentioned in section 3.1, we have four market structures when both firms enter the market. Since we consider two identical countries, however, the market structures $(1,2)$ and $(2,1)$ do not appear in equilibrium. Thus, we only consider the market structures $(1,1)$ and $(2,2)$ in the following.

Welfare in country i $(i=1,2)$ is given by

$$W_i = \begin{cases} CS_i + PS_i - s_i X_{ij} & \text{if firm } i \text{ is national} \\ CS_i + PS_i & \text{if firm } i \text{ is multinational} \end{cases} \tag{10}$$

where the first term

$$CS_i(X_i) = \int_0^{X_i} P(z)dz - p(X_i)X_i,$$

is the consumer surplus in the domestic market, the second term is the producer surplus of the domestic firm, and the third term is the total payment for the export subsidy.

We do not consider $(2,2)$ because governments do not subsidize in this case. Here, we consider the market structure $(1,1)$. We rewrite country i's producer surplus as $PS_i = \Pi_i + f$,

$$PS_i = \frac{(X_{ii}(s_j))^2}{b} + \frac{(X_{ij}(s_i))^2}{b} \tag{11}$$

For the linear inverse demand function $P_i = a - X_i/b$, country i's consumer surplus is calculated as

$$CS_i = \frac{(X_{ii}(s_j) + X_{ji}(s_j))^2}{2b}. \tag{12}$$

Substituting equations (11) and (12) into the welfare function (10), we have

$$W_i = \frac{(X_{ii}(s_j) + X_{ji}(s_j))^2}{2b} + \frac{(X_{ii}(s_j))^2}{b} + \frac{(X_{ij}(s_i))^2}{b} - s_i X_{ij}(s_i). \tag{13}$$

The first order condition for equation (13) is

$$\frac{\partial W_i}{\partial s_i} = \frac{2X_{ij}(s_i)}{b}\frac{\partial X_{ij}(s_i)}{\partial s_i} - X_{ij}(s_i) - s_i\frac{\partial X_{ij}(s_i)}{\partial s_i} = 0. \tag{14}$$

Note that the consumer surplus term disappears in equation (14) because it is

independent of s_i. Since we have $\partial X_{ij}(s_i)/\partial s_i = 2b/3$ for the market structure $(1,1)$ (see Table 1), we obtain the optimal export subsidy level for country i as

$$s_i^* = \frac{a-w-2t}{4} \tag{15}$$

for all $i=1,2$. Since the equilibrium outputs are nonnegative, the optimal export subsidy (15) is nonnegative, as claimed in Brander and Spencer (1985).

4. Endogenous Market Structure

We now focus on the determination of market structure. This is led by the governments' strategies; offering subsidies or not. Recall that insofar as firms enter the market, the equilibrium market structure is either $(1,1)$; national duopoly, or $(2,2)$; multinational duopoly. In order to maximize domestic welfare, the government compares the welfare of choosing "offering subsidy" with that of choosing "not offering subsidy", and determines its strategy.

Hereafter, we omit subscript i because of symmetry. In the following, parameters $(a-w)$ and b work critically on the determination of market structure. Define $\mu \equiv (a-w)$ as a *degree of monopoly* parameter[10] and regard b as a *market size* parameter[11]. In particular, we focus on the effects of the degree of monopoly μ and the fixed cost f on the market structure, for a given market size b. Figure 2 illustrates the relationship between the equilibrium market structure and these parameters.

First of all, consider the case where the fixed cost f is large compared to the degree of monopoly μ; *i.e.*, $\mu^2 < 9f/b$.

Case I: $\mu^2 < 9f/b$

First, suppose that $\Pi^h < 0$ for all $h=n,m$. Then, no firm has an incentive to enter the market and the equilibrium market structure is $(0,0)$.

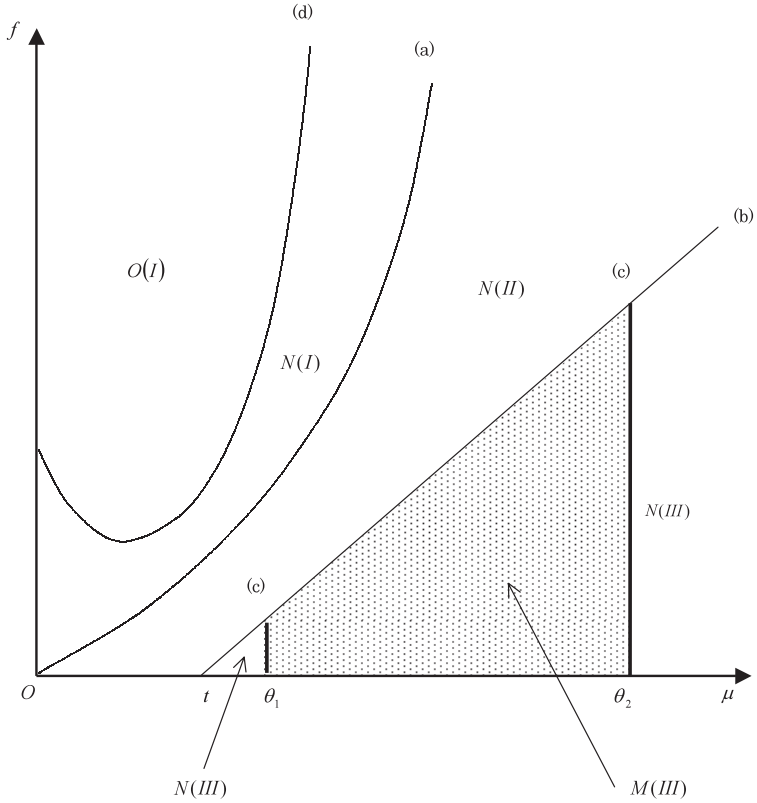
Next, suppose that at least Π^n is positive. Then, the threshold value $\bar{s}$ (equation (9)) is not obtained as a real number because the value inside the square root in equation (9) is negative. In other words, the fixed cost f is too large for firms to choose multinational. Thus, the equilibrium market structure is $(1,1)$ and the government offers export subsidies at $s = s^*$.

