Commercial Policy under Cross-Border Ownership*

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(preliminary and incomplete)

Abstract

It is often observed that in order to serve the domestic market, foreign firms not only export but also control domestic firms through foreign direct investment (FDI). This paper examines the effects of tariffs, production subsidies, and foreign ownership regulation on prices, outputs, profits, and welfare when both exports and FDI coexist. Cross-border ownership on the basis of both financial interests and corporate control leads to horizontal market-linkages through which tariffs and production subsidies may not benefit local firms. The effects of ownership regulation depends on both the initial ownership share and the substitutability between goods.

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1 Introduction

Cross-border ownership (CBO) is widespread in this age of globalization. According to Kang and Sakai (2000), cross-border strategic alliances worldwide increased from 860 in 1989 to 4400 in 1999. From an index compiled by Morgan Stanley Capital International (MSCI), Wojcik (2002, table 1) documents that 711 companies had foreign ownership in 16 northern and western European countries. The share of foreign ownership varies with an average of 61 percent. The highest is Norway at 91 percent and the lowest is Switzerland at 23 percent.

Although there are various CBO arrangements, an interesting fact is that foreign direct investment (FDI) often coexists with exports. A typical example is the automobile industry. General Motors (GM) is the 100 percent shareholder of Opel in Germany and Saab in Sweden and a heavy shareholder of Suzuki, Isuzu, Subaru (Fuji) in Japan, Daewoo in Korea, and Fiat in Italy.\footnote{GM has Suzuki's 20\% stocks, Isuzu's 12\% stocks, Subaru's 21\% stocks, Daewoo's 67\% stocks, and Fiat's 20\% stocks, respectively.} To serve the Japanese market, GM exports directly large and luxury cars such as Cadillac and Corvette and supplies compact cars through Suzuki, Isuzu, and Subaru.\footnote{Similar strategies can be seen between Daimler Chrysler and Mitsubishi and between Ford and Mazda.} Moreover, Shanghai GM is a 50-50 joint venture (JV) between GM and Shanghai Automotive Industry Corporation. Since the Chinese government does not allow foreign auto makers to have their own subsidiaries in China, world leading makers have been forming JVs with Chinese auto makers as well as exporting to China.\footnote{The upper limit of foreign ownership imposed by the Chinese government is 50 percent.}

Several authors have analyzed the relationship between collusion/competition and partial ownership within a country. For instance, Reynolds and Snapp (1986), Farrell and Shapiro (1990), Malueg (1992), and Reitman (1994) model horizontal partial ownership; Morita (2001) investigates the Japanese manufacturer-supplier relationship; and Alley (1997) finds empirically that Japanese firms form partial ownership to collude in the domestic market, but not in the export market.

When partial ownership schemes are across country borders, they have important consequences on trade and foreign investment. For instance, by forming CBO schemes, firms can not only share profits, but also shift production to meet local demands and to avoid high cost regions.
The present paper examines the effects of import tariffs, production subsidies, and foreign ownership regulation when both exports and FDI coexist. We are interested in how outputs, firm profits, consumer prices and national welfare change when a certain commercial policy is adopted.

Although there are several papers which analyze commercial policies under CBO in the framework of international oligopoly (see, for example, Lee, 1990; Weltzel, 1995; and Long and Soubeyran, 2001), our analysis is distinguished from these studies. In our analysis, we explicitly incorporate the fact that foreign firms control domestic ones through FDI. Firms are independent to each other without any ownership relationships, while the parent firm has complete control power in the case of full ownership. In the case of partial ownership, therefore, it is inferred that the partial owner has some control power under certain cases. In fact, it is widely observed that the principal shareholder sends executives such as the chief executive officer and chief operating officer to the partially owned company. We assume that the foreign firm has some corporate control over a domestic firm by undertaking FDI. Specifically, the domestic firm with foreign ownership cares about the profits of the foreign firm as well as its own profits. In particular, the higher the foreign ownership, the more the domestic firm takes account of the foreign firm’s profits.

We show that CBO on the basis of both financial interests and corporate control leads to horizontal market-linkages through which import tariffs and production subsidies may not benefit 100% locally owned firms. Nevertheless, regulating CBO may not benefit them either. Thus, our analysis and result lead to important policy implications for countries intending to develop local industries.

