On the Nonequivalence of VIE and Import Subsidy

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Abstract. In contrast to the equivalence/nonequivalence of tariffs and quotas in import restriction, we examine that of VIE and import subsidy in import expansion. Assuming an increase in the market-share of foreign product is realized by two policies, we show that VIE and import subsidy are not equivalent and an importing country always prefers VIE to import subsidy if the administrative cost of VIE is zero. We also show that if the administrative cost is positive its cutoff value determines the choice between two policies.

1. Introduction

Trade surplus of China with the US has been expanding since China joined the WTO in 2001. Bown and McCulloch (2009) show that the USTR yearly received at least one petition requesting the use of section 301 to investigate the reasons that have worked to restrict the market access. Undervaluation of the exchange rate and the neglects of labor right and environments have been pointed out. But these are the structural problems that cannot be solved in the short term. China will be obliged to use some compulsory import expansion policies.

A famous case of compulsory import expansion is the voluntary import expansion (VIE) in semiconductor agreement in 1986. This attracted academic interests and several papers were written in 1990s. These include Bhagwati (1987), Bjorksten (1994), Cronshaw and Markusen (1995), Dinopoulos and Kreinin (1990), Ethier and Horn (1996), Greaney (1996), Ishikawa (1999), Krishna, Roy and Thursby (2001) and Yin (2004).

However, the existing literature of VIE is not satisfactory for following reasons; i) it does not consider the administrative cost (AC), ii) it does not consider the policy choice in import expansion, and iii) the nonequivalence of VIE and import subsidy has not been taken up. Hence it is necessary to rethink the differences between VIE and import subsidy in import expansion.[1] The purpose of this paper is to propose a model that can analyze the nonequivalence of VIE and import subsidy in import expansion and extend the analysis of these policies.[2]

First, we note that two policies have both common and different features. The

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[1] Greaney(1996) is a seminal paper on this topic. By the use of a concrete model, we show the differences more clearly and provide new results.

[2] Safeguard, antidumping duty, and countervailing duty are also protective trade policies. But these are the emergency measures and are categorized as the administered protection. Moreover, in these cases there exist no negotiations between two countries.

common features are that i) the importing country is obliged to enforce import expansion, and ii) the costs of enforcement are borne by the importing country. These features are the products of the pressures and negotiations between two countries, which work to avoid the retaliation and make the setup costs of these policies cheap. Due to the common features, we will name them as the compulsory import expansion policies. The different features are that i) while a VIE realizes an increase in the market-share under lower total output an import subsidy realizes it under higher total output, and ii) while a VIE kinks the domestic reaction curve an import subsidy shifts out the foreign reaction curve.

Recently, at the TPP negotiation the US asked Japan to import additional 200,000 ton of rice and Japan is going to accept 50,000 ton. This is a case of VIE. Also compared with the voluntary export restraint (VER) the literature of VIE is scarce. Moreover, the equivalence/nonequivalence of VIE and import subsidy in import expansion has been an open question. These motivated us to write this paper.

The rest of the paper is as follows. In section 2, we first provide some remarks on the semiconductor VIE, followed by a model of market-share VIE without and with AC and then provide a welfare analysis. Section 3 sets up a model of equivalent import subsidy and provides a similar analysis. Section 4 compares two policies and shows the importance of the cutoff value of AC. Section 5 concludes.

2. VIE

2.1. Remarks on the semiconductor VIE

Before setting up our model, it is necessary to see what the Japanese government did to enforce the semiconductor agreement. By preparing the government officials, it first surveyed the purchase plans of the semiconductor users and then used the

moral suasions by the administrative guidance with implicit penalties to the users. Finally, it continued the follow-up survey. These actions reduced the Japanese and total outputs, forced users to switch from Japanese to the US products and increased the market-share of US products. Conversely, the US government did not take any actions and just looked on. These facts indicate followings. First, a VIE is a compulsory import expansion enforced by the importing country Second, its costs are born by the importing country.

