Parallel Trade with Endogenous Market Structure

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Abstract

This paper sets up a two-country model, in which there is one domestic manufacturer authorizing its product to a distributor in the foreign country, to investigate the effect of parallel trade (PT) on the profit of the manufacturer and social welfare if the domestic market structure is endogenously determined. The distributor can sell the product not only to its own market (i.e., the foreign market) but also back to the domestic market if parallel trade is allowed by the domestic government. We find that the wholesale price necessarily lower than the marginal cost under endogenous market structure. We also show that with endogenous market structure, PT not only increases the profit of the domestic manufacturer but also the welfare for both countries.

JEL classification: F12, F13, L11, L13

Keywords: Parallel trade, Endogenous Market structure, Social welfare

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1. Introduction

In the past decade, parallel trade (PT) has become more visible and of greater relevance in the system of global trade, and drawn considerable debate in the literature (Ganslandt and Maskus, 2004; Ganslandt and Maskus, 2008; Grossman and Lai, 2008; Kao and Peng, 2009; Hwang, Huang and Peng, 2014; Maskus and Stähler, 2014; Matteucci and Reverberi, 2014; and Hwang, Peng and Shih, 2014, among others).

PT of a product involves importing the product into one country from another, and then distributing it outside the distribution network set up by the manufacturer. The rights of original producers to control international distribution arise from the exercise of intellectual property rights (IPR). A central feature determining the scope of IPR is that each country's exhaustion policy. Under international exhaustion, first sale of the good anywhere in the world ends the right-holders ability to exclude PT. As a result, a distributor in any other country may legally resell the goods back to the manufacturer’s home country through PT. For instance, Ford sells its cars via authorized dealers in Canada and Mexico but some of those cars might be resold without its authorization in higher-priced USA, whether by the authorized retailer or other trading companies (Roy and Saggi, 2011). In countries such as China, Japan, and Taiwan, we can also buy a lot of products which are parallel imports from other countries; for example, cameras, automobiles, electronics, cosmetics, pharmaceuticals, motorcycles, clothes, etc. Nowadays, PT is a lawful form of trade based on the principle of the free movement of goods in EU. By contrast, a foreign authorized distributor is not allowed to resell the product back to the manufacturer’s home country under national exhaustion rule.
Whether PT should be permitted or banned is an open question which has received growing attention in the public debate and academic literature. This policy issue is particularly relevant in industries, such as pharmaceuticals. In the pharmaceutical sector, it is found that EU loses approximate $3 billion sales per year owing to the occurrence of PT (Ganslandt and Maskus, 2004).

As the role of PT becomes increasingly important in the global trade system, a growing literature has begun to explore the effects of PT on global welfare. The main focus along this strand of research is on optimal PT policies (see, for example, Maskus and Chen, 2004; Chen and Maskus, 2005; Grossman and Lai, 2008; Mueller-Langer, 2012; Mukherjee and Zhao, 2012; Hwang, Huang and Peng, 2014; Maskus and Stähler, 2014, among others). In their pioneer papers, Maskus and Chen (2004) utilize a two-country and two-firm Cournot model with a linear demand to investigate the optimal quantitative control of PT for an import country. They show that restricting parallel trade has an ambiguous welfare effect, depending on the trade cost of PT. Chen and Maskus (2005) reach a similar result with a general demand function. 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 PT 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. Furthermore, Mukherjee and Zhao (2012) find that PT is profitable for the manufacturer if there is a labor union in the domestic country. 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. Hwang, Huang and Peng (2014) investigate the welfare of tariffication on parallel import. They show that tariffication is socially undesirable for the domestic country no matter the manufacturer adopts one-part or two-part tariff pricing. Maskus and Stähler (2014) consider the case in which the
retailer has private information on the perceived quality of the good in its own market. However, the aforementioned papers all focus on the of the PT policy without considering an important fact: the market structure could be different with and with no PT. To the best of our knowledge, very little attention has been paid to the effects of endogenous market structure (EMS) on the optimal PT policies and their welfare implications. In this paper, we aims to investigate the effects of PT on the wholesale price, profitability of the manufacturer and welfare by considering EMS.