The rest of the paper is organized as follows. In section 2, we set up the basic model. Section 3 investigates the effects of import tariffs and production subsidy under foreign ownership and control. Section 4 introduces regulation on foreign ownership. Section 5 looks into the impact on national welfare. And section 6 concludes the paper.

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4 In fact, there are few studies that explicitly take this corporate control into account when analyzing partial ownership. An exception is Bresnahan and Salop (1986) which examines the relationship between the corporate control and Herfindher index.

5 For example, Daimler Chrysler, which has Mitsubishi’s 34% stocks, Ford, which has Mazda’s 33% stocks, and Renault, which has Nissan’s 44% stocks, send the president to Mitsubishi, Mazda, and Nissan, respectively.
2 Model Setup

2.1 Basic Structure

Consider two goods $X$ (a large car) and $Y$ (a small car), which are imperfect substitutes. Good $X$ is made by a foreign firm (e.g., Daimler Chrysler), who exports to the domestic market for sales. There are also two domestic firms $d$ (e.g., Mitsubishi) and $h$ (e.g., Honda), that produce and sell good $Y$ locally. Let us denote the marginal cost of firm $i$ as $c_i$ ($i = f, d, h$), which is constant. We assume that firm $f$ has financial interest in firm $d$, specifically, it holds firm $d$’s stocks, by a share $k$ ($0 \leq k \leq 1$).

We also assume that the domestic government imposes a specific tariff $t$ on the imported good $X$ and provides a specific subsidy $s$ to the locally produced good $Y$. Based on the tariff and subsidy, the firms compete in a Cournot fashion.

The inverse demands for the imperfectly substitutable goods $X$ and $Y$ are given respectively as

$$p_X = a - x - \gamma(y_d + y_h),$$
$$p_Y = b - (y_d + y_h) - \gamma x,$$

where $p_X$ and $p_Y$ are the prices of goods $X$ and $Y$, $0 < \gamma < 1$ is a parameter indicating the degree of substitutability between the two goods, and $x$, $y_d$ and $y_h$ are, respectively, the outputs of firms $f$, $d$ and $h$.

Given the above structure, the profit functions of firms $f$, $d$ and $h$ can be written respectively

$$\pi_f = (p_x - c_f - t)x + k(p_y - c_d + s)y_d,$$
$$\pi_d = (p_y - c_d + s)y_d,$$
$$\pi_h = (p_y - c_h + s)y_h.$$

2.2 Foreign firm’s control over the domestic firm

In cases involving partial ownership, the Industrial Organization literature and the Antitrust literature distinguish between financial interest and corporate control (e.g., O’Brien and Salop, 2000). Financial interest refers to the right to receive the stream of profits generated by the firm from its operations and investments. Corporate control
refers to the right to make the decisions that affect the firm. In a sole proprietorship, a single individual has the right to 100 percent of the profits of the firm. The same individual also has complete control over the company, making the decisions about levels of prices, outputs, investments and where to purchase inputs and locate plants, etc. In a partial ownership, nobody has 100 percent financial interest of the ownership. However, the majority owner of financial interest may have 100 percent corporate control and the minority owner has none. Generally, higher financial interest brings greater corporate control.

In our model, since firm $f$ holds firm $d$’s stocks (i.e., financial interest), the former may also affect the latter’s corporate control. For instance, it may be able to constrain firm $d$ from taking any action which is harmful to firm $f$. Thus, we assume the objective function of firm $d$, $\tilde{\pi}^d$, is the weighted average of firm $d$’s and firm $f$’s profit functions:

$$\tilde{\pi}^d = (1 - v)\pi^d + v\pi^f, \quad 0 \leq v \leq 1. \quad (6)$$

The parameter $v$ represents the degree of firm $f$’s control over firm $d$’s decision. In other words, parameters $k$ and $v$ respectively represent firm $f$’s financial interest (“ownership share” in our terminology) and corporate control (“control power” in our terminology) of firm $d$.

We formulate the relationship between firm $f$’s ownership share $k$ and control power $v$ as follows: \(^6\)

**Assumption 1**

$$v = \begin{cases} v(k), v' \geq 0 & \text{if } 0 \leq k < \bar{k} \\ 1 & \text{if } \bar{k} \leq k \leq 1 \end{cases} \quad (7)$$

where $v(0) = 0$ and $v(\bar{k}) = 1$.

