Profit-Enhancing Parallel Imports in the Presence of Vertical Control

Pei-Cyuan Shih
Department of International Business, Ming Chuan University, Taipei, Taiwan
Yan-Shu Lin
Department of Economics, National Dong Hwa University, Hua-Lien, Taiwan
Fang-Yueh Chen
Department of Economics, National ChungCheng University, Chia-Yi, Taiwan

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Abstract This paper sets up a two-country and vertical product differentiation model in which there is one domestic manufacturer authorizing its product to a retailer in the foreign country. The retailer can sell the product not only to its own market (i.e., the foreign market) but also back to the domestic market. The latter is called as parallel trade. The paper investigates the effects of parallel import on the profit of the manufacturer and social welfare in the presence of vertical control. With a vertical product differentiation model, it is found that the parallel trade may increase not only the profit of the manufacturer but also the welfare of both countries.

Keywords: Parallel imports, Vertical product differentiation, Social welfare

JEL classification: F12, K33, L13

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1. Introduction

Parallel import (PI), also known as gray-market imports, is a topic which has attracted a growing interest during the last two decades. It discusses genuine products sold under protection of a patent, copyright, or trademark in one country but shipped legally to another country without the original manufacturer's authorization. Under the national exhaustion, intellectual property rights are exhausted upon first sale within a nation. That is, a foreign authorized retailer is not allowed to resell the product back to the manufacturer's home country under national exhaustion rule (Maskus, 2000; Maskus and Chen, 2002). The United States pursues this national exhaustion policy for patented and copyrighted products. However, under the international exhaustion, a retailer in any other country may legally resell the goods in back to the manufacturer's home country through parallel trade. For example, Australia, New Zealand, Singapore and Taiwan are open to parallel trade in most copyrighted and trademarked goods.

In reality, parallel trade occurs in a lot of industries. For example, footwear and leather goods, musical recordings, cars, consumer electronics, domestic appliances, cosmetics, clothing, soft drinks, and several other consumer products.[1] Besides that, parallel trade issue is particularly relevant in pharmaceuticals industry.[2] In the pharmaceutical sector, it is found that EU loses approximate $3 billion sales per year due to the occurrence of parallel trade (Ganslandt and Maskus, 2007). Kanavos et al. (2004) mention the importance of parallel trade in the EU pharmaceutical market. They

[1] For instance, NERA (1999) reports that in EU, for CDs, consumer electronics, auto spareparts, cosmetics, and soft drinks, 5–20% of trade are parallel imports. Additional estimates and statistics can be found in OECD (2002).

[2] In the literature, it is common to observe parallel trade in pharmaceuticals industry. See, for example, Valletti and Szymanski (2006) and Bennato and Valletti (2014).

find that the share of parallel trade as a percentage of the total pharmaceutical market increased from under 2% to 10.1% in Sweden from 1997 to 2002, and from 1.7% to 7% in Germany.

Parallel trade has attracted substantial attention and been investigated extensively in the literature. The main focus is that whether parallel trade should be permitted or banned. See, for example, Malueg and Schwartz (1994), Richardson (2002), Maskus and Chen (2004), Chen and Maskus (2005), Hur and Riyanto (2006), Mueller-Langer (2012), Roy and Saggi (2012a, b), Maskus and Stahler (2014), and Bennato and Valletti (2014), among others. Malueg and Schwartz (1994) find that restricting parallel trade not only benefits the manufacturer, but also could raise the global welfare because the market regime that a monopolist wants to serve is larger than that without parallel trade. Richardson (2002) demonstrates that when countries individually choose whether or not to allow parallel trade, permitting parallel trade could be Nash equilibrium. Maskus and Chen (2004) utilize a two-country and two-firm Cournot model to investigate the optimal volume of parallel trade and they show that restricting parallel trade benefits the manufacturer, but could raise or reduce global surplus. They also use the econometric analysis to indicate that the vertical-control explanation of parallel imports is important. Chen and Maskus (2005) extend Maskus and Chen (2004) by assuming a general demand function and they reach a similar result. Hur and Riyanto (2006) examine interplay between tariff policy and parallel-import policy. They find that from a welfare point of view, a home government would prefer allowing parallel imports to prohibiting them. Roy and Saggi (2012a) adopt a two-country and Hotelling type duopoly model and show that parallel import policy can act as an instrument of strategic trade policy. The home firm's profit is higher when it cannot price discriminate internationally if and only if the foreign market is sufficiently bigger than the domestic one. Roy and Saggi (2012b) further utilize a North–South vertically differentiated

duopoly and analyze the effects of parallel import policies on price competition and the interdependence of national parallel import policies. Moreover, Mueller-Langer (2012) extends Maskus and Chen (2004) by assuming that products are heterogeneous and the manufacturer adopts one-part tariff pricing. He shows that permitting PI has a positive effect on the global welfare if the difference of the market sizes between the two countries is large and trade costs are low. Maskus and Stähler (2014) investigate the role of the retailer as an agent with private information on the perceived quality of the good in the foreign market. They also derived that restricting parallel trade benefits the manufacturer and foreign consumers, while home consumers are worse off than that with parallel trade. This literature generally finds that manufacturers want to avoid parallel trade, because it interferes with their monopoly benefits by increasing competition in the markets.

