

Voluntary Import Expansions (VIEs): Voluntary or Not?*

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This paper analyzes whether Voluntary Import Expansions (VIEs) are really voluntary from the viewpoint of an importing country. Using a simple Cournot duopoly model, this paper shows that when each country has a firm and marginal cost is the same, a VIE defined in terms of market share reduces the welfare of an importing country. The model is extended in order to find out the cases of voluntary VIEs. We show that a strategic import expansion by a VIE is justified when the costs of two firms are asymmetric. Furthermore, we provide a political economy justification of VIEs by introducing non-economic objectives and behavior of a government.

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1. INTRODUCTION

Since the middle of 1980s, in addition to Voluntary Export Restraints (VERs), Voluntary Import Expansions (VIEs) have become new forms of trade policies among industrialized countries. Following Bhagwati (1987), trade theorists have been studying VIEs from various perspectives. Among these are Bjorksten (1994), Cronshaw and Markusen (1995), Dinopoulos and Kreinin (1990), Ethier and Horn (1996), Greaney (1996, 1999), Irwin (1994), Ishikawa (1999), and Nagaoka (1997). However, in spite of increasing attention to VIEs, the voluntariness of VIEs from an importing country has not been taken up in the literature.

A VIE originates from the famous semiconductor agreement between US and Japan in 1986. This agreement aims to expand American semiconductor firms' access to the Japanese market. Thereafter the VIE has become an important market access trade policy that aims to 'open' foreign markets that are considered closed. It is implemented on the ground of 'fair trade' argument and has a nature of results-oriented trade policies that focus on concrete outcomes. Another example was the Korea-US beef agreement in which US demanded Korea to import a certain amount of their beef product.

The results-oriented trade policy such as VERs and VIEs is against the rule-oriented system of the GATT/WTO and has been criticized by Bhagwati (1987), among others. However, to settle trade conflicts, these types of trade policy have already become popular among industrialized countries. In fact, although the WTO aims to attain a rule-oriented multilateral trade system, it includes articles of minimum market access requirements in some agricultural products (for example, rice and beef). Therefore, bilateral and results-oriented trade arrangements by VIEs will continue to emerge in the future.

The first rigorous analysis of VIEs is attributed to Greaney (1996). Using a Bertrand model of duopoly with substitute goods, she analyzed the effects of VIEs. Specifically, she shows that a minimum market share VIE does

not increase competition and so fails to reduce the equilibrium prices of both goods. She shows that under price competition a VIE benefits both firms if it increases the import market share by a small proportion and mentions that under quantity competition a VIE hurts the home firm. However, she did not explicitly analyze the welfare effects of a VIE on the importing country.

In the case of VERs, Harris (1985) and Mai and Hwang (1988) have examined whether VERs are really voluntary and answered why and under what conditions they are voluntary. Naturally, the immediate question we face is whether VIEs are really voluntary or not for an importing country. Compared with the analyses of VERs, this question has not been taken up in the literature. The purpose of this paper is to fill this gap in the literature.

This paper analyzes whether VIEs are really voluntary from the viewpoint of an importing country. Using a simple Cournot duopoly model, this paper examines the welfare effect of a VIE defined in terms of market share on the importing country. Thus this paper is a complement to Greaney (1996) and prior literature on VIEs. Furthermore, in order to explore the voluntariness of VIEs, the model is extended to the cases where there exist cost asymmetry and multiple firms in two countries. Also, the voluntariness of VIEs is analyzed in a more general case where differentiated goods are produced in the two countries. Finally, we provide a political economy justification of VIEs by introducing non-economic objectives and behavior of a government.

This paper is organized as follows. Section 2 describes a simple duopoly model of VIEs with a homogenous final good and shows that when each country has a single firm and the marginal cost is identical, a VIE decreases the welfare of importing country, so that it is not voluntary for the importing country. In section 3, the model is extended to the cases of asymmetry cost and multiple firms in order to find out the cases of voluntary VIEs. Section 4 develops a differentiated goods duopoly model to explore on the voluntariness of VIEs. Section 5 introduces the political economy aspects to justify VIEs and section 6 summarizes the results. In the appendix, we compare the effects of a VIE and an equivalent import subsidy.