2.2. Model

This section sets up a model that reflects above facts. To obtain clear results, we will employ a simple and concrete model. Assume two countries, domestic (importing) and foreign (exporting), and each has one firm. Both firms produce a homogeneous product and compete in the domestic market in a Cournot fashion.[3] We consider three situations; free trade, VIE, and import subsidy. This section takes up the first two. Let the commodity in question be X and its inverse demand function be

$$p = p(X) = a - bX, \tag{1}$$

where p is the price of X, and a and b positive constants. Let $x(x^*)$ be the output of domestic (foreign) firm. Then $x + x^* \equiv X$, where the asterisk denotes foreign variables. We assume the fixed cost is zero and the marginal cost is constant and same for both firms. Thus the cost functions of two firms are $C(x) = cx$ and $C^*(x^*) = cx^*$, where c is the common marginal cost.[4] Trade costs are assumed to be zero. These assumptions are assumed to hold throughout.

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[3] Greaney(1996) assumes a Bertrand competition. In contrast, we assume a Cournot competition and introduce an administrative cost.

[4] This implies that the market-share of foreign product is 0.5. In many cases, the market-share of foreign product is less than 0.5. Our model just intends to show the effects of import expansion more than initial free trade.

We start from the situation of free trade. The reaction functions of two firms are

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

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

These reaction functions determine a unique and stable Cournot-Nash equilibrium.[5] This determines the free trade equilibrium. The commodity price, output of each firm, and total supply under free trade (with subscript f) are

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

We assume a representative consumer who is the owner of the firm. From (3a), the profit of each firm, and the consumer's surplus and welfare of domestic country are

$$\pi_f = \pi_f^* = \frac{(a-c)^2}{9b}, \quad CS_f = \frac{2(a-c)^2}{9b}, \quad W_f = \frac{(a-c)^2}{3b},$$ (3b)

where the domestic welfare is the sum of profit and consumer's surplus. The foreign welfare is equal to its profit.

Next, move to the situation of VIE. Assume a two-stage game. In the first stage, two governments negotiate and increase the market-share of foreign product in the domestic market. In the second stage, two firms compete non-cooperatively in the domestic market assuming that an increase in the market-share is realized by the domestic government. The analysis is divided into two cases; $AC = 0$ and $AC > 0$. The former is the case of the existing literature while in the latter we can consider the policy choice in import expansion.

2.3. Effects of VIE

2.3.1. $AC = 0$

Let the market-share of foreign product under free trade and VIE (with subscript

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[5] To ensure positive outputs, $(a-c) > 0$ is assumed.

v) be m_f and m_v respectively. Then we obtain:

$$\frac{x^*}{(x+x^*)} = m_v \geq m_f,$$

(4)

where $0.5 \leq m_f \leq m_v \leq 1$. Now, (4) is rewritten as

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

(5)

This shows that an introduction of market-share imposes a constraint on domestic output.

In Figure 1, $x(x^*)$ is measured horizontally (vertically). hh' (ff') is the reaction curve of domestic (foreign) firm with the slope of 2 ($1/2$). The free trade Cournot-Nash equilibrium is E_f and the level of output is $x_f(x_f^*)$. Draw a dotted straight line gg' that passes E_f with the slope of minus 1. Also draw two straight lines from the origin, $m_f/(1-m_f)$ and $m_v/(1-m_v)$. Since $m_f \leq m_v$, the slope of $m_v/(1-m_v)$ is not less than that of $m_f/(1-m_f)$. In addition, while $0h$ and $0f'$ are $(a-c)/b$, $0f$ and $0h'$ are $(a-c)/2b$.

The market-share VIE divides the domestic reaction curve into two parts, $0E_f$ and $E_f h$ and are represented by

$$x_v(x^*) = \frac{(1-m_f)x^*}{m_f}, \text{ if } x^* \leq x_f^*,$$

(6a)

$$x_v(x^*) = x(x^*), \text{ if } x^* > x_f^*,$$

(6b)

where $x_v(x^*)$ is the reaction function of domestic firm under the VIE. Thus the

market-share VIE kinks the domestic reaction curve.

As the result of the VIE, suppose the new domestic reaction curve becomes $OE_s h$.

Assume that under the VIE foreign firm responds by producing output on the initial

reaction curve.[6] Then the new equilibrium point is E_v on fE_f of the foreign

reaction curve. As E_v is below gg', total output under the VIE is less than that of

under free trade. This is due to the fact that the reduction of domestic output is

greater than the increase of foreign output.