The control power $v$ is increasing in firm $f$’s ownership share $k$. In other words, we assume that the weight firm $d$ puts on the profit from good $X$ is not decreasing in firm $f$’s ownership share $k$. When firm $f$ holds more than a critical share, it fully controls firm $d$. As pointed out by O’Brien and Salop (2000), $v = 1$ could hold even if $k < 1/2$.

From (3) and (6), firm $d$ maximizes

$$\tilde{\pi}^d = (1 - v + vk) \left[ (py - c^d + s)g^d + \frac{v}{(1 - v + vk)} (px - c^x - t)x \right]. \quad (8)$$

Thus, it is formally expressed as:

\(^6\)When $k$ is small, $v(k) = 0$ may hold. This is called “silent interests”. Even if $v(k) = 0$ holds for some range of $k$, the essence of our results would not change.
Assumption 2

\[
\frac{d\left(\frac{v}{1 - v + vk}\right)}{dk} = \frac{v' - v^2}{(1 - v + vk)^2} \geq 0.
\] (9)

For example, \(v(k) = (k/\bar{k})^\beta\), \(\beta \geq 1\) satisfies Assumption 2. Figure 1 shows the schedule of firm \(f\)'s ownership share \(k\) and control power \(v\).

Figure 1 around here

Finally, firms \(f\) and \(h\) are assumed to maximize their own profits simultaneously and independently, and firm \(d\) maximizes (8), giving rise to the following first order conditions respectively:

\[
\begin{align*}
\frac{d\pi^x}{dx} &= -x + p_x - c^f - t - k\gamma d = 0, \\
\frac{d\pi^d}{dy^d} &= (1 - v + vk)(-y^d + p_y - c^d + s) - v\gamma x = 0, \\
\frac{d\pi^h}{dy^h} &= -y^h + p_y - c^h + s = 0.
\end{align*}
\] (10) (11) (12)

3 Trade policies under foreign ownership and control

First, we consider the effects of the tariff on good \(X\) and the production subsidy to good \(Y\). Totally differentiating the first order conditions to derive:

\[
\begin{pmatrix}
2 & \gamma(1 + k) & \gamma \\
\gamma(1 + kv) & 2(1 - v + kv) & 1 - v + kv \\
\gamma & 1 & 2
\end{pmatrix}
\begin{pmatrix}
dx \\
dy^d \\
dy^h
\end{pmatrix}
= 
\begin{pmatrix}
-1 \\
0 \\
0
\end{pmatrix}
\begin{pmatrix}
dt \\
0 \\
1
\end{pmatrix}
\begin{pmatrix}
0 \\
1 - v + kv \\
1
\end{pmatrix}
ds.
\] (13) (14)

For stability, we assume

\[
\Delta \equiv (1 + kv - v)(6 - 2\gamma^2 - k\gamma^2) - v\gamma^2(1 + 2k) > 0.
\] (15)

3.1 Import Tariffs

The tariff has the following effects on outputs.
\[
\frac{dx}{dt} = -\frac{3(1 + kv - v)}{\Delta} < 0, \quad (16)
\]
\[
\frac{dy^d}{dt} = \frac{\gamma(1 + v + kv)}{\Delta} > 0, \quad (17)
\]
\[
\frac{dy^h}{dt} = \frac{\gamma(1 - v(2 - k))}{\Delta},\quad (18)
\]
\[
\frac{dY}{dt} = \frac{\gamma(2 - v + 2kv)}{\Delta} > 0, \quad (19)
\]

where \( Y \equiv y^d + y^h \).

**Figure 2 around here**

Conditions (16) and (17) say respectively that an increase in the tariff reduces the output of the foreign firm \( f \) but increases that of domestic firm \( d \), which are as expected. However, we find a counter-intuitive result: \( dy^h/dt \) in ((18)) is negative if and only if \( v > 1/(2 - k)(\equiv g(k)) \). Figure 2 depicts the relationship between \( g(k) \) and \( v(k) \).

Assumption 2 assures that curve \( v(k) \) intersects with curve \( g(k) \) once in \([0, \bar{k}]\). They intersect at \( k = k_1 \) in the figure. Thus, we obtain

**Proposition 1** When the import tariff on good \( X \) increases, firm \( h \) reduces its output if and only if \( k_1 < k < 1 \).

While the original purpose of the tariff is to help domestic firms, Proposition 1 says that if the foreign firm is tied up with a domestic firm, the other domestic firm could lose market share from a tariff, contrary to conventional wisdom.