On the other hand, another argument shows that the manufacturer may benefit from parallel trade. Raff and Schmitt (2007) consider about the effect of demand shocks in the market and the competitive retailers must order inventories before they know the realization of demand and for products whose sale value drops at the end of the demand period. They find that letting retailers trade unsold inventories generally results in larger orders placed with the manufacturer and higher manufacturer profit. Furthermore, Grossman and Lai (2008) show that, in a world where international exhaustion is permitted, the pace of innovation is often faster than in one with national exhaustion. More precisely, they consider that, where parallel trade is allowed, a foreign government has incentives to apply a less stringent price control of pharmaceuticals, because it recognizes that its policy has a global impact and fosters investments. Matsushima and Matsushima (2010) demonstrate that even if price discrimination is impossible under parallel imports, parallel imports might be able to increase the profits of all firms. The permission for parallel imports is a commitment device to soften price

competition in the foreign country to which the IPR holder exports. Mukherjee and Zhao (2012) find that parallel trade is profitable for the manufacturer if there is a labor union in the domestic country. Matteucci and Reverberi (2014) find that parallel trade may raise quality and then enhance welfare. Hwang, Peng and Shih (2014) show the product R&D incentive of the manufacturer with multiple distributors in the foreign market and rivals in the domestic market is higher if parallel trade is allowed.

However, the aforementioned papers all focus on the of the parallel trade policy without considering an important fact: There is vertical product differentiation between the product of the manufacturer and the parallel trade product, for example, the Maxxis tires. To the best of our knowledge, very little attention has been paid to the vertically differentiated model and the interaction between the manufacturer, the retailer and the foreign local rival. In this paper, we will concentrate our analysis on the optimal decision of the distribution and the manufacturers' profit by considering the vertical product differentiation. By considering the vertically differentiated model, we will show that PI is not only more profitable for the manufacturer but may also enhance the welfare for both countries. This result is interesting and deserves some policy implications.

The reminder of this paper is organized as follows. Section 2 introduces the basic model and examines the effect of PI under vertical product differentiated model. Section 3 investigates the effect of PI if there is another low quality producer in the foreign market. Section 4 examines the effect of PI if there is another high quality producer in the foreign market. Section 5 concludes the paper.

2. The Basic Model

Assume there are two countries in the model: country A and country B. In country A, there exists a manufacturer (firm A) who sells its product and the product quality is

equal to *1*. On the other hand, firm A authorizes an independent retailer (firm R) to sell its product in country B. We further assume that domestic consumers' preference on PI product is β, domestic consumers consider PI product as a high quality product if $\beta > 1$.[3] The retailer may parallel export the product to country A at no cost. Consumers' preference are $\theta \in [0,1]$. Assume consumers can buy quality 1 product from firm A, or can buy quality β product from firm R in the presence of PI. The utility function of consumer in market A is:

$$U_i = \begin{cases} \theta - p_i, i = A \\ \theta\beta - p_i, i = R \end{cases}.$$

We further assume that the manufacturer charges a two-part tariff contract, i.e., a fixed fee (F) and a wholesale price (w) when providing the product to the retailer. The quality sold by the retailer R in B is the same as that sold by the firm A in A.

The game in question comprises two stages. In the first stage, the manufacturer chooses its optimal pricing contract (w, F) and offers it to the foreign retailer. In the second stage, the manufacturer and the foreign retailer determine their optimal prices in the two markets with or without PI. The sub-game perfect Nash equilibrium will be solved via backward induction.

2.1 Without parallel imports

Under the national exhaustion regime, the foreign retailer is not allowed in reselling the product back to the home market. Thus, the home and the foreign markets are monopolized respectively by the manufacturer and the foreign retailer.

The demand function for firm A in the domestic market is $q_A = 1 - p_A$ and the demand function for firm R in the foreign market is $q_R = 1 - p_R$ .Accordingly, the profit

[3] The similar analysis can be applied to the case of $\beta < 1$: domestic consumers consider PI product as a low quality product.

functions of the manufacturer and the foreign retailer can be respectively expressed as follows:

$$\Omega_A = p_A(1-p_A) + w\, q_R(p_R) + F\,, \tag{1}$$

$$\Omega_R = \pi_R - R = (p_R - w)q_R - F\,. \tag{2}$$

The first-order conditions for profit maximization are as follows:

$$\frac{\partial \Omega_A}{\partial p_A} = 1 - 2p_A = 0\,,$$

$$\frac{\partial \Omega_R}{\partial p_R} = 1 - 2p_R + w = 0\,.$$

By solving the above equations, the equilibrium price and quantity are as follows:

$$p_A = \frac{1}{2},\ p_R = \frac{1}{2} + \frac{1}{2}w,\ \ q_A = \frac{1}{2},\ \text{and}\ \ q_R = \frac{1}{2} - \frac{1}{2}w\,.$$

Following the literature, we assume that the manufacturer can extract the entire profit from the foreign retailer under two-part tariff pricing. Thus, the optimal fixed fee charged by the manufacturer is defined as $F = (p_R(w) - w)q_R(w)$. By substituting the equilibrium price into (1), the optimal wholesale price *w* equals to 0. The result is consistent with Birg (2015) and Maskus and Chen (2004). This result implies that if the manufacturer adopts two-part tariff pricing, it will set the wholesale price at its marginal cost, that is zero, and extract the monopoly rent from the foreign retailer via the fixed fee. We further derive the profit of the manufacturer:

$$\Omega_A = \frac{1}{2}. \tag{3}$$

We then investigate the social welfare. The world social welfare is defined as the sum of consumer surplus in the two markets and profits of the firms. The social welfare functions for the two countries can be expressed as follows:

$$SW_A = CS_A + \Omega_A = \frac{1}{8} + \frac{1}{2} = \frac{5}{8}, \tag{4}$$

$$SW_B = CS_B + \Omega_R = \frac{1}{8}, \tag{5}$$

where CS_A and CS_B are the consumer surplus of the domestic and the foreign countries respectively. We note that the profits of the foreign retailer are nil. This is due to the two-part tariff adopted by manufacturer which can extract the entire rent made by the foreign retailer.