Under the VIE, (6a) is rewritten as $x^* = m_v x/(1-m_v)$. With this and (2b), the

commodity price, output of each firm and total supply under the VIE are:

$$p_v = \frac{am_v + c}{1 + m_v}, \quad x_v = \frac{(a-c)(1-m_v)}{b(1+m_v)}, \quad x_v^* = \frac{(a-c)m_v}{b(1+m_v)}, \quad X_v = \frac{(a-c)}{b(1+m_v)}. \quad (7a)$$

From (7a), the profit of domestic and foreign firm and the domestic consumer's

surplus under the VIE are:

$$\pi_v = \frac{(a-c)^2 m_v (1-m_v)}{b(1+m_v)^2}, \quad \pi_v^* = \frac{(a-c)^2 m_v^2}{b(1+m_v)^2}, \quad CS_v = \frac{(a-c)^2}{2b(1+m_v)^2}. \quad (7b)$$

From (3a) and (7a), as $m_v > 0.5$, $x_v^* > x_f^*$. From (7b), the welfares of two countries

are

$$W_v = \frac{(a-c)^2 (2m_v(1-m_v)+1)}{2b(1+m_v)^2}. \quad (8a)$$

$$W_v^* = \frac{(a-c)^2 m_v^2}{b(1+m_v)^2}. \quad (8b)$$

These show that the welfares depend on $(a-c)$, b and m_v. From these we obtain:

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[6] Greaney(1996) also used the same assumption.

$$\frac{dW_v}{dm_v} = -\frac{3(a-c)^2 m_v}{b(1+m_v)^3} < 0, \quad \frac{dW_v^*}{dm_v} = \frac{2(a-c)^2 m_v}{b(1+m_v)^3} > 0. \tag{9}$$

These produce:

Proposition 1. *Under* $AC = 0$, *a market-share VIE is welfare reducing for domestic country and welfare enhancing for foreign country.*

This implies that if domestic import is increased more than freely desired domestic welfare declines and foreign welfare increases. From (9), we obtain:

$$\frac{dW_v}{dm_v} + \frac{dW_v^*}{dm_v} = -\frac{(a-c)^2 m_v}{b(1+m_v)^2} < 0. \tag{10}$$

Thus we obtain:

Proposition 2. *A VIE is welfare reducing for the world.*

Further, as $0.5 < m_v < 1$, from (3a) and (7a), we obtain:

$$p_v - p_f = \frac{(a-c)(2m_v - 1)}{3(1+m_v)} > 0. \tag{11a}$$

Also from (3b) and (8a), we see:

$$W_v - W_f = -\frac{(a-c)^2 (4m_v + 1)(2m_v - 1)}{6b(1+m_v)^2} < 0. \tag{11b}$$

These show that the VIE increases commodity price and reduces domestic welfare.

2.3.2. $AC > 0$

When AC is positive, we must introduce the AC function. To do so, at least three

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aspects must be specified; the elements of AC, the AC function and the relationship between AC and the cost of production. We introduce it in a most simple way.

On the elements of AC, as noted in 2.1, it is actually the costs of employment of the government officials that work to increase the market-share of foreign product. This implies that it is a variable cost. On the AC function, we assume it depends on the import (output) from foreign country, specifically on the excess of import of foreign product under VIE over under free trade level. This will be justified because an increase in import is realized by an increase in the government officials. Further, we assume the dependence is proportional.

On the relationship between AC and the cost of production, we assume that the introduction of AC does not affect the cost of production. This is based on the fact that in the case of semiconductor the implementation of the VIE was introduced after the production of commodity and the price of semiconductor did not change as the result of the VIE.