2. THE BASIC MODEL

Assume two countries, domestic and foreign, where each country has one firm. Both firms produce a homogeneous final good and compete in the domestic country market in a Cournot fashion. For simplicity, let the fixed cost be zero and marginal cost be the same between the two firms. Now suppose that by the pressure of foreign firm's lobbying, the foreign (e.g., US) government asks domestic (e.g., Japan or Korea) government to negotiate on the market share of foreign firm of the good (say, computer chip, beef or rice) in question. As a result of bilateral negotiation, the domestic country implements some import expansion measures (i.e., VIEs).¹⁾

We consider a two-stage game. In the first stage, the governments of the two countries (i.e., USTR and METI or MOFAT) negotiate on the market share of foreign firm in the domestic market. In the second stage, based on this agreement, both firms compete non-cooperatively in the domestic market in Cournot fashion²⁾. Let the aggregate private (or representative consumer's) utility function of domestic country be quasi-linear:

$$u(X, Y) = U(X) + Y = aX - \frac{1}{2}bX^2 + Y,$$

where X is the consumption of the good in question and Y is that of other (numeraire) good. By the utility maximization subject to the budget constraint, $I = pX + Y$, we obtain the inverse demand function for the good:

¹⁾ Here we do not consider the enforcement mechanism. A subsidy or penalty to the domestic firm by the domestic government may be considered as an enforcement tool. On this aspect, see Krishna, Suddhasatwa, and Thursby (1998).

²⁾ We consider Cournot game rather than Bertrand game for the following reasons. First, this paper is written in order to be a complement of Greaney (1996), which assumes Bertrand game. Second, in the case of Bertrand game of homogenous product, only the low cost firm becomes the producer of the product. However this is not the case in real world. Third, in the case of VIEs as well as VERs, quantity competition is most popular.

$$p = U'(X) = a - bX, \quad (1)$$

where p is the price of X and both a and b are positive. a may be considered as a parameter expressing the market size of the domestic country.

Suppose that the cost functions of two firms are equal

$$C(x) = cx, \quad C^*(x^*) = cx^*,$$

where $x(x^*)$ is the output of domestic (foreign) firm and the asterisk denotes foreign variables.³⁾ The best response functions of domestic and foreign firms are

$$x(x^*) = \frac{a-c}{2b} - \frac{x^*}{2}, \quad x^*(x) = \frac{a-c}{2b} - \frac{x}{2}. \quad (2)$$

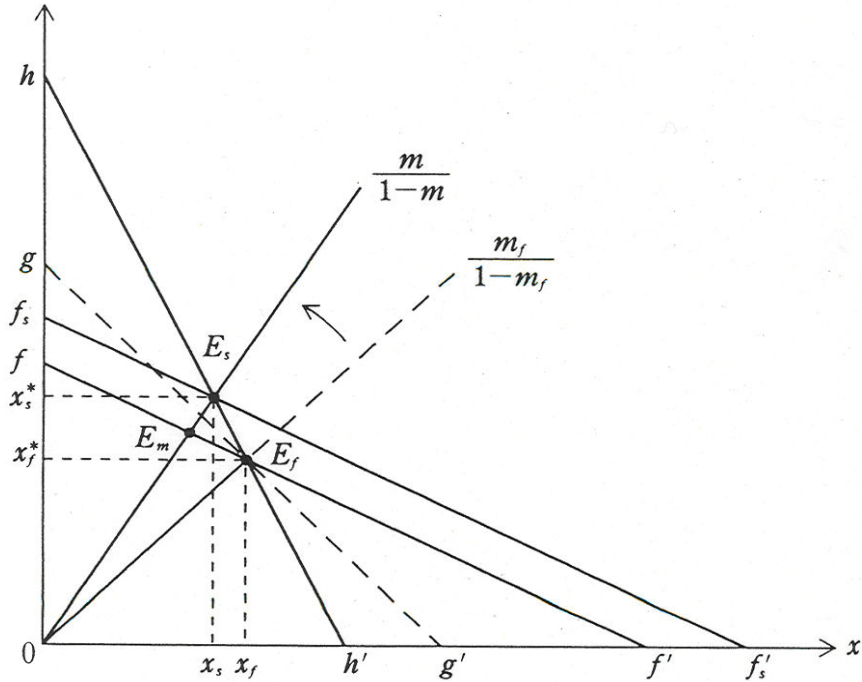
We assume that a unique and stable Nash equilibrium exists. Then the free trade Cournot-Nash equilibrium outputs of domestic and foreign firms and total supply are

$$x_f = x_f^* = \frac{a-c}{3b}, \quad X_f = \frac{2(a-c)}{3b}. \quad (3)$$

In figure 1, $hh'(ff')$ is the best response function of home (foreign) country and gg' is a line with the slope of minus 1. The free trade Cournot-Nash equilibrium point is given at E_f .

