Vertical Restraints and Parallel Imports with Differentiated Products [a]

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Abstract

A monopoly selling in two countries can use exclusive or competitive retailers to distribute its product. A low wholesale price in one country might induce a retailer to resell the good for profit in the other country, generating thereby parallel imports which compete with the authorized sales. Assuming that consumers consider the authorized good to be of higher quality than the parallel import, we show that it is often in the interest of the manufacturer to encourage the availability of parallel imported goods. We study equilibrium price strategies for the manufacturer as reflected in the chosen vertical contracts. We show that when the arbitrage cost is relatively low and the authorized good and the parallel import are poor substitutes, manufacturer's profits can be higher when parallel imports are allowed.

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1 Introduction

Parallel imports (sometimes called gray market goods) are products imported into a country through unauthorized distribution channels. They are genuine goods that are either produced abroad and imported without the consent of the trademark or copyright owner, or produced domestically for a foreign market and re-imported for resale. Economists agree that the gray market exists because there are significant retail price differences between countries. Parallel imports flow from low price countries to high price countries so the gray market is the result of the ability of the manufacturer to use price discrimination. Often manufacturers use retailers or distributors to sell their products to consumers. When this is the case, differences in not only retail prices but also wholesale prices can generate parallel trade.

This paper presents a simple model of international arbitrage. We consider a foreign manufacturer that sells its product to two different countries. In each country there are several distributors or retailers. The manufacturer can use one exclusive retailer to distribute the product in each country or can sell the product through several competitive retailers. A low wholesale price in one country might induce a retailer in that country to take advantage and resell the good for profit in the other country, generating thereby parallel imports which compete with the authorized sales. We show that manufacturers do not always fight to stop parallel trade. In other words, we show that manufacturers may have an incentive to have their products sold along with "unauthorized" counterparts. This occurs when there are qualitative differences between the goods sold by the parallel importer and those sold by the authorized dealers, inducing some consumers to buy the authorized product while some other consumers purchase the parallel import. Hence the manufacturer's incentive to let parallel imports enter comes from the fact that the parallel trader supplies a good designed for a different consumer type.

The economic literature on parallel imports can be divided into two categories. First, less formal papers include Gallini and Hollis (1996) that look at the use of legal tools to restrict parallel imports. Their view is that producers may use exclusive territory contracts to prevent parallel imports. Chard and Mellor (1989), Cavusgil and Sikora (1987) and Weigand (1991) evaluate different arguments for and against parallel trade. They conclude that permitting parallel imports hurts the manufacturers and their authorized distribution channel and thus they offer business strategies for combating the gray market.

Second, more technical papers include Malueg and Schwartz (1994), Anderson and Ginsburgh (1999), Maskus and Chen (1999), Ahmadi and Yang (2000) and Haller and Jeanneret (1999). Malueg and Schwartz (1994) discuss the ambiguous welfare impact of parallel imports in a third-degree price discrimination context. They find that price discrimination and free-riding seem to be the main sources of parallel imports. They also talk about the important role that exchange rate movements have in inducing

parallel trade. Anderson and Ginsburgh (1999) look at consumers with different arbitrage costs[1] and conclude that the manufacturer can use parallel imports to price discriminate across different consumer types. They infer that global welfare will depend on the level of arbitrage costs. Maskus and Chen (1999) take a different view by considering the presence of vertical restraints between the manufacturer and its authorized distributor as the main source of price differences. They model a monopoly that sells its product using an exclusive dealer in one country but several competitive retailers in the other country. Vertical controls induce the authorized distributor to increase profits by selling outside the main distribution channel. They conclude that the manufacturer always benefits from restricting parallel trade but with ambiguous welfare effects. They also show that when parallel imports are permitted the cost of engaging in parallel importing can have both adverse and positive effects on global welfare.

Ahmadi and Yang (2000) and Haller and Jeanneret (1999) introduce product differentiation into the model. Both papers consider parallel imports and authorized goods sold in a country as being imperfect substitutes. Since they consider a monopoly firm that sells the good directly to consumers, the source of parallel trade is the difference in retail prices in the two countries. Ahmadi and Yang (2000) use a Stackelberg leader-follower model to show that depending on market circumstances it might be profitable for a manufacturer to accommodate parallel trade without hurting the brand image. However, in their model, the manufacturer sells directly to consumers and therefore, no vertical issues were considered. Also, they look at parallel imports from the producer's point of view without addressing welfare issues.