Under these specifications, we assume the AC function: $z(x_v^*, x_f^*) = \alpha(x_v^* - x_f^*)$, where α is a positive constant. From (3a) and (7a), the AC function is:

$$z(x_v^*, x_f^*) = \frac{\alpha\left[(a-c)(2m_v - 1)\right]}{3b(1+m_v)}. \tag{7c}$$

AC must be subtracted to obtain welfare. Let W_v^{AC} be the welfare with AC. Then from (8a) and (7c), the domestic welfare with AC is:

$$W_v^{AC} = \frac{(a-c)^2(2m_v(1-m_v)+1)}{2b(1+m_v)^2} - \frac{\alpha\left[(a-c)(2m_v - 1)\right]}{3b(1+m_v)}. \tag{8a'}$$

From (8a)', we obtain:

$$\frac{dW_v^{AC}}{dm_v} = -\frac{3(a-c)^2 m_v}{b(1+m_v)^3} - \frac{\alpha(a-c)}{b(1+m_v)^2} < 0 \,. \tag{9'}$$

From (9)', we obtain:

Remark 1. *Under $AC > 0$, a market-share VIE is always welfare reducing for domestic country.*

This result is natural under our specifications of AC. From (3b) and (8a)', we obtain:

$$W_v^{AC} - W_f = -\frac{(a-c)^2(4m_v+1)(2m_v-1)}{6b(1+m_v)^2} - \frac{\alpha\left[(a-c)(2m_v-1)\right]}{3b(1+m_v)} < 0 \,. \tag{11b'}$$

3. Import Subsidy

3.1. Remarks on Import Subsidy

Export subsidy is an export protective policy by an exporting country. But it is prohibited under the WTO and cannot be used.[7] In contrast, import subsidy implemented by an importing country is not prohibited. Thus an exporting country that has trade deficits gives pressure to an importing country and asks to subsidize its exports. Hence it is a compulsory import expansion policy by the importing country. Note that whereas a VIE needs some administrative policies an import subsidy is enforceable. Furthermore, whereas a VIE kinks the domestic reaction curve, an import subsidy shifts out the foreign reaction curve.

3.2. Model

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[7] However, with the development of IO theory, the analyses of export subsidy produced a new trade policy under international duopoly, strategic trade policy based on the experiences of Japan in 1980s.

This section sets up a model of import subsidy with two-stage game. In the first stage, two governments negotiate and increase the market-share of foreign product to that under the VIE. In the second stage, two firms compete non-cooperatively in the domestic market assuming that the importing country pays a subsidy to the foreign firm. The profit of foreign firm under the subsidy (with subscript s) is

$$\pi_s^* = (a - b(x + x^*))x^* - (c - s)x^*,$$ (12)

where $s\,(>0)$ is the rate of import subsidy. Thus the foreign reaction function is

$$x^*(x,s) = \frac{(a-c)+s}{2b} - \frac{x}{2}.$$ (13)

From (2a) and (13), the output of both firm, total supply, and the market-share of foreign product under the subsidy are

$$x_s = \frac{(a-c)-s}{3b}, x_s^* = \frac{(a-c)+2s}{3b}, X_s = \frac{2(a-c)+s}{3b}, m_s \equiv \frac{x_s^*}{X_s} = \frac{(a-c)+2s}{2(a-c)+s},$$ (14)

where m_s is the market-share of foreign product under the subsidy. By equating m_s with m_v, we obtain:

$$\tilde{s} = \frac{(a-c)(2m_v - 1)}{2 - m_v} > 0, \text{ if } 0.5 < m_v < 1,$$ (15)

where $\tilde{s}$ is the rate of subsidy that attains the same market-share as under the VIE.

In Figure 1, the import subsidy $\tilde{s}$ shifts the foreign reaction curve to $f_s f_s'$ to realize E_s as the equilibrium point under the import subsidy where two reaction curves hh' and $f_s f_s'$ cross. As E_s is above gg', the total supply under the subsidy is larger than that under free trade. Furthermore, as both E_s and E_v are

on $m_v/(1-m_v)$, the market-share of foreign product is the same.

3.3. Effects of Import Subsidy

From (14), the commodity price, profits of both firm, and domestic consumer's surplus under the import subsidy are

$$p_s = \frac{a + 2c - \tilde{s}}{3}, \pi_s = \frac{((a-c)-\tilde{s})^2}{9b}, \pi_s^* = \frac{((a-c)+2\tilde{s})^2}{9b}, CS_s = \frac{(2(a-c)+\tilde{s})^2}{18b}. \quad (16)$$