In Figure 2, the former case corresponds to the region above line (d): $f = 5b\mu^2/16 - 3bt\mu/4 - 5bt^2/4$, which is derived from $\Pi^n = 0$ (we label "O" for the region in Figure 2), and the latter is described by a region between line (d)

10) As Rowthorn (1992) stated, Learner's degree of monopoly, $(P-w)/P$, has a positive relation with μ.

11) According to Petit and Sanna-Randaccio (2000), the parameter *b, i.e.,* the coefficient in the linear demand function (1), measures the size of the market.

Figure 2 . The Equilibrium Market Structure



and (a): $f = \mu^2 b/9$ (we label "N" for the region).

Assume that $\mu^2 > 9f/b$ below. If it is satisfied, the threshold value $\bar{s}$ is obtained as a real number. Since $\bar{s}$ can be positive or negative, we need to examine the sign.

Case Ⅱ: $\bar{s} < 0$

From equation (9), the condition $\bar{s} < 0$ is rewritten as $-\mu + 2t + \sqrt{\mu^2 - 9f/b} < 0$. Solving this inequality, we find that case Ⅱ holds if $\mu < (9f/4bt) + t$; *i.e.,* case Ⅱ occurs if the degree of monopoly is relatively small for the fixed cost. Since the threshold value of s is negative, the firm does not choose multinational even if $s = 0$. Therefore, the equilibrium market structure is (1, 1) and the governments subsidize at $s = s^*$. This is the same as in case Ⅰ. In Figure 2, case Ⅱ is described by a region between line (a) and (b): $f = 4bt\mu/9 - 4bt^2/9$.

Case Ⅲ: $\bar{s} > 0$

In this case, the firm's optimal strategy is national on the node of "offering" and multinational on the node of "not offering". Thus, the government com-

pares the welfare under national duopoly $W^{n*} = W^n(s^*)$ with that under multinational duopoly W^m, and chooses "offering" or "not offering". In this case, the equilibrium market structure is determined depending on the degree of monopoly parameter, μ.

Lemma 1
Suppose that $\mu^2 - 9f/b > 0$ and $\bar{s} > 0$. Then, $W^{n*} > W^m$ *if* $\mu < \theta_1$ *or* $\mu > \theta_2$, *where*

$$\theta_1 = \frac{(180-\sqrt{25344})t}{14} \text{ and } \theta_2 = \frac{(180-\sqrt{25344})t}{14}.$$

Proof. *For the market structure (1, 1), substituting the equilibrium outputs and the optimal subsidy level (15) into the welfare function (10), we have the welfare under national duopoly as*

$$W^{n*} = \frac{(15\mu^2 - 20\mu t + 28t^2)b}{32}.$$

The welfare under the market structure (2, 2) is obtained as

$$W^m = \frac{4\mu^2 b}{9}.$$

Solving $W^{n*} > W^m$, *we find that the relationship holds if* $\mu < \theta_1$ *and* $\mu > \theta_2$.
Q.E.D.

Lemma 1 shows that offering an export subsidy is advantageous for the country if the degree of monopoly is sufficiently large or extremely small. We summarize the above results in Proposition 1.

Proposition 1
Suppose that $\Pi^h > 0$ *for all* $h = n, m$. *If (a) the fixed cost f is relatively large;* $f > \mu^2 b/9$, *(b) the degree of monopoly* μ *is relatively small for f;* $f > 4bt\mu/9 - 4bt^2/9$, *and/or (c)* μ *is extremely small or sufficiently large ;* $\mu < \theta_1$ *or* $\theta_2 < \mu$, *then the equilibrium market structure is (1, 1); national duopoly. Otherwise, the equilibrium market structure is (2, 2); multinational duopoly.*

Figure 2 describes the equilibrium market structure in (μ, f)-space. We express the regions of $(1,1)$ (national duopoly) as "N" (called *N-regions*) and the region of $(2,2)$ (multinational duopoly) as "M" (called *M-region*). Since the products are homogeneous, a realization of $(1,1)$ corresponds to intra-industry trade. The M-region is shown as a shaded area. It is easily recognized that an increase in the fixed cost f lowers the possibility for firms to choose multina-

tional. If the fixed cost f is extremely high, it is no longer advantageous for firms to enter either market.