This paper introduces product differentiation into a Maskus and Chen (1999) type model. Unlike Maskus and Chen (1999), we consider other combinations of contracts (like exclusive territory contracts in both countries) and we allow the manufacturer to choose the most profitable contract combination depending on the market conditions (reflected in the parameters of the model) in each country.

In Maskus and Chen (1999), goods are homogeneous and they model the competition between the authorized and the unauthorized goods as Cournot competition. We introduce differences in consumers' preferences that are reflected in the demand for the two goods and we model the competition at the retail level as Bertrand price competition. Since the authorized good and the parallel imports are imperfect substitutes, they are sold for different prices so, in this case, modeling the competition at the retail level as price competition instead of quantity competition seems more appropriate. We assume that the consumers consider the authorized good to be of "high quality" and the parallel import to be of "low quality". There are differences between the parallel imports and the authorized goods such as name[2] or package labeling differences or differences in standards (power supply).

[1] They model the arbitrage cost as a transportation cost.

[2] For example a Nikon N90S camera sold in the USA is marketed as the F90X in Europe an Asia. Canon's EOS

The main distinction between parallel imports and authorized goods is that the parallel imports usually lack a manufacturer's warranty. Although some firms have an international distribution and servicing network, normally warranty services can only be consumed in the country where the goods were intended to be sold i.e. warranties are non-tradable. Therefore if a consumer purchases the parallel import, the product is not usually covered by the manufacturer's warranty because the manufacturer's licensed or authorized dealer did not import that item. In most cases, the retailer is assuming responsibility for anything that might go wrong with the product under warranty and is offering the appropriate servicing[3]. We assume that the services offered by a parallel importer are inferior to those provided by an authorized retailer thus leading consumers to always prefer the authorized good when the parallel import is offered at the same price. In other words, the bundle (the good and the associated services) sold by the parallel importer is considered a lower quality choice than the bundle offered by the authorized distributor. We could specifically add warranties to the model but we choose the broader approach where the difference between the authorized good and the parallel import is in quality.

We show that it is often in the interest of the manufacturer to encourage the availability of parallel imported goods. We study equilibrium price strategies for the manufacturer as reflected in the chosen vertical contracts, when the difference between the authorized product (high quality) and the parallel import (low quality) is exogenous. We show that, when the arbitrage cost is relatively low and when the authorized good and the parallel import are poor substitutes, it is in the interest of the manufacturer to allow parallel imports. In this case, manufacturer's profits, as well as domestic welfare, can be higher when parallel imports are permitted by law than when they are not.

The rest of the paper is organized as follows: in the next section we introduce the model and we derive the equilibrium choice of contracts as functions of the exogenous parameters of the model when parallel trade is not permitted by law (the two markets are segmented). In Sections 3 we derive the terms of contract and retailers choice whether to engage in parallel imports or not when parallel trade is permitted by law (the markets are integrated). We derive the equilibrium contract configurations in Section 4. Section 5takes a closer look at the preferred contract configuration by the manufacturer and Section 6 looks at the welfare implications of allowing parallel trade. Section 7 provides concluding remarks.

Elan IIE in the USA is named EOS 50E elsewhere (www.bhphotovideo.com).

[3] B&H Photo-Video, a on-line retailer of imaging equipment, defines a parallel imports as "an item B&H Photo-Video sells that includes a B&H warranty which covers the same particulars the manufacturer warranty would cover for one year. The only difference is that you [the customer] would ship the item to B&H for warranty service, and you need your B&H Photo-Video invoice instead of a warranty certificate" (www.bhphotovideo.com).