The cost of import subsidy is $\tilde{s}x^* = \dfrac{\tilde{s}((a-c)+2\tilde{s})}{3b}$, which is to be subtracted to obtain domestic welfare. The domestic and foreign welfare under the subsidy are

$$W_s = \frac{2(a-c)^2 - 2\tilde{s}(a-c) - 3\tilde{s}^2}{6b}. \quad (17a)$$

$$W_s^* = \frac{((a-c)+2\tilde{s})^2}{9b}. \quad (17b)$$

These show that the welfares depend on $(a-c)$, m_v and b. From (17a) and (17b), we obtain:

$$\frac{dW_s}{d\tilde{s}} = -\frac{(a-c)+3\tilde{s}}{3b} < 0, \quad \frac{dW_s^*}{d\tilde{s}} = \frac{4((a-c)+2\tilde{s})}{9b} > 0. \quad (18)$$

These produce:

Proposition 3. *An import subsidy that attains the same market-share is welfare reducing for domestic country and welfare enhancing for foreign country.*

This shows that if domestic import is increased more than freely desired domestic welfare declines and foreign welfare increases. Thus the voluntary nature of import subsidy is the same as that of VIE; both reduce domestic welfare and increase foreign welfare.

However, there exists a difference in world welfare. From (18), we have:

$$\frac{dW_s}{d\tilde{s}} + \frac{dW_s^*}{d\tilde{s}} = \frac{(a-c)-\tilde{s}}{9b} \ . \tag{19}$$

As $0.5 < m_v < 1$, from (15), $(a-c)-\tilde{s} > 0$. This produces:

Proposition 4. *An import subsidy is welfare enhancing for the world.*

Proposition 2 and 4 indicate that VIE and import subsidy produce a contrastive result on the world welfare. This is due to the fact that while a VIE reduces total output and is thus anti-competitive an import subsidy increases total output and is thus pro-competitive.

Similar to the case of VIE, we can calculate the differences in price and welfare between import subsidy and free trade. From (3a) and (16), we obtain:

$$p_s - p_f = -\frac{\tilde{s}}{3} < 0 . \tag{20a}$$

Also from (3b) and (17a), we obtain:

$$W_s - W_f = -\frac{2\tilde{s}(a-c)+3\tilde{s}^2}{6b} < 0 . \tag{20b}$$

Both commodity price and domestic welfare decline as the result of the import subsidy. From (11b) and (20b), we see that domestic welfare declines if its import is increased more than freely desired.

4. Nonequivalence of VIE and Import Subsidy

In the existing literature of import tariffs and quotas we have an important result: the equivalence/nonequivalence theorem of Bhagwati (1965). This says that under competitive markets two policies produce same effects on price and welfare but if the markets are not competitive the effects are not equivalent and that given the same level of import a quota produces worse impacts on price and welfare than a

tariff. The analysis of the existing literature is in import restriction. In contrast, here, it is in import expansion. To attain the same market-share of foreign product, we compare VIE and import subsidy and show that they are not equivalent in three aspects.

4.1. Level of Output

We showed that an increase the market-share of foreign product is realized under either lower or higher total output. The former is the VIE, where domestic output declines and foreign output increases. But as the decline of domestic output is greater than the increase of foreign output an increase in the market-share is realized under lower total output. The latter is the import subsidy, where domestic output also declines and foreign output also increases. But as the increase of foreign output is greater than the decline of domestic output an increase in the market-share is realized under higher total output.

4.2. Commodity Price

Since the total output declines under VIE and increases under import subsidy, the commodity price would be less under import subsidy. From (7a) and (16), we obtain:

$$p_s - p_v = -\frac{(a-c)(2m_v - 1) + \tilde{s}(1+m_v)}{3(1+m_v)}.$$
(21)

As $0.5 < m_v < 1$, $p_s < p_v$. Furthermore, from (11a) and (20a), $p_s < p_f < p_v$. The commodity price under the import subsidy is less than the free trade price, which is less than the VIE price. These are consistent with the changes in outputs.

4.3. Welfare

We now consider the welfare effects of two policies and show that if $AC = 0$ a VIE is always preferable to an import subsidy and that when $AC > 0$ the cutoff value of α determines the policy choice.