2.2 With parallel imports

Under the PI regime, the foreign retailer can engage in PI if it is profitable. All the assumptions and model settings are the same as those in the previous subsection, except that the foreign retailer now sells part of the goods acquired from the manufacturer back to the home market and competes with the manufacturer in Bertrand fashion. Let us denote q_T as the amounts of the product the retailer sells to market A (i.e., PI).

The demand function for parallel imports and firm A in market A is $q_T = 1 - \frac{p_T - p_A}{\beta - 1}$ and $q_A = \frac{p_T - p_A}{\beta - 1} - p_A$. The demand function for foreign retailer in market B is $q_R = 1 - p_R$.Thus, the profit functions for the manufacturer and the foreign retailer in the final stage can be respectively written as follows:

$$\Omega_A = p_A q_A + w[q_T(p_A, p_T) + q_R(p_R)] + F, \tag{6}$$

$$\Omega_R = \pi_R - R = (p_R - w) q_R + (p_T - w) q_T - F. \tag{7}$$

The first-order conditions for profit maximization are as follows:

$$\frac{\partial \Omega_A}{\partial p_A} = \frac{p_T - 2p_A\beta + w}{\beta - 1} = 0,$$

$$\frac{\partial \Omega_R}{\partial \tilde{p}_T} = \frac{-1 + \beta + p_A - 2p_T + w}{\beta - 1} = 0,$$

$$\frac{\partial \Omega_R}{\partial p_R} = 1 - 2p_R + w = 0.$$

The second-order and the stability conditions are all satisfied. Thus, we can derive the equilibrium price of the two firms as follows $p_A(w)$, $p_T(w)$ and $p_R(w)$. By substituting the equilibrium price into (6), the profit function of the manufacturer for

the first-stage game can be expressed as follows:

$$\begin{aligned}&\underset{w}{\text{Max}}\ \Omega_A(p_A(w), p_R(w), p_T(w), w, F)\\&= p_A q_A + w(q_T(p_A, p_T) + q_R(p_R)) + F\end{aligned} \quad . \tag{8}$$

By differentiating (8) with respect to w and applying the envelope theorem, we can derive the first-order conditions for profit maximization is as follows:

$$\frac{\partial \tilde{\Omega}_A}{\partial \tilde{w}} = -\frac{1}{2}\frac{16\beta^2 w + 8\beta w - 16\beta - 2 + 21w}{\left(-1+4\beta\right)^2} = 0 .$$

The optimal wholesale price and the equilibrium price for the domestic and foreign market are derivable as follows:

$$\tilde{w} = \frac{2\left(1+8\beta\right)}{16\beta^2 + 8\beta + 21} \quad , \quad \tilde{p}_A^* = \frac{4\beta^2 - \beta + 15}{16\beta^2 + 8\beta + 21} \quad , \quad \tilde{p}_T^* = \frac{2\left(4\beta^3 - \beta^2 + 7\beta - 1\right)}{16\beta^2 + 8\beta + 21} \quad ,$$

$$\tilde{p}_R^* = \frac{1}{2}\frac{16\beta^2 + 24\beta + 23}{16\beta^2 + 8\beta + 21} .$$

We further derive the profit of manufacturer under parallel imports regime is:

$$\tilde{\Omega}_A^* = -\frac{1}{4}\frac{-16\beta^3 - 25 - 20\beta^2 - 20\beta}{16\beta^2 + 8\beta + 21} . \tag{9}$$

We can also investigate the social welfare. The social welfare functions for the two countries can be expressed as follows:

$$\tilde{SW}_A^* = \frac{384\beta^5 + 800\beta^4 + 1256\beta^3 + 565 + 1326\beta^2 + 772\beta}{4\left(16\beta^2 + 8\beta + 21\right)^2}, \tag{10}$$

$$\tilde{SW}_B^* = \frac{1}{8}\frac{\left(16\beta^2 - 8\beta + 19\right)^2}{\left(16\beta^2 + 8\beta + 21\right)^2} . \tag{11}$$

By comparing (3) and (9), we can derive the profit difference of the manufacturer at two regimes is $\Delta\Omega_A = \tilde{\Omega}_A - \Omega_A$ .We further deposit the profit difference of the manufacturer is as follows:

$$\Delta\Omega_A = \underbrace{\underbrace{\Delta\pi_A}_{\text{competition effect}} + \underbrace{\Delta R_A}_{\text{market expansion effect}}}_{\text{domestic market effect(+)}} + \underbrace{\Delta R_B}_{\text{foreign market effect}} \quad . \tag{12}$$