2 The Model

Consider a manufacturer (call it M) that sells its product in two countries (K and J) using retailers or distributors. Suppose each country has a large number of retailers. The manufacturer produces the goods with constant marginal cost normalized to zero without loss of generality, and no fixed costs of production. Neither retailing nor the distribution of the product from the manufacturer to the retailer is costly. The manufacturer chooses whether to offer exclusive territory contracts (ET) to one retailer or to let many retailers distribute their product (No ET) for each country. Because the manufacturer deals with retailers in both countries, there are four possible contract configurations. They correspond to:

a) the manufacturer uses exclusive distributors in both countries (ET, ET),
b) the manufacturer uses an exclusive distributor in one country but not in the other (ET, No ET) or (No ET, ET), and
c) the manufacturer deals with retailers in both countries without exclusivity contracts (No ET, No ET). We look at these contractual configurations separately.

In country K, the manufacturer offers its authorized retailers a contract (w^K, F^K) where w^K is the wholesale unit price and F^K is a franchise fee. When the wholesale price w^K is sufficiently low, an authorized retailer in country K (call it R^K) may find it profitable to ship some of the goods to the other country and sell it for profit on the gray market. We call parallel imports the goods intended to be sold in one market that end up in the other market. Therefore, in market K (J), the parallel imports sold by R^J (R^K) come into direct competition with the goods sold by the authorized retailer in that country (called the authorized goods).

We develop a three-stage game. In the first stage the manufacturer chooses the contract to offer each retailer. In the second stage, the manufacturer chooses the terms of the contract - the wholesale price, w, and franchise fee, F. In the third stage, each retailer decides whether to engage in parallel importing or not. If parallel trade is permitted by law, and if the retailer engages in parallel trade, the retailer sets the retail price in the domestic (authorized) market as well as the retail price for the parallel import. Given the prices of the two products, consumers in each country decide which good to purchase[4] (when both goods are available) and the sale takes place.

We solve the game by backward induction. First we look at the situation when parallel trade does not take place (i.e., it is illegal and the prohibition is enforced). Then we consider the case when the law lets retailers to engage in parallel trade. We look at how parallel trade affects contracts, prices, manufacturer's profits and welfare in the two countries. We look at manufacturer's incentives to stop parallel trade from taking place.

[4] It is assumed that consumers buy goods available in their domestic country only.

Before we do this, it may be useful to specify how our analysis differs from Maskus and Chen (1999). First, they restrict their analysis to only one of the contract configurations mentioned above, more specifically the (No ET, ET) case. We not only look at the other combinations of contracts but we also allow the manufacturer to choose the most profitable contract combination depending on the market conditions (reflected in the parameters of the model) in each country. Second, Maskus and Chen (1999) consider parallel imports and authorized goods sold in country J as being perfect substitutes and they model the competition between the authorized retailer and the parallel importer as Cournot competition. We introduce an explicit model of quality differentiation with price competition in order to derive the equilibrium contracts and thus to be able to answer questions such as: is there a contract configuration that the manufacturer prefers? Under what market conditions are we more likely to see parallel imports? What is the role of quality perception by consumers?

On the demand side, suppose the two countries are identical in terms of consumers' preferences and the two countries have the same income distribution. In each country, the consumers' income (or reservation price; both terms will be used indifferently below)[5] is uniformly distributed on the interval $[a, b]$ with identical density.

We use a vertical product differentiation model as in Shaked and Sutton (1982). The utility of the consumer with income y^K, $y^K \hat{I} [a, b]$ and buying one unit of good i is defined by:

$$U_y^K = q\left(y^K - p_i^K\right) \qquad (2.1)$$

where p_i^K is the retail price charged by the retailer in country K, y^K is the consumer's reservation price and q is a parameter that reflects the quality of the good.

First suppose only the product sold by the authorized retailers is available. Hence, a consumer buys either one unit of the good or he/she does not buy this good at all. Let $U_0 = 0$ be consumer's reservation utility. The income $\hat{y}^K$ of the consumer indifferent between buying and not buying the good is given by:

$$q\left(\hat{y}^K - p_i^K\right) = 0$$

The total demand for this product (equivalently, since individual demand is inelastic, the number of consumers that purchase the good) is given by:

$$D_i^K\left(p_i^K\right) = b - \hat{y}^K \qquad (2.2)$$

In both cases (ET or No ET), the parameters a and b must satisfy: $a \le \hat{y}^K \le b$. The first part of the inequality means that the demand $D^K\left(p^K\right)$ is positive, while the second part of the inequality means that it is possible that some consumers do not purchase the good at all. This is particularly important for the

results of our analysis because it is the existence of these potential consumers that makes parallel imports worthwhile from the point of view of the manufacturer.