The intuition of Proposition 1 lies in the production sifting from \( x \) to \( y^d \) due to the control power \( v \) and the initial ownership share \( k \). To see this more clearly, let us derive the reactions functions, using the FOCs.

\[
x = r^f(y^d, y^h) = \frac{(a - c^f - t)}{2} - \frac{\gamma(1 + k)}{2} y^d - \frac{\gamma}{2} y^h, \quad (20)
\]
\[
y^d = r^d(x, y^h) = \frac{(b - c^d + s)}{2} - \frac{y^h}{2} - \frac{\gamma x}{2} \left( 1 - \frac{v}{1 - v + kv} \right), \quad (21)
\]
\[
y^h = r^h(x, y^d) = \frac{(b - c^d + s) - \gamma x - y^d}{2} \quad (22)
\]

**Figure 3 around here**
Figure 3 shows the reaction curves of firms $f$ and $d$ for given $y^h$. From (21) and Assumption 2, a larger $k$ leads to a steeper reaction curve for firm $d$ when $k$ is less than $\bar{k}$; whereas it leads to a flatter reaction curve when $k$ is greater than $\bar{k}$.

As the reaction curve becomes steeper, the production sifting from $x$ to $y^d$ becomes larger. Suppose that the tariff on good $X$ increases, then the reaction curve $r^f$ shifts downward. In turn $x$ falls and $y^d$ rises, because they are strategic substitutes. In view of Figure 3, it is obvious that the steeper $r^d$ is, the more $y^d$ increases for given $y^h$.

Whether $y^h$ increases or not depends on the scale of the production sifting from $x$ to $y^d$. Proposition 1 implies that the increase in $y^d$ dominates the decrease in $x$ if $k$ is greater than $k_1$ and less than 1.

Next, we investigate the effects of the tariff on prices.

\[
\frac{dp_x}{dt} = \frac{(3 - 2\gamma^2) - v\{(1 - k)(3 - 2\gamma^2) + \gamma^2\}}{\Delta},
\]
\[
\frac{dp_y}{dt} = \frac{\gamma\{1 - v(2 - k)\}}{\Delta}.
\] (23) (24)

From (23), $dp_x/dt$ is negative if and only if $v > (3 - 2\gamma^2)/(1 - k)(3 - 2\gamma^2) + \gamma^2 \equiv h(k)$. And (24) says that $dp_y/dt$ becomes negative if only if $v > g(k)$. In Figure 2, $v(k)$ intersects with $h(k)$ at $k = k_2$ and $\gamma^2/(3\gamma^2 - 2)$. Thus, we have

**Proposition 2** When the tariff on good $X$ increases, (i) the price of good $Y$ falls if and only if $k_1 < k < 1$; and (ii) the price of good $X$ falls if and only if $k_2 < k < \gamma^2/(3\gamma^2 - 2)$.

Proposition 2 is again counter-intuitive. Normally when the tariff rises, imports decrease while import prices rise, and the prices of substitutes also rise. However, Proposition 2 says that both prices can fall following an increase in the import tariff. The intuition follows from Proposition 1.

Finally, we turn to the effects on the profits of the domestic firm $h$. Substitution yields

\[
\frac{d\pi^h}{dt} = 2y^h \frac{dy^h}{dt}.
\] (25)

Invoking Proposition 1, we can state:

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\(^7\)In view of Figure 2, the parameters in which the price of good $X$ falls exist if and only if $\tilde{k} < \gamma^2/(3 - 2\gamma^2)$. 

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8
Proposition 3 When the import tariff increases, the profit of firm $h$ falls if and only if $k_1 < k < 1$.

Next, define the profits earned by selling good $X$ as $\pi^x \equiv (p_x - c^f - t)x$, i.e., $\pi^f = \pi^x + k\pi^d$. Then

$$\frac{d\pi^d}{dt} = \frac{\gamma y^d(2 - v + 2kv) + v\gamma^2 x(1 + v + kv)/(1 - v + vk)}{\Delta} > 0,$$

$$\frac{d\pi^x}{dt} = -x\{6(1 + kv - v) - k\gamma^2(3 - v + k)\} + 3y^d k\gamma(1 + kv - v)/\Delta < 0.$$ 

(26) (27)

That is, the tariff increases firm $d$’s profits, but reduces the profits from selling good $X$. Thus, the change of firm $f$’s total profits is generally ambiguous.