4.3.1. $AC = 0$

Substituting (15) into (17a) and subtracting from (8a), we obtain:

$$W_v - W_s = \frac{(a-c)^2(1+4m_v)(1-2m_v)^2}{2b(1+m_v)^2(2-m_v)^2} > 0. \tag{22}$$

This produces:

Proposition 5. *Under $AC = 0$, an importing country always prefers a VIE to an import subsidy.*

This shows that a VIE is the second best policy under $AC = 0$. An intuition is that the same marker-share is realized under smaller total output and cost. Following corroborations will justify this; the values of domestic welfare and the curvature of domestic welfare function.

First, calculate the values of welfare in two extreme cases by specifying $(a-c)$ $=1$, $b=1$, and thus $(a-c)^2/b = 1$. If $m_v = 0.5$, then $\tilde{s} = 0$ and $W_v = 0.333 = W_s$. But if $m_v = 1$, then $\tilde{s} = (a-c)$, $W_v = 0.125$ and $W_s = -0.500$. Thus, in the case of VIE, as the value of m_v increases from 0.5 to 1, the domestic welfare declines from 0.333 to 0.125. But, in the case of import subsidy it declines from 0.333 to -0.500. This shows that the import subsidy is more welfare reducing.

Second, examine the curvature of the welfare functions. First, from (9), we obtain:

$$\frac{d^2 W_v}{dm_v^2} = -\frac{3(a-c)^2(1-2m_v)}{b(1+m_v)^4}. \tag{23a}$$

The sign of (23a) is positive as long as $0.5 < m_v < 1$. From (9) and (23a), we see that under the VIE the welfare of importing country declines at a decreasing rate. On the other hand, in the case of import subsidy, from (18a), we obtain:

$$\frac{d^2 W_s}{d\tilde{s}^2} = -\frac{1}{b} < 0. \tag{23b}$$

From (18) and (23b), we see that under the import subsidy it declines at an increasing rate. From (23a) and (23b), the loss of welfare is less under the VIE. These show that a VIE is preferable to an import subsidy when $AC = 0$.

4.3.2. $AC > 0$

From (15), (17a) and (8a)', we obtain:

$$W_v^{AC} - W_s = \frac{(a-c)^2(1+4m_v)(1-2m_v)^2}{2b(1+m_v)^2(2-m_v)^2} - \frac{\alpha[(a-c)(2m_v-1)]}{3b(1+m_v)}. \tag{24}$$

This shows the differences in welfare between two policies under $AC > 0$. If AC is positive and then increases, the advantage of VIE declines and we have a situation where two policies are indifferent. Let $\tilde{\alpha}$ be the cutoff value of α that makes two policies indifferent. Then, from (24), it is

$$\tilde{\alpha} = \frac{3(a-c)(1+4m_v)(1-2m_v)^2}{2(1+m_v)(2-m_v)^2(2m_v-1)} > 0. \tag{25}$$

From (24) and (25), we obtain:

Remark 2. *Under $AC > 0$, an importing country prefers a VIE to an import subsidy if $0 < \alpha < \tilde{\alpha}$. If $\alpha = \tilde{\alpha}$, they are indifferent, and if $\alpha > \tilde{\alpha}$, an import subsidy is preferable to a VIE.*

This provides a rationale for the policy choice in import expansion under $AC > 0$.

How $\tilde{\alpha}$ depends on $(a-c)$ and m_v?. From (25), we obtain:

$$\frac{\partial \tilde{\alpha}}{\partial (a-c)} = \frac{3(1+4m_v)(1-2m_v)^2}{2(1+m_v)(2-m_v)^2(2m_v-1)} > 0. \tag{26a}$$

$$\frac{\partial \ln \tilde{\alpha}}{\partial m_v} = -\frac{3}{m_v} < 0. \tag{26b}$$

These show that the cutoff value increases when $(a-c)$ increases and declines when the market-share of foreign product increases.

Finally, it should be noted that the policy choice from the aspect of the importing country and the world is not the same and it depends on the values of α and $\tilde{\alpha}$. We noted already that an import subsidy is always welfare enhancing for the world. Thus if $\alpha < \tilde{\alpha}$ initially, then as an importing country chooses a VIE in this region, there is a conflict in the choice between them. However, if as a result of an increase in α or a decline in $\tilde{\alpha}$ by an increase in the market-share we move to the region $\alpha > \tilde{\alpha}$, then both choose an import subsidy and the conflict disappears.