Now suppose that in addition to the authorized product, parallel imports are available. Suppose product 1 is the authorized product and product 2 is the parallel imported product. In country K, the consumer with income y^K has the following utility:

$$U_y^K = \begin{cases} q\left(y^K - p_1^K\right) & when \quad good \quad 1 \quad is \quad purchased \\ aq\left(y^K - p_2^J\right) & when \quad good \quad 2 \quad is \quad purchased \end{cases} \tag{2.3}$$

where p_1^K is the retail price charged by an authorized retailer in country K and p_2^J is the price of the parallel import (sold by retailer R[J], located in country J). The low quality of the parallel import is reflected in the parameter a, which is assumed to satisfy: $0 < \underline{a} \le a < 1$. In other words, the quality of the parallel import is a fraction a of the quality of the authorized good. This is a reasonable assumption in so far as the consumer perception of the quality of the parallel import is relative to the quality of the authorized product. Here $\underline{a}$ represents the minimum quality difference between the authorized product and the parallel import such that $0 < \underline{a}q < q$. For the time being, we assume that a is exogenous. Later we consider the situation where the manufacturer controls the quality of the parallel import (for instance through the choice of packaging or warranty coverage) and thus chooses a.

Let us now determine the demand for the authorized product and for the parallel import in country K. Without loss of generality assume the upper level of the consumer income (reservation price) b is equal to *1*. The income $\hat{y}^K$ of the consumer who is indifferent between buying the parallel import (low quality) and not buying the good is given by:

$$a\,q\left(\hat{y}^K - p_2^J\right) = 0$$

The income $\tilde{y}^K$ of the consumer indifferent between buying the parallel import (low quality) and buying the authorized good (high quality) is given by:

$$a\,q\left(\tilde{y}^K - p_2^J\right) = q\left(\tilde{y}^K - p_1^K\right)$$

Therefore $\tilde{y}^K\left(p_1^K, p_2^J\right) = \dfrac{p_1^K - ap_2^J}{1-a}$ and $\hat{y}^K\left(p_1^K, p_2^J\right) = p_2^J$. The demand for the parallel import is then given by:

$$D_2^J\left(p_1^K, p_2^J\right) = \tilde{y}^K - \hat{y}^K = \frac{1}{1-a}\left(p_1^K - p_2^J\right) \tag{2.4}$$

and the demand for the authorized good is:

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[5] See Motta (1993) for a discussion on this point.

$$D_1^K\left(p_1^K, p_2^J\right)=1-\tilde{y}^K=1-\frac{p_1^K-ap_2^J}{1-a} \tag{2.5}$$

given that

$$a \le \hat{y}^K \le \tilde{y}^K \le 1 \tag{2.6}$$

We assume that a is small enough so that there is a positive demand for the parallel imported good and there are always a number of consumers who prefer not to buy the good at all. In other words, there are some consumers with very low income who find even the parallel import, when available, too expensive. Hence, the demand for good 1 in country K is:

$$D_1^K\left(p_1^K, p_2^J\right)=\begin{cases}1-\dfrac{p_1^K-ap_2^J}{1-a} & when \quad p_1^K > p_2^J \\ 1-p_1^K & when \quad p_1^K \le p_2^J\end{cases} \tag{2.7}$$

and the demand for good 2 is:

$$D_2^J\left(p_1^K, p_2^J\right)=\begin{cases}\dfrac{1}{1-a}\left(p_1^K-p_2^J\right) & when \quad p_1^K > p_2^J \\ 0 & when \quad p_1^K \le p_2^J\end{cases} \tag{2.8}$$

There is no demand for the parallel import when it is sold for a price that is equal to or exceeds the price of the authorized product.

We will do two types of comparisons. First we will look at a given contract configuration and compare a situation when parallel trade is allowed to a situation when parallel trade is prohibited by law. Second we want to compare retail prices for the authorized good and for the parallel import under different contract configurations. We look at the contract configurations mentioned above - (ET, ET), (ET, No ET), (No ET, ET) and (No ET, No ET).