³⁾ The assumption of identical cost plays a key role to the level of output of the firms. Suppose if $c \leq c^*$, then we have $x_f \geq x_f^*$ at the initial free trade Cournot equilibrium. This is illustrated as follows. In figure 1, as c declines, hh' shifts to right in parallel and the point E_f moves down on ff' , so that x_f increases and x_f^* declines. Furthermore, since the vertical intercept of domestic firm's reaction function is $(a-c)/b$ and that of foreign firm is $(a-c^*)/2b$, the condition that $(a-c)b > (a-c^*)/2b$ is required for both firms to produce positive outputs, which is written as $((a-c) - (c-c^*)) > 0$.

Figure 1 Effects of a VIE



A VIE agreement is divided into two steps. The first one is where the import market share of foreign firm is the same as that at the initial free trade. The second one is more favorable to foreign firm. Both steps are represented by

$$\frac{x^*}{x + x^*} \geq m \geq m_f, \tag{4}$$

where m_f is the market share of foreign firm in the domestic market under initial free trade.

In the case of negotiated non-tariff barriers such as VIEs, the agreement is usually made in the form of market share (rather than quantity) of foreign

firm and it is based on the initial market share under free trade. Suppose this is the case. Then from (4), we obtain

$$x \leq \frac{(1-m_f)}{m_f} x^*. \quad (5)$$

By placing such constraint on the domestic firm, a VIE alters the domestic firm's best response function. This function has now two branches

$$\begin{aligned} \text{if } \frac{1-m_f}{m_f} x^* \leq x_f(x^*), \text{ then } x_m(x^*) &= \frac{1-m_f}{m_f} x^*, \\ \text{if } \frac{1-m_f}{m_f} x^* > x_f(x^*), \text{ then } x_m(x^*) &= x(x^*), \end{aligned} \quad (6)$$

where $x_m(x^*)$ is the reaction function of domestic firm under VIEs.

(6) implies as follows: (i) If the foreign supply under VIEs is not greater than that under free trade, the reaction function of domestic firm under VIEs becomes $0 E_f$ in figure 1. (ii) If the foreign supply under VIEs is greater than that under free trade, the reaction function of domestic firm under VIEs is equal to (6). Thus the reaction function of domestic firm under VIEs has a kink at point E_f and the new domestic reaction function is now $0 E_f h$. As m increases by an implementation of a VIE, the new equilibrium point is determined such as at E_m on the fE_f part of the foreign reaction function.

Suppose that the VIE constraint is binding. Then from (2) and (6), the equilibrium outputs of each firm and total supply are the function of m and are written as follows

$$x_m = \frac{(a-c)(1-m)}{b(1+m)}, \quad x_m^* = \frac{(a-c)m}{b(1+m)}, \quad X_m = \frac{(a-c)}{b(1+m)}. \quad (7)$$

If $m = m_f = 1/2$, then

$$X_m = \frac{2(a-c)}{3b} = X_f. \quad (8)$$

From (7), the profits of domestic and foreign firm under free trade VIE are

$$\pi(m) = \frac{m(1-m)(a-c)^2}{b(1+m)^2}, \quad \pi^*(m) = \frac{(a-c)^2 m^2}{b(1+m)^2}. \quad (9)$$