This paper is closely relevant to the EMS literature. Although the properties of a basic Cournot model with EMS has been studied extensively, a new theoretical research wave has applied these tools to revisit standard theoretical results in many issues, such as Melitz (2003) and Etro (2004). With EMS, trade policies for the domestic exporters has been analyzed by Horstmann and Markusen (1986). De Santis and Stähler (2004) and Markusen and Stähler (2011) also examine the impact of FDIs in foreign markets with EMS.

The issue on EMS needs to be addressed when discussing PT because most market structures are neither perfectly or monopolistically competitive: they are characterized by a small number of firms engaged in strategic interactions. However, most of the PT papers are still based on a simplified world with one manufacturer and one distributor. By considering EMS, we will show that PT is not only more profitable for the manufacturer but also enhance the welfare for both countries. This result is interesting and deserves some policy implications.

The remainder of this paper is organized as follows. Section 2 investigates the equilibrium of PT under endogenous market structure. Section 3 analyzes the profitability of the manufacturer and welfare implications under endogenous market

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2 Hwang, Peng and Shih (2014) is an exception. They consider the product R&D incentives of the manufacturer with multiple distributors in the foreign market and if there are rivals in the domestic market. However, the number of firms are exogenously given in their paper whereas we consider the EMS model in which the number of firms in the market is endogenously determined.
structure. Section 4 concludes the paper.

2. The model
Assume there are two countries, country A and country B. A manufacturer, located in country A, sells \( q \) units of its product to its own market (i.e., market A). The manufacturer also authorizes a foreign distributor to sell its product in country B. When producing the product, the manufacturer incurs a constant marginal cost, \( c \). The foreign distributor may engage in parallel trade, selling \( y^* \) to market B and \( x^* \) back to market A, if country A allows parallel trade. A per-unit trade cost for PT is assumed to be \( t \). Contrarily, PT does not occur and \( x^* = 0 \) if PT is prohibited. We further assume that the manufacturer charges a two-part tariff contract, i.e., a fixed fee \( T \) and a wholesale pricing \( w \) when providing the product to the distributor. In addition, there are \( n \) potential rivals (hereafter, the domestic rivals) other than the manufacturer in market A, all producing a homogenous product, \( x' \), with a marginal cost \( v \) and a fixed cost \( F \). The inverse demand functions for markets A and B are respectively \( p = p(Q) \) and \( p^* = p^*(y^*) \), where \( Q = q + \sum_{i=1}^{n} x' + x^* \), and with the property \( p'(Q) < 0 \), \( p^*(y^*) < 0 \).

The game in question comprises two stages. In the first stage, the manufacturer chooses its optimal pricing contract \( (w \text{ plus } T) \) and offers it to the foreign distributor. In the second stage, the domestic rivals determine whether to enter the market, and the manufacturer and the domestic rivals determine their optimal outputs in market A whereas the foreign distributor decides its optimal sales in the two markets. The sub-game perfect Nash equilibrium will be solved via backward induction.

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3 Trade costs for the manufacturer and retailing costs are assumed to be zero for simplification. It is for mathematical simplicity and does not change the qualitative results of the paper.
In the final stage, the profit functions for the manufacturer, the domestic rivals and the foreign distributor can be respectively expressed as follows:

$$
\Pi(q, x^*, y^*; w, T) = [p(Q) - c]q + (w - c)[x^* + y^*] + T, \quad (1)
$$

$$
\pi^i(q, x^*, x^*; w, T) = [p(Q) - v]x^i - F, \quad i = 1, \ldots, n. \quad (2)
$$

$$
\pi^*(q, x^*, y^*; w, T, t) = [p(Q) - w - t]x^* + [p^*(y^*) - w]y^* - T. \quad (3)
$$