5. Conclusions

Contrary to the case of import tariffs and quotas in import restriction, we have no literature on the nonequivalence of VIE and import subsidy in import expansion. Also the introduction of AC has been an open question in the analysis of VIE. To address these issues, we extended the existing model of VIE and compared it with import subsidy. We obtained followings.

First, two policies are not equivalent in output, price, and welfare. Second, if AC is zero an importing country always chooses a VIE and the cutoff value of α

determines the policy choice in import expansion. Third, while a VIE reduces the world welfare an import subsidy enhances it.

Finally, we provide some remarks on our analysis and results. First, our results are obtained under extremely restrictive assumptions: constant and identical cost, linear demand, homogeneous product and one firm in each country. A model with variable and different cost, non-linear demand and differentiated product would be desirable. More general market structures may be desirable. Second, we assumed the AC function depends on the excess of import of foreign product under VIE over free trade level. Also we assumed the market-share rather than the minimum quantity of import is a target. Alternative specifications could be considered. Third, a production tax on domestic firm reduces the output and profit of domestic firm, shifts down the domestic reaction curve and attains the same market-share as the VIE. Such a domestic policy could be an alternative policy. Fourth, the model of VIE and import subsidy can be extended to include factor mobility. A model in this direction has been provided by Oda and Stapp (2007).

Nonetheless, this paper is the first to propose a model that can analyze the nonequivalence of VIE and import subsidy in import expansion and extend the existing model of VIE. We showed that two policies are not equivalent in output, price, and welfare and that the second best policy depends on the cutoff value of AC.

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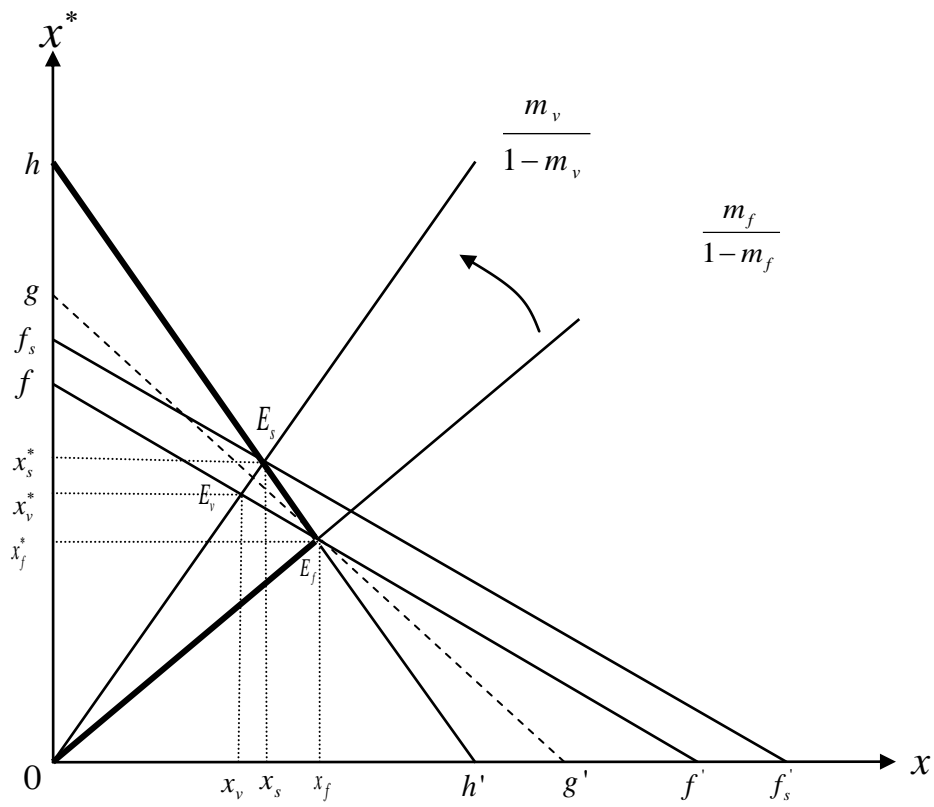Yin, Xiaopeng (2004) 'Voluntary Import Expansion with Non-Stationary Demand,' *Canadian Journal of Economics* 37, 1084 - 96.

Fig.1 Effects of VIE and Import Subsidy