As shown in (12), there are three effects that jointly determine the manufacturer's profit difference under two regimes. The first term, referred to as the domestic market competition effect, is negative. It shows that allowing parallel imports lowers the manufacturer's output also its own profit in the domestic market. The second term is the market expansion effect, which is positive. It shows that if parallel import is allowed, the domestic market is expanded. This is because domestic consumers consider parallel import product as a high quality product. A higher the preference on PI product β will attract more consumers to buy parallel import products, and hence the market expansion effect is significant. This would also raise the profit of the manufacturer. The third term, referred to as the foreign market effect, is negative. It shows that if parallel import is prohibited, the manufacturer uses the wholesale price to maximize its profit from the foreign market only. Clearly, it should set the price equal to the marginal cost and use fixed fee to extract the monopoly rent acquired by the foreign retailer. By contrast, if parallel import is allowing, the manufacturer has an incentive to set a higher wholesale price to reduce the volume of parallel trade. A higher wholesale price will reduce PI and also the quantity for the foreign market, which in turn decreases the foreign market profit from the foreign retailer. Overall, the sign of (12) is ambiguous, depending on the forces of the three effects. It leads to the following proposition.

Proposition 1. *If there is no foreign rival, allowing PI may increase the profit of the manufacturer, depending on the domestic consumer's preference on PI product.*

The above result is of interest and in sharp contrast to the findings in Maskus and Chen (2004) and Li and Maskus (2006). They both conclude that PI definitely reduces the profit of the manufacturer. But their result is reversed when the domestic consumer's preference on PI product is high. By comparing (10) and (4), we can derive the

domestic country's social welfare difference at two regimes is $\Delta SW_A = \tilde{S}W_A - SW_A$. The same as before, by comparing (11) and (5), we can also derive the foreign country's social welfare difference at two regimes is $\Delta SW_B = \tilde{S}W_B - SW_B$. We further deposit the social welfare difference of the domestic and the foreign country are respectively as follows:

$$\begin{aligned}\Delta SW_A &= \Delta\Omega_A + \Delta CS_A > 0 \\ &= \underset{\substack{competition\ effect \\ (-)}}{\Delta\pi_A} + \underset{\substack{market\ expanding\ effect \\ (+)}}{\Delta R_A} + \underset{\substack{foreign\ market\ effect \\ (-)}}{\Delta R_B} + \underset{(+)}{\Delta CS_A}\ ,\end{aligned} \tag{13}$$

$$\Delta SW_B = \Delta CS_B < 0\,. \tag{14}$$

The world social welfare is defined as the sum of consumer surplus in the two markets and profits of the firms. That is $SW=SW_A+SW_B$.

Proposition 2. *If there is no local rival in the foreign market, allowing PI definitely increases the social welfare of the domestic country. Besides that, allowing PI may also increase the global social welfare, depending on the domestic consumer's preference on PI product.*

3. The low quality foreign rival (s<1)

In the existing literature on PI, it is commonly assumed that there are only two firms: one manufacturer and one retailer. This assumption simplifies the analysis, but makes the model less general and realistic. In this section, we shall relax this assumption to investigate the effect of PI on the manufacturer's profit and social welfare if there is another local rival, firm B in the foreign market. We will explore the case in which the product quality of the local rivals in the foreign market is low quality in this section.

All the model settings are the same as those in the previous sections except that

now there is another local rival in the foreign market whose product quality is $s<1$ and whose outputs are sold to the home market only.

3.1 Without parallel imports

Under the national exhaustion regime, the foreign retailer is not allowed in reselling the product back to the home market. Under such a circumstance, the home market is monopolized by the manufacturer and the foreign market is Bertrand duopoly by the foreign retailer and the local rival. The demand function for firm A in the domestic market is $q_A = 1 - p_A$ and the demand function for firm R and the firm B in the foreign market is $q_R = 1 - \frac{p_R - p_B}{1-s}$ and $q_B = \frac{p_R - p_B}{1-s} - \frac{p_B}{s}$, respectively. Accordingly, the profit functions of the manufacturer, the foreign retailer and the foreign rival can be respectively expressed as follows:

$$\Omega_A = \pi_A + R = p_A(1 - p_A) + w\left(1 - \frac{p_R - p_B}{1-s}\right) + F, \tag{15}$$

$$\Omega_R = \pi_R - R = (p_R - w)\left(1 - \frac{p_R - p_B}{1-s}\right) - F, \tag{16}$$

$$\pi_B = p_B\left(\frac{p_R - p_B}{1-s} - \frac{p_B}{s}\right). \tag{17}$$

The first-order conditions for profit maximization for the third-stage game are derivable as follows:

$$\frac{\partial \Omega_A}{\partial p_A} = 1 - 2p_A = 0, \quad \frac{\partial \Omega_R}{\partial p_R} = \frac{s - 1 - p_B + 2p_R - w}{s-1} = 0 \quad \text{and} \quad \frac{\partial \pi_B}{\partial p_B} = -\frac{sp_R - 2p_B}{s(s-1)} = 0.$$