3.2 Production Subsidy

Now, we turn to the impact of the production subsidy. First, we look at outputs and obtain

$$\frac{dx}{ds} = -\frac{\gamma(2 + k)(1 - v + kv)}{\Delta} < 0,$$

$$\frac{dy^d}{ds} = \frac{2(1 - v + kv) + v\gamma^2}{\Delta} > 0,$$

$$\frac{dy^h}{ds} = \frac{2 - v\{2 + \gamma^2 - (2 - \gamma^2)k\}}{\Delta},$$

$$\frac{dY}{ds} = \frac{4(1 - v) + kv(4 - \gamma^2)}{\Delta} > 0.$$ 

(28) (29) (30) (31)

Figure 4 around here

A counter-intuitive result is that $dy^h/ds$ in (30) is negative if and only if $v > 2/\{2 + \gamma^2 - (2 - \gamma^2)k\}(\equiv f(k))$. Figure 4 illustrates the relationship between $f(k)$ and $v(k)$. In the figure, $v(k)$ intersects with $f(k)$ at $k = k_3$ and $\gamma^2/(2 - \gamma^2)$. Assumption 2 assures that $v(k)$ intersects with $f(k)$ at most once in $[0, \bar{k}]$. This implies that there exist parameters $(k, v)$ in which firm $h$ decreases its output if and only if $\bar{k} < \gamma^2/(2 - \gamma^2)$. Therefore, the following proposition can be established.
Proposition 4 An increase in the production subsidy to good $Y$ reduces the output of firm $h$ if and only if $k_3 < k < \gamma^2/(2 - \gamma^2)$.

This counter-intuitive result again stems from the production sifting from $x$ to $y^d$ due to the control power $v$. As is shown in Figure 5, when the reaction curve $r^d$ becomes steeper, the effect of a change in the production subsidy on $y^d$ basically becomes larger. Because firm $h$’s reaction curve also shifts upward, however, the range of $k$ in which firm $h$ reduces its output becomes smaller than in the case of a tariff (see Figure 6).

Figure 5 around here

Figure 6 around here

As expected, the subsidy lowers the prices of both goods.

\[
\begin{align*}
\frac{dp_x}{ds} &= -\frac{\gamma \{kv(2 - k - \gamma^2) + (1 - v)(2 - k)\}}{\Delta} < 0, \\
\frac{dp_y}{ds} &= -\frac{kv\{4 - \gamma^2(3 + k)\} + (1 - v)\{4 - \gamma^2(2 + k)\}}{\Delta} < 0.
\end{align*}
\]

(32)  
(33)

We are also interested in how the subsidy affects the profits of firm $h$. Straightforward substitutions yield,

\[
\frac{d\pi_h}{ds} = 2y^h \frac{dp_y}{ds}. 
\]

(34)

Thus, when the output of firm $h$ decreases, its profit also falls. Proposition 4 leads straightforwardly to:

Proposition 5 An increase in the production subsidy to good $Y$ reduces the profits of firm $h$ if and only if $k_3 < k < \gamma^2/(2 - \gamma^2)$.

The production subsidy increases the profits of firm $d$, but decreases the profits from selling good $X$ as follows

\[
\begin{align*}
\frac{d\pi_d}{ds} &= \frac{1}{\Delta} \left[ y^d(4(1 - v) + kv(4 - \gamma^2)) + \frac{v\gamma x(2(1 - v + kv) + v\gamma^2)}{(1 - v + vk)} \right] > 0, \\
\frac{d\pi_x}{ds} &= \frac{\gamma[-x\{4(1 - v) + kv(4 - \gamma^2)\} - y^d k(2 + k)(1 - v + kv)]}{\Delta} < 0.
\end{align*}
\]

(35)  
(36)

Thus, the change in firm $f$’s profits is generally ambiguous.