When parallel trade is illegal, only the authorized good (good 1) is available in each country. Consumer demand for the authorized good in each country can be written as $D_1(p_1)$. A retailer can deal with the manufacturer with an ET contract (that particular retailer is the only retailer authorized to sell the good) or without an ET contract (several competitive retailers are authorized to sell the good). The model reduces to a standard case of a monopoly choosing its contract to sell in a particular market, since only product 1 is available in each country. We know in this case that, given the assumptions of the model, the manufacturer is indifferent between ET and No ET (see Tirole, 1988). Given the specific assumption about demand and cost, this implies that, under ET or No ET, the retail price is the monopoly retail price equal to $p_1=\frac{1}{2}$, also corresponding to the volume of sales in each market. The manufacturer sets its wholesale price equal to the retail price when the contract is No ET and sets its wholesale price equal to

zero when it chooses an ET contract. In both cases the entire profit of the retailer is still entirely extracted (with ET, through the franchise fee $F = \frac{1}{4}$).

3 The Retail Stage

When parallel trade is permitted by law, an authorized retailer in country K (J) may have an incentive to ship some of the goods to country J (K) and sell them for profit on the gray market.

We are assuming that retailing per se and shipping between the manufacturer and retailers are not costly[6]. There is, however, a per unit arbitrage cost *t* incurred by a retailer R^K when engaging in parallel trade. This cost is the same regardless of the direction of trade and it can be justified by the fact that a parallel trader may need to repackage the product when there are differences in national provisions on the packaging of goods, may need to print instruction booklets in the language of the country of destination or may have to pay certain licensing fees for the use of the product in the country of destination.

The manufacturer is aware of the competition in country K between the parallel import that comes from country J and the authorized goods sold by R^K. Why would the manufacturer accommodate these parallel imports? The manufacturer accommodates these goods because the parallel import and the authorized good are differentiated products and are being consumed by different types of consumers. Thus, the parallel import may be a tool used by the manufacturer to serve a fragment of consumers in country K with low income. When the parallel import is not available some of these customers do not buy the authorized good because it is too expensive. Thus, parallel trade is a way for the manufacturer to segment the market without directly incurring the cost *t* and without adding too much competition to the market for the authorized good. If the manufacturer were to provide a different good designed for the low income consumers and distribute it through the authorized distribution channel, the manufacturer would have to incur an additional production cost to "modify" the original good[7] to custom design it for this market segment.

As mentioned in the previous section, we develop a three stage game: in the first stage the manufacturer chooses the contract to offer each retailer. In the second stage it chooses the terms of the contract - the wholesale price and franchise fee. In the third stage, each retailer decides whether to engage in parallel importing or not. When parallel trade is permitted by law and if parallel trade takes place, the retailer sets the retail price in the domestic (authorized) market as well as the retail price for the parallel import. Given the prices of the two products, in each country, the consumers decide which good to

[6] A positive and constant unit cost will not change the results.
[7] See Deneckere and McAfee (1996) for more on this point.

purchase (when both goods are available) and the sale takes place. We solve the game by backward induction. We look at the contract configurations mentioned in the previous section one by one.

3.1 The Case of (ET, ET)

Suppose that in both countries the manufacturer sells its product using exclusive dealers (or retailers) so that the contract configuration is (ET, ET). Each retailer's terms of contract include a wholesale price and a positive franchise fee.

First suppose *both* retailers engage in parallel trade. Retailers in each country maximize total profit generated from domestic sales and parallel imports. In country K, the solution at this stage is given by two retail prices $\hat{p}_1^K\left(w^K, w^J\right)^{EE}$ and $\hat{p}_2^J\left(w^K, w^J\right)^{EE}$, and in country J it is given by $\hat{p}_1^J\left(w^K, w^J\right)^{EE}$ and $\hat{p}_2^K\left(w^K, w^J\right)^{EE}$. With the demand and cost structure we have chosen, the retailer's pricing decision can be separated by country. Hence, the retailer's decision whether to sell parallel imports or not as well as the pricing decision in the parallel market is not affected by its choice of retail prices in its domestic market. With the particular demand functions in (2.7) and (2.8), when both retailers engage in parallel trade, with (ET, ET), the solution to the profit maximization problem is presented in Table 1 in Appendix 7.