On the other hand, the consumer's surplus of domestic country is

$$CS(m) = \frac{1}{2} b X_m^2. \quad (10)$$

Assuming that the private welfare of domestic country is the sum of profits of domestic firm and consumer's surplus, we obtain

$$W(m) = \frac{(a-c)^2 [2m(1-m) + 1]}{2b(1+m)^2}. \quad (11)$$

Suppose that, by the pressure of foreign firm, a VIE is renegotiated between the two governments and that the foreign firm can now increase its market share in the domestic market. The effects of an increase in foreign market share (the implementation of a VIE) on outputs, profits, and private welfare can easily be obtained by differentiating (7), (9), and (11) with respect to m . From (11), we have

$$\frac{dW(m)}{dm} = -\frac{3(a-c)^2 m}{b(1+m)^3} < 0. \quad (12)$$

An increase in foreign firm's market share reduces the welfare of domestic country. In this sense, a VIE is not voluntary for the domestic country. We summarize the result as follows:

Proposition 1

A VIE is not voluntary for the importing country in the case of Cournot duopoly with identical and constant costs.

3. EXTENSIONS

Is it possible to find out the case of voluntary VIEs in this model? In this section, we modify some of the assumptions in order to find out the cases of voluntary VIEs. Although it is possible to relax many of the assumptions of the model, we modify production side and take up the following two cases: (i) cost asymmetry, (ii) multiple firms.

3.1. Cost Asymmetry

Since decreasing marginal cost and cost asymmetry are common in the production process, consider a case where the marginal cost of domestic firm is constant, while that of foreign firm declines owing to economies of scale. We show that when the costs of two firms are asymmetric, a strategic import expansion policy by a VIE is justified under certain conditions.

Suppose that the cost functions of domestic and foreign firm are

$$C = C(x) = cx, \quad C'(x) = c, \quad C''(x) = 0,$$

$$C^* = C^*(x^*), \quad C^{*'}(x^*) > 0, \quad C^{*''}(x^*) < 0.$$

Note that since the marginal cost of foreign firm is decreasing, the costs of two firms are asymmetric. The profit function of foreign firm is

$$\pi^*(x, x^*) = (a - bx - bx^*)x^* - C^*(x^*).$$

The first order and second order condition for the foreign firm are

$$\begin{aligned} \frac{\partial \pi^*}{\partial x^*} &= -2bx^* + a - bx - C^{*'}(x^*) = 0, \\ \frac{\partial \pi^*}{\partial x^{*2}} &= -2b - C^{*''}(x^*) < 0. \end{aligned} \tag{13}$$

The first-order condition of (13) gives us an implicit function: $F(x, x^*) = 0$. We use the Implicit Function Theorem to find the value of dx^*/dx in order to determine whether a small increase of m increases the total supply in the domestic market under the decreasing cost of foreign firm.

The Implicit Function Theorem says: $dx^*/dx = -F_x/F_{x^*}$. From (13), we obtain: $F_x = -b$ and $F_{x^*} = -2b - C^{*''}(x^*) < 0$.

Then we obtain

$$\frac{dx^*}{dx} = \frac{b}{2b + C^{*''}(x^*)} < 0. \tag{14}$$

In order for a VIE to increase the total supply in the domestic market, the following condition must be satisfied

$$1 < -\frac{dx^*(x)}{dx} = \frac{-b}{2b + C^{*''}(x^*)} < 2. \tag{15}$$

Two cases are divided according to the value of denominator of the third term of (15).

Case 1: $2b + C^{**}(x^*) > 0$. In this case we have: $-1.5b < C^{**}(x^*) < -b$.⁴⁾

Case 2: $2b + C^{**}(x^*) < 0$. This case is excluded by the second order condition of (13).

Thus the case 1 is only relevant. In this case, if the value of $C^{**}(x^*) < 0$ lies within this range, an increase of m raises the total supply in the domestic market. More analyses should be added to find out the conditions for a voluntary VIE.

Let us define $\phi^*(x^*) \equiv C^{**}(x^*)/b$ as the relative slope of the foreign marginal cost curve to the demand curve. By the use of $\phi^*(x^*)$, (14) is rewritten as

$$\frac{dx^*}{dx} = -\frac{1}{2 + \phi^*(x^*)}. \quad (14a)$$

Now an imposition of VIE implies $dx < 0$. For a VIE to enhance domestic welfare, it is necessary to obtain $dW/dx < 0$. Now a change of domestic welfare is

$$dW = -x^* p' dX + (p - c) dx \quad (16)$$

From which we obtain

$$\frac{dW}{dx} = -x^* p' \frac{dX}{dx} + (p - c). \quad (16a)$$

We are going to find out the condition for (16a) to be negative. For a VIE

⁴⁾ To ensure the stability of the Cournot Nash equilibrium, we assume: $\pi_{xx} \pi_{x^*x^*} - \pi_{xx^*} \pi_{x^*x} = 3b^2 + 2bC^{**}(x^*) > 0$, which implies $C^{**}(x^*) > -1.5b$.