Proceeding as before, we can derive the optimal wholesale price as follows:

$$w = \frac{1}{2}\frac{s(s-1)}{s-2}, \tag{18}$$

which is positive. It is found that in the absence of PI, the manufacturer will charge its foreign retailer a wholesale price which is higher than its marginal cost (zero). This result is different from Li (2005), Li and Maskus (2006), Birg (2015) and the most literature. They all find that if the manufacturer adopts two-part tariff pricing, it will set

the wholesale price at its marginal cost, that is zero, and extract the monopoly rent from the foreign retailer via the fixed fee. In this paper, there is another local rival in the foreign country. If there is another local rival in the foreign market, the manufacturer can use the two-part tariff to soften the competition and to move the price equilibrium in the foreign market from Bertrand to what would be the Stackelberg leader equilibrium with the foreign retailer as the leader. It implies that the manufacturer should set a higher wholesale price (i.e., higher than the marginal cost). The intuition behind this result is the same as Eaten and Grossman (1986). They investigate the effect of the export policy on the domestic country and show that the government should impose an export tax on the domestic firm when they compete in Bertrand competition in the third country. In our model, the two-part tariff plays the same role as the export policy.

We further derive the profit of the manufacturer and the foreign local rival, respectively:

$$\Omega_A = -\frac{1}{4}\frac{-3s+4}{s-2}, \qquad \pi_B = -\frac{1}{4}\frac{s(s-1)}{(s-2)^2}.$$

We then investigate the social welfare. The social welfare functions for the two countries can be expressed as follows:

$$SW_A = CS_A + \Omega_A = -\frac{1}{8}\frac{-7s+10}{s-2},$$

$$SW_B = CS_B + \Omega_R + \pi_B = -\frac{1}{8}\frac{3s^2-3s-4}{(s-2)^2}.$$

3.2 With parallel imports

In this subsection, the foreign retailer can engage in PI if it is profitable. All the assumptions and model settings are the same as those in the previous subsection, except that the foreign retailer now sells part of the goods acquired from the manufacturer back

to the home market and competes with the manufacturer in Bertrand fashion. The demand function for parallel imports and firm A in market A is $q_T = 1 - \frac{p_T - p_A}{\beta - 1}$ and $q_A = \frac{p_T - p_A}{\beta - 1} - p_A$. The demand function for foreign retailer and the local producer in market B is $q_R = 1 - \frac{p_R - p_B}{1 - s}$ and $q_B = \frac{p_R - p_B}{1 - s} - \frac{p_B}{s}$, respectively. Thus, the profit functions for the manufacturer and the foreign retailer in the final stage can be respectively written as follows:

$$\tilde{\Omega}_R = \tilde{\pi}_R - \tilde{R} = \left(\tilde{p}_T - \tilde{w}\right)\left(1 - \frac{\tilde{p}_T - \tilde{p}_A}{\beta - 1}\right) + \left(\tilde{p}_R - \tilde{w}\right)\left(1 - \frac{\tilde{p}_R - \tilde{p}_B}{1 - s}\right) - \tilde{F}, \tag{19}$$

$$\tilde{\Omega}_A = \tilde{\pi}_A + \tilde{R} = \tilde{p}_A\left(\frac{\tilde{p}_T - \tilde{p}_A}{\beta - 1} - \tilde{p}_A\right) + \tilde{w}\left(1 - \frac{\tilde{p}_T - \tilde{p}_A}{\beta - 1} + 1 - \frac{\tilde{p}_R - \tilde{p}_B}{1 - s}\right) + \tilde{F}, \tag{20}$$

$$\tilde{\pi}_B = \tilde{p}_B\left(\frac{\tilde{p}_R - \tilde{p}_B}{1 - s} - \frac{\tilde{p}_B}{s}\right). \tag{21}$$

The first-order conditions for profit maximization are as follows:

$$\frac{\partial \tilde{\Omega}_A}{\partial \tilde{p}_A} = \frac{\tilde{p}_T - 2\tilde{p}_A\beta + \tilde{w}}{\beta - 1} = 0, \quad \frac{\partial \tilde{\Omega}_R}{\partial \tilde{p}_T} = \frac{-1 + \beta + \tilde{p}_A - 2\tilde{p}_T + \tilde{w}}{\beta - 1} = 0,$$

$$\frac{\partial \tilde{\Omega}_R}{\partial \tilde{p}_R} = \frac{s - 1 - \tilde{p}_B + 2\tilde{p}_R - \tilde{w}}{s - 1} = 0 \text{ , and } \frac{\partial \tilde{\pi}_B}{\partial \tilde{p}_B} = \frac{s\tilde{p}_R - 2\tilde{p}_B}{(1 - s)s} = 0.$$

Proceeding as before, we can derive the first-order condition for profit maximization of the manufacturer as follows:

$$\frac{\partial \tilde{\Omega}_A}{\partial \tilde{w}} = 0.$$

By evaluating the above equation at the wholesale price level derived under no PI regime, we can derive that:

$$\frac{\partial \tilde{\Omega}_A}{\partial \tilde{w}}\Big|_{w=w^*} = \frac{4\beta\left(s^2 - 3s + 4\right) + s(5s - 6) + 2}{\left(-1 + 4\beta\right)^2(2 - s)} > 0,$$

which is positive. It implies that the wholesale price is higher than that under no PI

regime. If there is no PI, the wholesale price as we derived in(18). This is because if PI is allowed, increasing the competition in the domestic market. This hurts the profits of the manufacturer from the home market, giving the manufacturer an incentive to raise the wholesale price to mitigate PI from the foreign retailer.