In order for a solution with parallel trade to exist in country J (K), the demand for parallel imports has to be positive. In other words, parallel trade is possible in country J when $D_2^K\left(\hat{p}_1^K, \hat{p}_2^K\right) > 0$ or, using (2.8) and after simplification:

$$w^K - (2-a)w^J + (1-a) - (2-a)t > 0 \qquad (3.1)$$

Similarly, parallel trade exists in country K when $D_2^J\left(\hat{p}_1^J, \hat{p}_2^J\right) > 0$ or, using (2.8) and after simplification:

$$w^J - (2-a)w^K + (1-a) - (2-a)t > 0 \qquad (3.2)$$

Now suppose *only* the retailer located in country K engages in parallel trade. In this case, only the authorized good is sold in country K, but in country J both a parallel import and the authorized good are available. Retailer R^K maximizes the total profit with respect to p_1^K and p_2^K with $D_1^K\left(p_1^K\right)$ instead of $D_1^K\left(p_1^K, p_2^J\right)$ since the demand for the authorized good in country K - D_1^K - depends only on p_1^K. The dealer in country J, who does not engage in parallel trade, maximizes the profit generated from sales in the domestic market only.

The two retailers choose the retail prices simultaneously. In country K the solution at this stage is given by the retail price $\tilde{p}_1^K\left(w^K\right)^{EE}$ and in country J it is given by $\tilde{p}_1^J\left(w^K, w^J\right)^{EE}$ and $\tilde{p}_2^K\left(w^K, w^J\right)^{EE}$. The retail prices chosen are presented in Table 1. As before, parallel imports exist if $D_2^K\left(\tilde{p}_1^J, \tilde{p}_2^K\right) > 0$ or, when

$$w^K - (2-a)w^J + (1-a) - (2-a)t > 0 \qquad (3.3)$$

The solution for the situation when both retailers decide not to sell parallel imports was discussed earlier.

3.2. The case of (ET, No ET) and (No ET, ET)

Suppose the manufacturer distributes its product using an exclusive dealer in country K but sells its products to several competitive retailers in country J so that the contract configuration is (ET, No ET). In country K, the manufacturer offers its exclusive retailer a contract (w^K, F^K) where w^K is the wholesale unit price and F^K is a franchise fee. In country J, each retailer pays the manufacturer w^J for each unit bought and the franchise fee is zero.

Now suppose *both* retailers engage in parallel importing. At the retail stage, the retailer R^K maximizes the profit with respect to p_1^K and p_2^K. On the other hand, a retailer R^J prices at cost because of perfect competition at the retail level both in its domestic market in country J and in the parallel market in country K. Therefore, retailer R^J chooses $\hat{p}_1^J\left(w^J\right)^{EN}$ and $\hat{p}_2^J\left(w^J\right)^{EN}$. The solution exists provided that there is a positive demand for the parallel import in country K , or:

$$w^J - w^K - t > 0 \qquad (3.4)$$

The other two retail prices, p_1^K and p_2^K are obtained by solving retailer R^K's profit maximization problem. With the particular demand system we chose, the retail prices are $\hat{p}_1^K\left(w^K, w^J\right)^{EN}$ and $\hat{p}_2^K\left(w^K, w^J\right)^{EN}$ in Table 1. Parallel imports are possible (the demand for parallel imports is positive) when, after simplification,

$$w^K - (2-a)w^J + (1-a) - (2-a)t > 0 \qquad (3.5)$$

Suppose that retailer R^J engages in parallel trade but the retailer R^K does not. In this case, the consumers in country J may only consume the good sold by the authorized competitive retailers. At the retail stage, since the pricing decision can be separated by country, R^K chooses $\breve{p}_1^K\left(w^K, w^J\right)^{EN}$ in Table 1, while R^J prices at cost both in the domestic and parallel market, provided that there is a positive demand for the parallel import, or (3.4) holds.