to increase total supply in domestic market, it is necessary to have

$$\frac{dX}{dx} = 1 + \frac{dx^*}{dx} = \frac{1 + \phi^*(x^*)}{2 + \phi^*(x^*)} < 0. \quad (17)$$

Evaluating (16a) at the initial free trade, we have

$$\left. \frac{dW}{dx} \right|_{FT} = -x^* p' \frac{dX}{dx} + (xp') = -p' \left[x^* \frac{dX}{dx} + x \right], \quad (18)$$

where use is made of the first order condition of the domestic firm $p - c = bx = -xp'$. Since the imposition of a VIE implies $dx < 0$, from (18), the necessary and sufficient condition for the VIE to be welfare enhancing is

$$\left[x^* \frac{dX}{dx} + x \right] < 0. \quad (19)$$

Using (17), we finally obtain

$$\frac{x^*}{x} > -\frac{2 + \phi^*(x^*)}{1 + \phi^*(x^*)}. \quad (20)$$

Proposition 2

If $\frac{x^*}{x} > -\frac{2 + \phi^*(x^*)}{1 + \phi^*(x^*)}$, then a VIE will be voluntary for an importing country.

This implies that for a VIE to be voluntary the output of foreign firm should be high at the initial free trade equilibrium. This result says that if the marginal cost of foreign firm declines and (20) is satisfied, a strategic import

expansion policy by a VIE will be justified.

3.2. Multiple Firms

This section assumes that there exist multiple firms in two countries: n firms in home country and n^* firms in foreign country. In this section, we consider how a VIE affects the welfare of importing country when there exists a difference in the number of firms in two countries.

Let x and x^* be the total output in home and foreign country and x_i and x_i^* be the output of i the firm in each country respectively. If the output of each firm is identical, we have: $x = nx_i$ and $x^* = n^*x_i^*$. Now assume that a VIE is binding. Then we have

$$x_m(x^*) = ((1-m)x^*)/m.$$

The profit of i the firm in home country under VIE is

$$\pi_i = (a-c)x_i - (bx_i)/(1-m),$$

where $x = X_m(1-m)$ is used and c is the marginal cost of firm.

By the profit maximization, the output of a firm and total output in home country are

$$x_i = [(a-c)(1-m)]/b(n+1), \quad x = [n(a-c)(1-m)]/b(n+1). \quad (21)$$

Similarly, the output of a firm and total output in foreign country are

$$x_i^* = [(a-c)m]/b(n^*+1), \quad x^* = [n^*(a-c)m]/b(n^*+1), \quad (22)$$

where c is also the marginal cost of foreign firm. From (21) and (22),

total supply to domestic market is

$$X_m = \frac{(a-c)\{n(n^*+1)+m(n^*-n)\}}{b(n+1)(n^*+1)}. \quad (23)$$

On the other hand, the profits of a firm in the domestic and foreign country are

$$\pi_i = \frac{(a-c)^2\{(n^*+1)-(n^*-n)m\}(1-m)}{b(n+1)^2(n^*+1)}, \quad (24)$$

$$\pi_i^* = \frac{(a-c)^2\{(n^*+1)-(n^*-n)m\}m}{b(n+1)(n^*+1)^2}.$$

From (23), consumer's surplus of home country is

$$CS = \frac{(a-c)^2\{n(n^*+1)+m(n^*-n)\}^2}{2b(n+1)^2(n^*+1)^2}. \quad (25)$$

From (24) and (25), the welfare of home country is

$$W(m) = \frac{(a-c)^2\{n(n^*+1)+m(n^*-n)\}^2}{2b(n+1)^2(n^*+1)^2} + n \left[\frac{(a-c)^2\{(n^*+1)-(n^*-n)m\}(1-m)}{b(n+1)^2(n^*+1)} \right]. \quad (26)$$

Differentiating (26) with respect to m , we obtain

$$\frac{dW(m)}{dm} = \frac{(a-c)^2 \{(n^* - n)(2nn^* + n + n^*)m - n(n^* + 1)\}^2}{b(n+1)^2(n^* + 1)^2}. \quad (27)$$

(27) shows that the welfare effect of a VIE depends on the difference in number of firms and the market share of foreign firm. We summarize this result as follows:

Proposition 3

The necessary condition for a VIE to be voluntary under multiple firms in two countries is $n^* > n$.