We can also derive the profit of the manufacturer, the foreign retailer and the foreign local rival are $\tilde{\Omega}_A^*$ 、 $\tilde{\Omega}_R^* = 0$ 、 $\tilde{\pi}_B^*$ .The social welfare functions for the two countries are

$$\tilde{S}W_A = \tilde{C}S_A + \tilde{\Omega}_A,$$

$$\tilde{S}W_B = \tilde{C}S_B + \tilde{\Omega}_R + \tilde{\pi}_B .$$

Proceeding as section 2, we further derive the profit difference of the manufacturer at two regimes is $\Delta\Omega_A = \tilde{\Omega}_A - \Omega_A$. We also derive the domestic and foreign country's social welfare difference at two regimes are $\Delta SW_A = \tilde{S}W_A - SW_A$ and $\Delta SW_B = \tilde{S}W_B - SW_B$.

The same as in (12), there are three effects that jointly determine the manufacturer's profit difference under two regimes. The domestic market competition effect and the foreign market effect are both negative. It shows that allowing parallel import lowers the manufacturer's profit acquired from the foreign retailer also its own profit in the domestic market. The second term is the market expansion effect, which is positive. It shows that if parallel import is allowed, the domestic market is expanded. We can use Figure 1 to illustrate the difference of the manufacturer. When β is higher than β_2, the first two negative effects are dominated by the third positive effect. It implies that allowing parallel imports increases the manufacturer's profit. This is because domestic consumers consider parallel import product as a high quality product, increasing the willingness to pay of the domestic consumers, and hence the market expansion effect is significant. We also note that the social welfare of the foreign country. The domestic

country's social welfare difference at two regimes is $\Delta SW_A = \tilde{S}W_A - SW_A$. From proposition 2, we know that allowing PI definitely increases the social welfare of the domestic country. In this section, we want to highlight the role of the foreign local producer, π_B . We can also deposit the social welfare difference of the foreign country is as follows:

$$\Delta SW_B = \underset{\substack{\text{profit effect} \\ (+)}}{\Delta \pi_B} + \underset{\substack{\text{consumer surplus effect} \\ (-)}}{\Delta CS_B}. \qquad (22)$$

From the above equation, we know that there are two effects determine the foreign country's social welfare difference under two regimes. The first term, referred to as the local producer's profit effect, is positive. It shows that allowing parallel imports increases the local producer's output also its own profit in the foreign market. The second term is the consumer surplus effect, which is negative. It is because if parallel import is allowing, the manufacturer has an incentive to set a higher wholesale price to reduce the volume of parallel trade. A higher wholesale price will reduce PI and also the quantity for the foreign market, which in turn decreases the consumer surplus for the foreign market. Overall, the sign of (22) is ambiguous, depending on the forces of the two effects. From the figure 2, we know that when β is higher than $\tilde{\beta}_3$, the negative effect is dominated by the positive effect. It implies that allowing parallel imports increases the foreign country's social welfare.

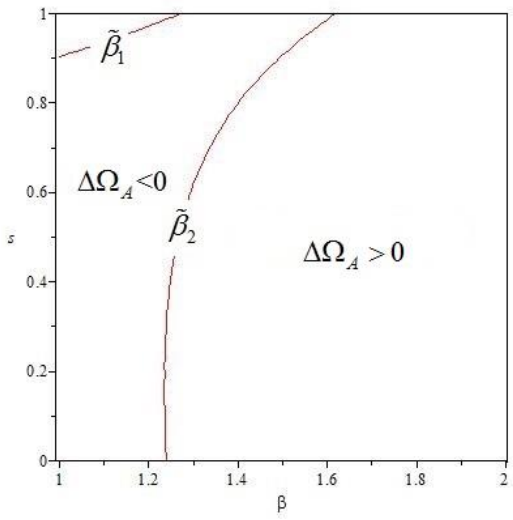

Figure1. The profit difference of the manufacturer

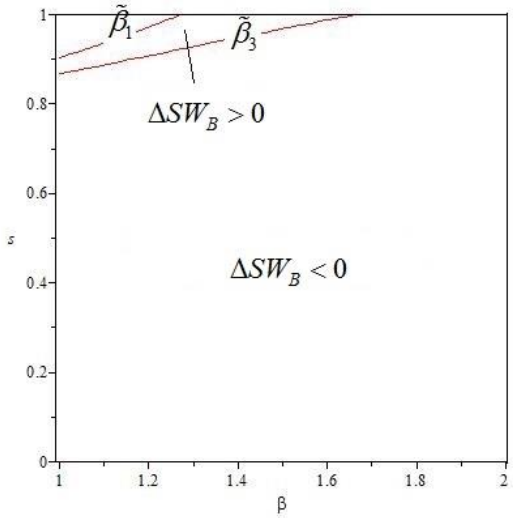

Figure 2. The social welfare difference of the foreign country

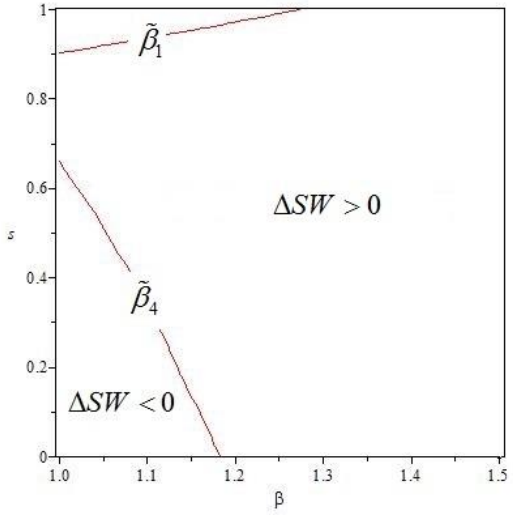

Figure 3. The difference of the global social welfare

We can also use Figure 3 to illustrate the difference of the global social welfare at two regimes. When β is higher than β_4, allowing parallel imports increases the global social welfare.