The first-order conditions for profit maximization of the firms and the zero-profit condition for entry are respectively as follows:

$$
\frac{\partial \Pi}{\partial q} = p - c + p'q = 0, \quad (4)
$$

$$
\frac{\partial \pi^i}{\partial x^i} = p - v + p'x^i = 0, \quad i = 1, \ldots, n, \quad (5)
$$

$$
\frac{\partial \pi^*}{\partial x^*} = p - w - t + p'x^* = 0, \quad (6)
$$

$$
\pi = [p(Q) - v]x - F = 0. \quad (7)
$$

$$
\frac{\partial \pi^*}{\partial y^*} = p^* - w + p^*y^* = 0. \quad (8)
$$

The equilibrium in the domestic market is solved by (4) to (6) and (7) whereas that of the foreign market. By summing up (4) and (6), we can derive that

$$
2p - c - w - t + p'Z = 0, \quad (9)
$$

where $Z = q + x^*$. In addition, by symmetry, equation (5) can be rewritten as follows:

$$
\frac{\partial \pi}{\partial x} = p - v + p'x = 0. \quad (10)
$$

From (7), we derive that:

$$
\frac{\partial n}{\partial Z} = \frac{1}{x}, \quad \frac{\partial n}{\partial x} = \frac{-n}{x}, \quad (11)
$$

By totally differentiating (9) and (10), and then making use of (11), we derive the slope of the joint reaction function of the manufacturer and foreign distributor and that of the representative domestic rival are derivable respectively as follows:

$$
\frac{dx}{dZ} = \frac{-p'}{(2p' + p^*Z)} < 0, \quad \frac{dx}{dZ} = 0. \quad (12)
$$

We use Figure 1 to illustrate the above result. In Figure 1, $R_z$ denotes the joint
reaction function of the manufacturer and foreign distributor while \( R_x \) represents the reaction of the representative domestic rival. It is obvious that the slope of \( R_x \) is equal to zero which is different from that under exogenous market structure. This result implies that the equilibrium output of each rival firm is fixed and not affected by \( Z \). The intuition is as follows. At the beginning zero-profit condition holds, the equilibrium output of each rival firm is at the tangency of its perceived demand and average cost. An increase in \( Z \) shifts the perceived demand of rival firm inwards (below its average cost), causing its profit loss. In this context, some of the rival firms will exit the market, shifting the rest of the rival firms’ perceived demands outwards to the output at which zero-profit condition holds (before \( Z \) increases). This result is in line with those in the EMS literature; for example, Etro (2006, 2007), Davidson and Mukherjee (2007), Ino and Matsumura (2012) and Cato and Oki (2012). Given the above discussion, we can construct the lemma as follows:

**Lemma 1. The optimal output decisions of the domestic rivals are independent of the outputs of the manufacturer and the volume of parallel trade when the market structure is endogenously determined.**

Hwang et al. (2014) assume that the number of domestic rival firms is fixed and find that the optimal outputs of the domestic rivals decrease with the optimal output. We find that this negative relationship does not exist when market structure is endogenously determined.
Figure 1. The reaction functions under endogenous market structure

By (4) and (6) to (10), we further derive the comparative static effects as follows:

\[ x^* = 1/p' < 0, \quad n_w = n_t = -1/(p' x) > 0, \quad \text{and} \quad y^*_w = 1/(2p^* + p^* y^*) < 0, \]

\[ q_w = x_w = Q_w = q_t = x_t = Q_t = 0. \]

The above results follow that an increase in \( w \) or \( t \) will decrease the volume of PT but increase the number of the domestic rivals. However, neither \( w \) nor \( t \) affects the outputs of the manufacturer and domestic rivals. The intuition is as follows. An increase \( w \) (or \( t \)) raises the marginal cost of PT, decreasing the volume of PT. The reduction in PT will raise the market price, causing the domestic rivals profitable. In this context, more domestic rivals shall enter the market till the zero profit condition is satisfied. Besides, given (7), the equilibrium price is determined by the tangent of the perceived demand and the average cost of the local rivals both of which are independent of \( w \) and \( t \). It implies that \( w \) and \( t \) have no impact on the first-order conditions of the manufacturer and local rivals. As a result, \( q, x \) and \( Q \) are not affected by \( w \) and \( t \). Given the above discussion, we build the proposition as follows.