4. A MODEL OF VIEs WITH DIFFERENTIATED GOODS

Until now it is assumed that the two countries produce a homogeneous good. However, trade in differentiated goods occupies a dominant share among industrialized countries. In this section, we analyze the effects of VIEs in the case of differentiated goods.

Suppose that each firm in two countries produces differentiated products (for example, automobile) and both products are consumed in the home country. Assume the following utility function,

$$u = U(x, x^*) + y = (x + x^*) - \frac{1}{2}(\alpha x^2 + \alpha^* x^{*2}) - \beta x x^* + y,$$

where $x(x^*)$ is the domestic (foreign) firm's product, respectively.⁴⁾ From the utility function, we obtain the inverse demand functions of two goods.

⁴⁾ This utility function is quasi concave, if $U_{xx} = -\alpha < 0$, $U_{x^*x^*} = -\alpha^* < 0$, $U_{xx^*} = U_{x^*x} = -\beta < 0$, $|H| = \alpha\alpha^* - \beta^2 > 0$.

$$p = 1 - \alpha x - \beta x^*, \quad p^* = 1 - \beta x - \alpha x^*, \quad (28)$$

where $p(p^*)$ is the price of the domestic(foreign) good, respectively. It is assumed that the cross price effect β is symmetric. If $\beta = 0$, then the two goods are independent. The value of $\beta^2 / \alpha\alpha^*$ is used as a degree of product differentiation. When this value is zero, the two goods are independent and when it is 1, they are perfect substitute. It is usually assumed that $0 \leq \beta^2 / \alpha\alpha^* \leq 1$.

For the sake of simplicity, we assume that the marginal cost of production is zero and $\alpha^* = \alpha$. The profit functions of domestic and foreign firm are

$$\pi(x, x^*) = (1 - \alpha x - \beta x^*)x, \quad \pi^*(x, x^*) = (1 - \beta x - \alpha x^*)x^*. \quad (29)$$

From (29), the reactions of two firms are $x = (1 - \beta x^*) / 2\alpha$, $x^* = (1 - \beta x) / 2\alpha$. If a VIE is binding at the free trade level, the domestic reaction function is $x_{m_f} = [(1 - m_f)x^*] / m_f$.

With these two reaction functions, the equilibrium outputs of each firm and the total supply under a VIE are

$$\begin{aligned} x(m) &= \frac{1 - m}{2\alpha m + \beta(1 - m)}, \\ x^*(m) &= \frac{m}{2\alpha m + \beta(1 - m)}, \\ X(m) &= \frac{1}{2\alpha m + \beta(1 - m)}. \end{aligned} \quad (30)$$

where $m = m_f$ for simplicity. The prices of two products under a VIE are

$$p(m) = \frac{(3\alpha - 2\beta)m + (\beta - \alpha)}{2\alpha m + \beta(1 - m)}, \quad p^*(m) = \frac{\alpha m}{2\alpha m + \beta(1 - m)}. \quad (31)$$

The welfare of home country is

$$W = \pi + CS = 2x - 1.5\alpha x^2 - 2\beta xx^* + x^* - 0.5\alpha x^{*2} - px - p^* x^*. \quad (32)$$

Substituting (30) and (31) into (32), we obtain

$$W(m) = \frac{2-m}{2\alpha m + \beta(1-m)} - \frac{0.5\alpha + \alpha m + \beta(1-m)}{[2\alpha m + \beta(1-m)]^2}. \quad (33)$$

Differentiating (33) with respect to m , we obtain:

$$\frac{dW(m)}{dm} = \frac{\alpha[3m(\beta - 2\alpha) - 2(\beta - \alpha)]}{[2\alpha m + \beta(1-m)]^3}. \quad (34)$$

Evaluating (34) at $m = m_f = 1/2$, we obtain the following result:

Proposition 4

In the general case of product differentiation: $0 \leq \beta \leq \alpha \leq 1$, a VIE is not voluntary to the importing country. If $0 < \beta < \alpha$ and the utility function is quasi concave, a VIE will not be voluntary for the importing country.