Based on the above discussions, we can arrive at the following proposition:

Proposition 3*. If there is another low quality foreign rival in the foreign market, allowing PI definitely increases the social welfare of the domestic country. Besides that, allowing PI may also increase the social welfare of the foreign country and the profit of the manufacturer, depending on the domestic consumer's preference on PI product.*

4. The high quality foreign rival (s >1)

In this section, we shall discuss the case in which the local rival in the foreign market whose product quality is high quality. All the model settings are the same as those in the previous sections except that now there is another local rival in the foreign market whose product quality is *s>1* and whose outputs are sold to the home market only.

4.1 Without parallel imports

Under the national exhaustion regime, the foreign retailer is not allowed in reselling the product back to the home market. Under such a circumstance, the home market is monopolized by the manufacturer and the foreign market is Bertrand duopoly by the foreign retailer and the local rival. The demand function for firm A in the domestic market is $q_A = 1 - p_A$ and the demand function for firm D and the firm B in the foreign market is $q_R = \frac{p_B - p_R}{s-1} - p_R$ and $q_B = 1 - \frac{p_B - p_R}{s-1}$, respectively. Accordingly, the profit functions of the manufacturer, the foreign retailer and the foreign local rival can be respectively expressed as follows:

$$\Omega_A = \pi_A + R = p_A(1-p_A) + w\left(\frac{p_B - p_R}{s-1} - p_R\right) + F,$$

$$\Omega_R = \pi_R - R = (p_R - w)\left(\frac{p_B - p_R}{s-1} - p_R\right) - F,$$

$$\pi_B = p_B\left(1 - \frac{p_B - p_R}{s-1}\right).$$

The second stage game is similar to that in Section 2. Proceeding as before, we can derive the optimal wholesale price as follows:

$$w^* = \frac{1}{4}\frac{s-1}{s(-1+2s)} > 0.$$

Hence, the profit of the domestic manufacturer and the foreign producer are as follows:

$$\Omega_A^* = -\frac{1}{8}\frac{-5s+3}{-1+2s},$$

$$\pi_B^* = -\frac{1}{16}\frac{-16s^3 + 24s^2 - 9s + 1}{(-1+2s)^2}.$$

The social welfare functions for the two countries can be expressed as follows:

$$SW_A^* = -\frac{1}{8}\frac{-7s+4}{-1+2s},$$

$$SW_B^* = -\frac{1}{32}\frac{-48s^3 + 36s^2 - 3s - 1}{(-1+2s)^2}.$$

The world social welfare can also be derived as follows:

$$SW^* = -\frac{1}{32}\frac{57s - 20s^2 - 17 - 48s^3}{(-1+2s)^2}.$$

4.2 With parallel imports

In this subsection, the foreign retailer can engage in PI if it is profitable. All the assumptions and model settings are the same as those in the previous section, except that the foreign retailer now sells part of the goods acquired from the manufacturer back to the home market and competes with the manufacturer in Bertrand fashion. The

demand function for parallel imports and firm A in market A is $q_T = 1 - \frac{p_T - p_A}{\beta - 1}$ and $q_A = \frac{p_T - p_A}{\beta - 1} - p_A$. The demand function for foreign retailer and the local producer in market B is $q_R = \frac{p_B - p_R}{s-1} - p_R$ and $q_B = 1 - \frac{p_B - p_R}{s-1}$, respectively. Thus, the profit functions for the manufacturer and the foreign retailer in the final stage can be respectively written as follows:

$$\tilde{\Omega}_A = \tilde{\pi}_A + \tilde{R} = \tilde{p}_A\left(\frac{\tilde{p}_T - \tilde{p}_A}{\beta - 1} - \tilde{p}_A\right) + \tilde{w}\left(1 - \frac{\tilde{p}_T - \tilde{p}_A}{\beta - 1} + \frac{\tilde{p}_B - \tilde{p}_R}{s-1} - \tilde{p}_R\right) + \tilde{F}, \tag{23}$$

$$\tilde{\Omega}_R = \tilde{\pi}_R - \tilde{R} = \left(\tilde{p}_T - \tilde{w}\right)\left(1 - \frac{\tilde{p}_T - \tilde{p}_A}{\beta - 1}\right) + \left(\tilde{p}_R - \tilde{w}\right)\left(\frac{\tilde{p}_B - \tilde{p}_R}{s-1} - \tilde{p}_R\right) - \tilde{F}, \tag{24}$$

$$\tilde{\pi}_B = \tilde{p}_B\left(1 - \frac{\tilde{p}_B - \tilde{p}_R}{s-1}\right). \tag{25}$$