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4 Regulated foreign ownership

In many developing countries, there exist legal limits on foreign ownership. Our model can be used to analyze such a policy. We focus on the effects on the outside agents, who are not directly involved in the partial ownership, i.e., the consumer prices and the profit of firm $h$. Totally differentiating the first order conditions, we obtain

$$
\begin{pmatrix}
2 & \gamma(1 + k) & \gamma \\
\gamma(1 + kv) & 2(1 - v + kv) & 1 - v + kv \\
\gamma & 1 & 2
\end{pmatrix}
\begin{pmatrix}
dx \\ dy^d \\ dy^h
\end{pmatrix}
= \begin{pmatrix}
-\gamma y^d \\ -\gamma x \theta \\ 0
\end{pmatrix}
dk. \tag{37}
$$

The parameter $\theta$, defined as $\theta \equiv (v' - v^2)/(1 - v + vk)$, captures the change of firm $d$'s weight on the profit from good $X$; that is, the change of firm $d$’s incentive to reduce its own output for the sales of good $X$. From Assumptions 1 and 2, we have

$$\theta = \begin{cases}
(v' - v^2)/(1 - v + vk) > 0 & \text{if } 0 \leq k < \bar{k} \\
-1/k < 0 & \text{if } \bar{k} < k \leq 1
\end{cases} \tag{38}
$$

Because a higher ownership share leads to a greater control power, the reduction of firm $d$’s output for the sales of good $X$ increases as firm $f$’s share rises. When firm $f$ acquires full control, however, an increase in its share raises the cost to reduce the output and profits of firm $d$. Thus, in the latter case, the higher share mitigates firm $d$’s output reduction (see also O’Brien and Salop 2000).

4.1 The effects on the outside agents

First, we look into firm $h$. Using the FOCs, foreign ownership changes firm $h$’s profits as follows

$$
\frac{d\pi^h}{dk} = 2y^h \frac{dy^h}{dk}, \tag{39}
$$

which depends on the change of firm $h$’s output

$$
\frac{dy^h}{dk} = \frac{\gamma [\gamma y^d (g(k) - v)/(2 - k) + x\theta(2 - \gamma^2 - k\gamma^2)]}{\Delta}, \tag{40}
$$

$$
\frac{dy^h}{dk} \bigg|_{v=1} = -\frac{\gamma [k(1 - k)\gamma y^d + x(2 - \gamma^2 - k\gamma^2)]}{k\Delta} < 0. \tag{41}
$$

As can be seen in Figure 2, $g(k) > v$ if $k < k_1$ and the sign is ambiguous when $k_1 < k < \bar{k}$. Thus, we can state:

**Proposition 6** Suppose that firm $f$’s ownership share rises. Then the output and profit of firm $h$ increase if $k < k_1$ but decrease if $k \geq \bar{k}$.
Next we investigate the consumer prices. From the FOC for firm $h$, we derive
\[
\frac{dp_y}{dk} = \frac{dy^h}{dk}.
\] (42)

Using Proposition 6, we establish:

**Proposition 7** Suppose firm $f$’s ownership share increases. Then the price of good $Y$ falls if $k < k_1$, but rises if $k \geq \bar{k}$.

The price of good $X$ changes as follows:
\[
\frac{dp_x}{dk} = \frac{\gamma}{\Delta} \left[ y^d \{h(k) - v\} \right] + x \theta \{1 - k(2 - \gamma^2)\},
\] (43)
\[
\frac{dp_x}{dk} \bigg|_{v=1} = -\gamma \{ky^d \{\gamma^2 - k(3 - 2\gamma^2)\} + x \{1 - k(2 - \gamma^2)\}\}.
\] (44)

It can be seen from Figure 2 that the sign is ambiguous if either $k_2 < k < \bar{k}$ or $\gamma^2/(3 - 2\gamma^2) < k < 1/(2 - \gamma^2)$ holds and that $v > h(k)$ if and only if $k_2 < k < \gamma^2/(3 - 2\gamma^2)$.

Since $\gamma^2/(3 - 2\gamma^2) < 1/(2 - \gamma^2)$, we obtain:

**Proposition 8** Suppose that firm $f$’s ownership share rises. Then the price of good $X$ increases if either $k \leq k_2$ or $k \geq 1/(2 - \gamma^2)$ holds, but decreases if $\bar{k} < k < \gamma^2/(3 - 2\gamma^2)$.

From Propositions 7 and 8, we also obtain the following:

**Corollary 1** Suppose that firm $f$’s ownership share increases. Then the prices of both goods $X$ and $Y$ rise if $k < k_1$, while they both fall if $\bar{k} < k < \gamma^2/(3 - 2\gamma^2)$.

5 Welfare

In this section, we look into the welfare effects of commercial policies under cross border ownership. For computational simplicity, we assume the following on the ownership of the domestic firms.