**Proposition 1. If the market structure is endogenously determined, an increase in the wholesale price or trade cost increases the number of domestic rivals but has no effect on the equilibrium output and price of the domestic market.**
We then move to the first-stage game. By substituting the equilibrium outputs in
the second stage into (1), the profit function of the manufacturer for the first-stage
game can be expressed as follows:

\[
\max_w \Pi(q(w), x(w), n(w), x^*(w), y^*(w), w; t) = [p(Q(n(w))) - c]q + (w - c)[x^*(w) + y^*(w)] + T,
\]
s.t. \( T = (p(Q) - w - t)x^*(w) + (p^*(y^*(w)) - w)y^*(w). \)

By substituting the constraint into the profit function, differentiating it with
respect to \( w \), and then applying the envelope theorem, we derive the first-order
condition for profit maximization of the manufacturer as follows:

\[
\frac{d \Pi}{dw} = \frac{\partial \Pi}{\partial q} \frac{\partial q}{\partial w} + n \left[ \frac{\partial \Pi}{\partial x} \frac{\partial x}{\partial w} + \frac{\partial \Pi}{\partial n} \frac{\partial n}{\partial w} + \frac{\partial \Pi}{\partial x^*} \frac{\partial x^*}{\partial w} + \frac{\partial \Pi}{\partial y^*} \frac{\partial y^*}{\partial w} + \frac{\partial \Pi}{\partial y} \frac{\partial y}{\partial w} + \frac{\partial \Pi}{\partial T} \frac{\partial T}{\partial w} \right] = -x^* + (w - c)[x^* + y^*] = 0.
\] (12)

The second-order condition is satisfied as \( \Pi_{ww} = y^*_w < 0 \). By totally differentiating
(12) with respect to \( w \) and \( t \), it can be derived that: \( w_t = -\Pi_{wt}/\Pi_{ww} > 0 \), where
\( \Pi_{wt} = -x^*_t > 0 \). If there is no \( PT \) (i.e., \( x^* = 0 \)), it is trivial to derive from (12) that the
optimal wholesale price is \( c \). However, if \( PT \) is allowed (\( x^* > 0 \)), it can be shown
that by evaluating (12) at \( w = c \), we have

\[
\frac{d \Pi}{dw} \bigg|_{w=c} = -x^* < 0.
\]

This result follows that, in this context, the optimal wholesale price is necessarily
lower than \( c \). The intuition behind this result is quite straightforward. According to
Proposition 1, the wholesale price will not affect the equilibrium market output and
price. When \( PT \) is allowed, it is beneficial for the manufacturer to set the wholesale
price below its marginal cost to increase its domestic sales and profit via \( PT \), albeit
this wholesale price hurts the manufacturer’s profit in the foreign country.
Proposition 2. With parallel trade and the market structure is endogenously determined, the wholesale price charged by the manufacturer is lower than its marginal cost.