5. A POLITICAL ECONOMY ANALYSIS OF VIEs

Why are VIEs accepted as trade policies even if they reduce its private welfare of an importing country? In order to explain its popularity, we provide an additional explanation: a political economy explanation of VIEs by considering the behavior and non-economic objectives of a government. Every government cares about the foreign interests and lobbying in addition to domestic interests. Furthermore, it also wants to achieve non-economic

objectives such as to maintain ‘a good trade relation with other countries’. In this section, by considering the behavior and non-economic objectives of a government, we present a political economy explanation of VIEs.

Today, the government of developed countries cares about foreign interests in order to maintain ‘a good trade relation with other countries.’ This is explained by a fact that trade with foreign countries is a ‘repeated-game’ rather than a ‘one-shot’ game. ‘A good trade relation with other countries’ produces benefits to a country as a whole and it can be maintained by considering foreign interests. Now assume that foreign interest is represented by the profit of foreign firm and that the trade relation with foreign country can be improved as the profit of foreign firm increases. If an increase in the market share of foreign firm by a VIE works to maintain ‘a good trade relation with foreign country,’ the government of importing country will allow to increase the market share of foreign firm. In the case of Japan, most VIEs and VERs with the US can be explained by this non-economic objective.

Assume that the domestic government cares the interests of both countries and it wants to maximize the weighted sum of domestic private welfare (11) and foreign profit (9). Let ρ be a parameter of weight that the domestic government puts on the domestic private welfare. The objective function of government is

$$V(m) = \rho \frac{(a-c)^2 [2m(1-m) + 1]}{2b(1+m)^2} + (1-\rho) \frac{(a-c)^2 m^2}{b(1+m)^2}, \quad (35)$$

where $0 < \rho < 1$.

Differentiating (35) with respect to m , we obtain

$$\frac{dV(m)}{dm} = \frac{(a-c)^2 (2-5\rho)m}{b(1+m)^3} \quad (36)$$

From (36), we obtain the following result

Proposition 5

If $0 < \rho < 2/5$, a VIE will be voluntary for the importing country as a whole.

The proposition 5 is interesting because if $\rho < 2/5$, a VIE will be preferred by an importing country as a whole. This implies that ρ should not be too high in order for a VIE to be voluntary for an importing country. Our political economy approach would explain why VIEs have been popular to settle bilateral trade conflicts in real world.

6. SUMMARY AND THE CONCLUDING REMARKS

Since VIEs have become new forms of market access trade policies in developed countries, it is necessary to analyze the voluntariness of VIEs. Using a Cournot duopoly model of homogenous and heterogeneous goods with import market share target, this paper analyzed the voluntariness of VIEs. It is shown that when each country has a single firm and both firms produce a homogenous good under identical marginal cost, a VIE may not be voluntary for the importing country. We extended the model to the case of asymmetry cost and multiple firms in two countries and found the cases of voluntary VIEs. Furthermore we provided a political economy explanation of VIE by considering the interests of foreign country. This paper explored the voluntariness of market share VIEs in the Cournot model and provided justifications of VIEs, which had never been taken up in the prior literature.

APPENDIX

In this appendix, we compare the effects of a VIE with an import subsidy when both policies produce an equal market share of foreign firm in Cournot model. In figure 1, an import subsidy to the foreign firm shifts the foreign response curve to the right. Suppose $f_s f'_s$ is the new foreign best

response curve under import subsidy. E_s is the new equilibrium point under the import subsidy where hh' and $f_s f_s'$ cross. As demonstrated before, when a VIE is set equal to $m(> m_f)$, the equilibrium point is E_m . For comparison, we assume that E_s is the equilibrium point under the import subsidy.

Now we have three equilibrium points: E_s, E_f, E_m . We see that the ranking in total supply is $E_s > E_f > E_m$. Thus if two instruments of trade intervention policy are available to increase the market share of foreign firm in domestic market, we see that while an import subsidy is pro-competitive, a VIE is anti-competitive.

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