**Assumption 3** The residual share $(1 - k)$ of firm $d$’s stocks and all of firm $h$ ’s stocks are owned by domestic residents.

We define the domestic welfare $W$ as the sum of the consumer surplus, the domestic firms’ profits and the government revenue:
\[
W \equiv U(x, Y) - p_x x - p_y Y + \pi^h + (1 - k)\pi^d + tx - sY,
\] (45)
where $\partial U/\partial x = p_x$ and $\partial U/\partial Y = p_y$. Totally differentiating $W$ yields:

$$
dW = -\{xdp_x + ky^d dp_y\} + \{(p_y - c^h)dy^h + (1 - k)(p_y - c^d)dy^d\} + \{tdx + xdt - k(sdy^d + y^d ds)\} + (\rho - \pi^d)dk,
$$

where $\rho$ is the price of firm $d$’s stock. The first three brackets respectively express the terms of trade effect, the resource allocation effect, and the tariff revenue effect. The last term is the surplus from the sales of firm $d$’s stock to firm $f$.

5.1 Tariff and production subsidy

We are now in a position to state:

**Proposition 9** Suppose that $s = 0$ and $t = 0$ hold initially. Then, (i) a small tariff on good $X$ raises domestic welfare if \((k - k_1)(c^h - c^d) \geq 0\); and (ii) a small production subsidy to good $Y$ enhances domestic welfare if \((k - k_3)(k - \gamma^2/(2 - \gamma^2))(c^h - c^d) \geq 0\).

Note that if $c^d = c^h$, both the tariff and the production subsidy increase domestic welfare.

**Proof of Proposition 9** Expression (46) can be rewritten as

$$
dW = x(dt - dp_x) + (tdx - ksdY^d) + d\omega,
$$

where $d\omega \equiv -ky^d(dp_y + ds) + (p_y - c^h)dy^h + (1 - k)(p_y - c^d)dy^d$. Because the second term \((tdx - ksdY^d) = 0\) with $s = 0$ and $t = 0$, it is sufficient to show that \((dt - dp_x)\) and $d\omega$ are both positive.

First, recall that $dp_x/ds < 0$ from (32). And from (23), we have

$$
1 - \frac{dp_x}{dt} = \frac{(1 - v)(3 - k\gamma^2) + kv(3 - k\gamma^2 - 2\gamma^2)}{\Delta} > 0.
$$

Therefore, \((dt - dp_x) > 0\); that is, the producer price of good $X$ always falls.

From the FOC for firm $h$, $dp_y + ds - dy^h = 0$, and that for firm $d$, $p_y - c^d = y^d + \eta\gamma x$, where $\eta \equiv v/(1 - v + kv)$. Now $d\omega$ can be simplified as

$$
d\omega = -ky^d dy^h + (p_y - c^d)(dY - kdy^d) + (c^d - c^h)dy^h
$$

$$
= (1 - k)y^d dY + \eta\gamma x (dY - kdy^d) + (c^d - c^h)dy^h.
$$
Because \( dY/dt > 0 \) in (19) and \( dY/ds > 0 \) in (31), the first term in (50) is positive. The second term is also positive because

\[
\frac{dY}{ds} - k \frac{dy^d}{ds} = \frac{2\gamma((1-v)(2-k) + kv(2-\gamma^2-k))}{\Delta} > 0, \quad (51)
\]

\[
\frac{dY}{dt} - k \frac{dy^d}{dt} = \frac{\gamma(2-v-k+k^2v)}{\Delta} > 0. \quad (52)
\]

Using Proposition 4, the last term in (50), \((c^d - c^h)(dy^h/ds) \geq 0\) if and only if \((k-k_3)(k-\gamma^2/(2-\gamma^2))(c^h - c^d) \geq 0\). Similarly, from Proposition 1, \((c^d - c^h)(dy^h/dt) \geq 0\) if and only if \((k-k_1)(c^h - c^d) \geq 0\). Q.E.D.

6 Concluding Remarks

References


Figure 1: The schedule of ownership $k$ and control $v$. 
Figure 2: Tariff on good $X$.

Figure 3: Production shifting from $x$ to $y^d$ (Tariff).
Figure 4: Production Subsidy for good \( Y \).

Figure 5: Production shifting from \( x \) to \( y^d \) (Production Subsidy).
Figure 6: The range of the counter-intuitive case.