Finally, we clarify the effect of market size b and the transport cost t on the market structure.

Proposition 2
An increase in the market size expands the region of multinational duopoly.

Proof. *Let $\Delta(b,t)$ be the area of the M-region, where*

$$\Delta(b,t)=\int_{\theta_1}^{\theta_2}\left(\frac{4}{9}bt\,\mu-\frac{4}{9}bt^2\right)d\mu=\Omega(t)\left(\frac{2}{9}bt\Lambda(t)-\frac{4}{9}bt^2\right),$$

where $\Omega(t)\equiv\theta_2(t)-\theta_1(t)>0$ and $\Lambda(t)\equiv\theta_2(t)+\theta_1(t)>0$. Differentiating $\Delta(b,t)$ with respect to b,

$$\frac{\partial\Delta(b,t)}{\partial b}=\frac{2}{9}t\Omega(t)\left(\Lambda(t)-2t\right)>0$$

because $\Lambda\approx 25.7t>2t$. Therefore, the M-region expands. Q.E.D.

Proposition 3
An increase in the transport cost t expands the region of multinational duopoly.

Proof. *Differentiating $\Delta(b,t)$ with respect to t,*

$$\frac{\partial\Delta(b,t)}{\partial t}=\frac{\partial\Omega(t)}{\partial t}\left(\frac{2}{9}bt\right)\left(\Lambda(t)-2t\right)+\Omega(t)\left(\frac{2}{9}b\right)\left(\Lambda(t)+t\frac{\partial\Lambda(t)}{\partial t}-2t\right),$$

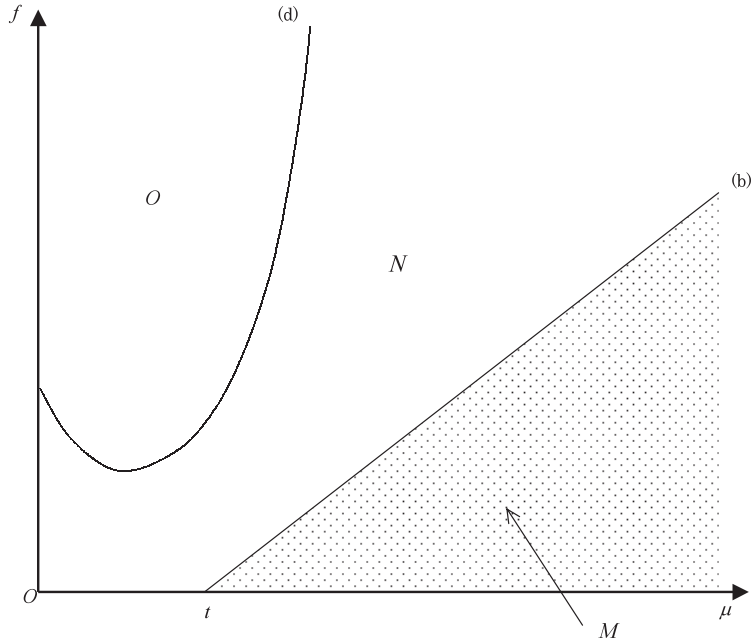
which is positive because $\partial\Omega(t)/\partial t>0$, $\partial\Lambda(t)/\partial t>0$, and $\Lambda(t)>4t$. Q.E.D.

Proposition 2 shows that economic development (*i.e.,* an expansion of the market) makes choosing multinational more attractive. Proposition 3 implies that an economic integration (such as the realization of a free trade agreement) increases the probability of intra-industry trade.

5. Concluding Remarks

We have investigated the role of government in the determination of market structure. We show that market size and the degree of monopoly relative to the fixed cost for a plant are critical in the determination of market structure. Multinational duopoly is likely to occur in an economy with large markets. However, if the degree of monopoly is large, the government has an incentive to subsidize and firms may choose exporting rather than local produc-

Figure 3. The Equilibrium Market Structure without Export Subsidies



tion, because the export subsidy raises the profits from export. This result implies that the government may restrict chances for foreign direct investment.

In the real world, there are some rules which regulate trade policy; for example, countries belonging to World Trade Organization cannot use export subsidies for industrial goods (see JMETI, 2003). If export subsidies were banned, governments would lose the power to determine market structure; that is, governments would not be players in the game. Then, the game becomes two-staged; in the first stage, firms choose the number of plants and they maximize profits in the second. In this case, there are no longer any restrictions for firms to become multinationals (see Figure 3). This result explains why foreign direct investments are often observed among developed countries.

In this paper, we have focused on the market structure between two identical countries. However, trade between a developed country and a developing country has often been observed. Allowing asymmetries must induce different results. For example, if a wage differential exists, the firm in the high-wage country will have an incentive to become multinational. As a result, an asymmetric market structure will be realized. This issue is left for a future research.

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