In addition, \( w_t = - \frac{\Pi_{yw}}{\Pi_{ww}} > 0 \) if \( \Pi_{yw} = -x_r^* > 0 \). It follows that the higher the trade cost, the higher the optimal wholesale price. It because a higher trade cost decreases the profitability of PT, giving the manufacturer an incentive to increase the wholesale price and mitigate the profit loss from the foreign market. The above result differs from those in Maskus and Chen (2004) and Li and Maskus (2006). They all assume that the manufacturer adopts two-part tariff pricing under exogenous market structure and without local rivals. They find that when the trade cost is high, the trade waste of PT is enormous, which reduces the manufacturer’s profit and provides an incentive to limit PT through a higher wholesale price. This is because when the number of the rival firms is fixed, lowering \( w \) although increases market share of the manufacturer in country A, it also reduces the equilibrium price. In contrast, the equilibrium price is not changed by PT under EMS. The manufacturer always has an incentive to set a lower \( w \) to increase its market share via PT, which in turn increase its profit.

3. Profit and Welfare analysis

In this section, we compare profitability and social desirability of PT under EMS. Note that the manufacturer will set \( w = c \) if PT is banned. Given \( w = c \), the occurrence of PT increases the manufacturer’s profit as its profit from market B is the same and that from market A increases. In addition, note that \( p(Q) \) is independent of \( w \) and \( x' \) under EMS. By (12), the manufacturer can further enhance its profit
by setting its optimal wholesale price at the level lower than \( c \). Namely, PT is beneficial for the manufacturer under EMS. Therefore, we construct the position as follows.

**Proposition 3. If the market structure is endogenously determined, PT is beneficial for the manufacturer.**

The above result is of interest and in sharp contrast to the findings in Maskus and Chen (2004) and Li and Maskus (2006). Under exogenous market structure, they both conclude that PT definitely reduces the profit of manufacturer. We show the counter result when the market structure is endogenously determined.

We then investigate the welfare effects of PT. The welfare levels in country A and country B are defined as the sum of its consumer surplus and profit, which can be expressed respectively as follows:

\[
SW = CS(Q) + \prod + \sum_{i=1}^{n} \pi^i,
\]

\[
SW^* = CS^*(y^*) + \pi^*,
\]

where \( \pi^* = \pi^i = 0 \). Note that the manufacturer adopts a two-part tariff contract. The profit of the distributor is zero with or without PT. In addition, \( \pi^i \) is equal to zero due to zero-profit condition. We claim that under EMS, PT will increase the welfare in both countries. The explanation is as follows. PT will enhance the welfare in country B as it decreases the wholesale price (by Proposition 2). In country A, the total output and the profits of the local rivals are not changed by PT, but it increases the manufacturer’s profit. As a result, the welfare in country A is also improved by PT. Since both countries are better off, the world welfare is also enhanced by PT. In sum, we construct the position as follows.
Proposition 4. If the market structure is endogenously determined, PT enhances the welfare of the domestic country as well as the foreign country.

This result is different from those in Maskus and Chen (2004), Li and Maskus (2006) and Mueller-Langer (2012) in which PT is welfare-reducing and should be banned by the host government. This is because these studies only consider exogenous market structure. We show that that PT is beneficial to the manufacturer and globally desirable if market structure in the domestic market is endogenously determined.

4. Conclusion

In the past two decades, PT has been de-regulated by a lot of countries. Thus, the volume of PT is growing significantly around the world. The social desirability of PT has become one of the most important issues in international trade literature. While some studies find that PT is pro-competition and thus beneficial to the domestic welfare, others have argued that permitting PT could be socially undesirable as it reduces the profit of the home manufacturer and the foreign consumer surplus.

By considering EMS, this paper examines how PT affects the profitability of the host manufacturer and welfare in the two countries. It is found that permitting PT will enhance the profit of the domestic manufacturer as well as the welfare for both domestic and foreign countries. This result is novel and of some interest as it is in sharp contrast to the existing PT literature. We hope that the implications of this study provide an important rationale for the governments engaging in PT deregulation.

There are a number of ways in which this work could be extended. First, we can consider the R&D investment of the manufacturer. Second, the manufacturer can act as a Stackelberg leader and is able to commit its output in prior to the distributor and the rivals. It is hoped that this study will go some way toward stimulating these lines of research.

Reference