Now suppose only the retailer in country K engages in parallel trade. The consumers in country K may only buy the good sold by the authorized dealer. In this case, the demand for the authorized good in country K, D_1^K, depends only on p_1^K since good 1 is the only good sold in country K. At the retail stage, R^K chooses $\tilde{p}_1^K\left(w^K\right)$ and $\tilde{p}_2^K\left(w^K, w^J\right)$ provided that there is a positive demand for the parallel import or (3.5) holds. At the same time, R^J prices at cost in the domestic market. The retail prices in this case are also presented in Table 1.

The solution for the situation where neither retailer sells parallel imports was provided in the previous section. For the contract configurations (ET, No ET) and (No ET, ET)[8], the profit collected by retailer R^J is equal to zero regardless of the choice to engage in parallel imports or not because of perfect competition at the retail level in this country.

3.3 The case of (No ET, No ET)

Finally, suppose the manufacturer uses several competitive retailers in each country so that the contract configuration is (No ET, No ET). At the retail stage, retailers in both countries price at cost in their domestic market and in the parallel market, if parallel trade is possible. The retail prices $\bar{p}_1^K\left(w^K\right)^{NN}$, $\bar{p}_2^K\left(w^K\right)^{NN}$, $\bar{p}_1^J\left(w^J\right)^{NN}$ and $\bar{p}_2^J\left(w^J\right)^{NN}$ are presented in Table 1. A solution with parallel imports is possible in country K when there is a positive demand for parallel imports or:

$$w^K - w^J - t > 0 \tag{3.6}$$

Similarly, parallel imports exist in country J if:

$$w^J - w^K - t > 0 \tag{3.7}$$

Each retailer collects zero profit in each country with or without parallel imports because of perfect competition at the retail level. Hence, a retailer is indifferent between parallel trade and no parallel trade and it is the existence condition that will determine the equilibrium at the retail stage for this contract configuration.

Lemma 1. *For any contract combination, if there is a positive demand for parallel imports then parallel trade takes place.*

[8] When the contract configuration is (No ET, ET), and only retailer R^J engages in parallel trade the equilibrium retail prices for R^J are given by $\breve{p}_1^J\left(w^J\right)^{NE} = \tilde{p}_1^K\left(w^K\right)^{EN}$ and $\breve{p}_2^J\left(w^K, w^J\right)^{NE} = \tilde{p}_2^K\left(w^K, w^J\right)^{EN}$ while R^K prices at cost, provided that (3.5) holds. When only retailer R^K does parallel trade, then R^J choose the domestic retail prices $\tilde{p}_1^J\left(w^K, w^J\right)^{NE} = \breve{p}_1^K\left(w^K, w^J\right)^{EN}$ while R^K prices at cost both at home and on the parallel market. Naturally, (3.4) must hold in this case.

In other words, when a retailer has the possibility to sell parallel imports (there is a positive demand for parallel imports in the other country or the existence condition for this retailer is satisfied) it will choose to do so. The decision whether to engage in parallel imports or not does not affect the choice of retail price and thus its profit at home: the two markets are completely segmented. Then, as long as there is a demand for parallel imports, it is profitable for a retailer to provide them to the consumers. Hence, from now on, in each country, for any contract combination, it is the existence condition that will determine whether parallel trade takes place or not, provided that it is allowed by law.

Let us now turn to manufacturer's choice of wholesale prices and franchise fees. We look at the three possible contract combinations, one by one.

4 The Manufacturing Stage

For each contract combination, there are two strategies the manufacturer can follow: either the manufacturer allows parallel imports to take place or it does not. If the manufacturer does not allow parallel imports, it chooses wholesale prices such that a retailer finds it unprofitable to engage in parallel trading.

4.1 The Case of (No ET, No ET)

Suppose the manufacturer uses several competitive retailers in both countries (No ET, No ET). Because of symmetry the manufacturer chooses the same wholesale prices in both countries. A parallel importer's cost in country K (and therefore the retail price) is at least as high as the price that the authorized retailer chooses in country K so the demand for the parallel import cannot be positive. This is reflected in the fact that the existence conditions (3.6) and (3.7) do not hold when the two wholesale prices (under No ET) are the same. Hence, the retail prices in this case are identical whether parallel trade is permitted or not (since it cannot occur) and they are given by $\overline{p}_1^K$ and $\overline{p}_1^J$ in Table 1. The manufacturer profit is in this case $\overline{\Pi}^{NN} = \frac{1}{4}$.