The first-order conditions for profit maximization are as follows:

$$\frac{\partial \tilde{\Omega}_A}{\partial \tilde{p}_A} = \frac{\tilde{p}_T - 2\tilde{p}_A\beta + \tilde{w}}{\beta - 1} = 0, \quad \frac{\partial \tilde{\Omega}_R}{\partial \tilde{p}_T} = \frac{-1 + \beta + \tilde{p}_A - 2\tilde{p}_T + \tilde{w}}{\beta - 1} = 0,$$

$$\frac{\partial \tilde{\Omega}_R}{\partial \tilde{p}_R} = -\frac{-\tilde{p}_B + 2\tilde{p}_R s - sw}{s-1} = 0 \text{ and } \frac{\partial \tilde{\pi}_B}{\partial \tilde{p}_B} = \frac{s - 1 - 2\tilde{p}_B + \tilde{p}_R}{s-1} = 0.$$

Proceeding as before, we can derive the first-order condition for profit maximization of the manufacturer as follows:

$$\frac{\partial \tilde{\Omega}_A}{\partial \tilde{w}} = 0.$$

By evaluating the above equation at the wholesale price level derived under no PI regime, we can derive that:

$$\frac{\partial \tilde{\Omega}_A}{\partial \tilde{w}}\Big|_{w=w^*} = \frac{1}{2}\frac{\left(32s^2 - 20s + 4\right)\beta + \left(4s - 7\right)s + 5}{\left(4\beta - 1\right)^2 s\left(2s - 1\right)} > 0,$$

which is positive. It implies that the wholesale price is higher than that under no PI regime. This is because if PI is allowed, increasing the competition in the domestic

market. This hurts the profits of the manufacturer from the home market, giving the manufacturer an incentive to raise the wholesale price to mitigate PI from the foreign retailer.

We can also derive the profit of the manufacturer, the foreign retailer and the foreign local rival are $\tilde{\Omega}_A^*$ 、 $\tilde{\Omega}_R^* = 0$ 、 $\tilde{\pi}_B^*$.Proceeding as section 2, we further derive the profit difference of the manufacturer at two regimes is $\Delta\Omega_A = \tilde{\Omega}_A - \Omega_A$.From the Figure 4, we note that when β is higher than $\tilde{\beta}_5$, allowing parallel trade increases the profit of the manufacturer. This is because a higher β, increasing the willingness to pay of the domestic consumers, and hence the positive market expansion effect is significant.

The social welfare functions for the domestic country under PI regime is $\tilde{S}W_A = \tilde{C}S_A + \tilde{\Omega}_A$. The domestic country's social welfare difference at two regimes isas follows:

$$\Delta SW_A = \underset{(?)}{\Delta\Omega_A} + \underset{(+)}{\Delta CS_A} > 0 \quad . \tag{26}$$

It is found that allowing PI definitely increases the social welfare of the domestic country.

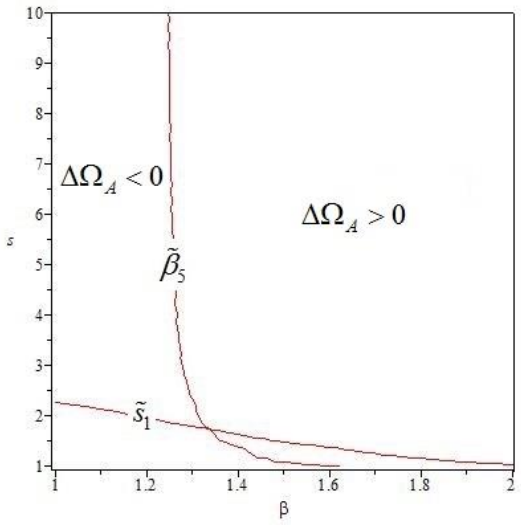

Figure 4.The profit difference of the manufacturer

The social welfare functions for the foreign country is $\tilde{S}W_B = \tilde{C}S_B + \tilde{\Omega}_R + \tilde{\pi}_B$. Similarly,the foreign country's social welfare difference at two regimes isas follows:

$$\Delta SW_B = \underset{\substack{\text{profit effect} \\ (+)}}{\Delta\pi_B} + \underset{\substack{\text{consumer surplus effect} \\ (-)}}{\Delta CS_B} > 0 \quad . \tag{27}$$

It is found that the negative effect is always dominated by the positive effect. It implies that allowing parallel imports definitely increases the foreign country's social welfare. Thus, we can establish the following proposition.

Proposition 4. *If there is another high quality producer in the foreign market, PI enhances the welfare of the domestic country as well as the foreign country. Besides that, allowing PI may also increase the profit of the domestic manufacturer, depending on the domestic consumer's preference on PI product.*

5. Conclusion

During the past two decades, parallel trade has been de-regulated by many countries and growing significantly. Its social desirability has received much attention

in international trade literature. While some studies find that parallel trade is pro-competitive and thus beneficial to the domestic welfare; others argue that PI could be socially undesirable as it reduces the profit of the manufacturer and the foreign country's social welfare.

By considering a vertically differentiated model, this paper examines how parallel imports affect the profit of the manufacturer and the welfare of the domestic and foreign countries. It is found that parallel import may enhance the profit of the domestic manufacturer as well as the welfare of both the domestic and foreign countries, depending on the domestic consumer's preference on parallel import products. This result is novel and of some interest as it is not documented in the existing literature. We hope that the implications of this study provide an important rationale for the governments engaging in parallel import deregulation.

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