The above analysis suggests that for any parameter values, in a symmetric environment, the manufacturer could always choose (No ET, No ET) if he wants to deter parallel imports. Therefore, a

situation where parallel imports are not allowed is similar to a situation where parallel imports are allowed but the manufacturer chooses No ET in both countries[9].

4.2 The Case of (ET, ET)

Let us look at the situation where the manufacturer uses exclusive retailers in each country (ET, ET) and both countries allow parallel imports. At the manufacturing stage, the manufacturer maximizes the total profit from sales in both markets. When retailers in one or both countries engage in parallel importing, the manufacturer's profit takes this into account by including both sales made by the authorized good dealers and sales of parallel imports. Note that the manufacturer collects w^J (w^K) for every unit sold by the parallel importer R^J (R^K) in country K (J), since M originally sold the goods to R^J (R^K) for w^J (w^K) each.

First suppose retailers in *both* countries engage in parallel trade - (PT, PT). The total profit for the manufacturer is given by sales of products through authorized channels, parallel imports sales, and a franchise fee for each retailer. When choosing the franchise, the manufacturer takes into account the fact that each retailer has surplus from two sources, domestic sales and parallel imports.

The solution is obtained by solving the profit-maximization problem for the manufacturer. Using the demand functions in (2.7) and (2.8) the equilibrium wholesale prices, $\left(\hat{w}^K\right)^{EE}$ and $\left(\hat{w}^J\right)^{EE}$, are presented in Table 2 in Appendix 7. Parallel trade occurs in country K/J when (3.1)/(3.2) hold for the corresponding wholesale prices - denoted as the existence condition - or

$$(1-a)-2t>0 \qquad (4.1)$$

When parallel trade goes in both directions (PT, PT) let M's profit be $\hat{\Pi}^{EE}$.

Now suppose *only* the retailer located in country K engages in parallel trade – (PT, No PT). The optimal wholesale prices $\left(\tilde{w}^K\right)^{EE}$ and $\left(\tilde{w}^J\right)^{EE}$, obtained by solving the profit maximizing first-order conditions are presented in Table 2. Note that parallel imports in country J are possible or (3.3) holds for the above wholesale prices when:

$$4(1-a)-(8-3a)t>0 \qquad (4.2)$$

With parallel trade going in one direction - (PT, No PT) - manufacturer's profit is given by $\tilde{\Pi}^{EE}$. The above equilibrium also corresponds to a situation when only one country (in this case country J) permits parallel trade.

[9] This result no longer holds when the two countries are not identical.

Finally, when both retailers sell the goods only in their domestic market – (No PT, No PT), the equilibrium wholesale prices chosen by the manufacturer are equal to the marginal cost of production. In this case (No PT, No PT), the manufacturer profit is given by $\overline{\Pi}^{EE}$.

To determine when the manufacturer chooses to have parallel trade under ET in both countries, let us compare manufacturer's profit when both retailers engage in parallel trade (PT, PT), only one retailer does parallel trade (PT, No PT) and when there is no parallel trade (No PT, No PT).

Let us consider (PT, PT). The wholesale prices $\left(\hat{w}^K\right)^{EE}$ and $\left(\hat{w}^J\right)^{EE}$ are the equilibrium wholesale prices at the manufacturing stage if $\hat{\Pi}^{EE} \geq \overline{\Pi}^{EE}$ and $\hat{\Pi}^{EE} \geq \tilde{\Pi}^{EE}$, provided that parallel imports exist - (4.1) holds. With (PT, No PT), M chooses the wholesale prices $\left(\tilde{w}^K\right)^{EE}$ and $\left(\tilde{w}^J\right)^{EE}$ such that (PT, No PT) is the equilibrium at the manufacturing stage when $\tilde{\Pi}^{EE} \geq \hat{\Pi}^{EE}$ and $\tilde{\Pi}^{EE} \geq \overline{\Pi}^{EE}$ provided that parallel imports are possible - (4.2) holds. As for the third possible equilibrium (No PT, No PT), the manufacturer prefers to stop parallel imports rather than to allow them when $\hat{\Pi}^{EE} \leq \overline{\Pi}^{EE}$.

Using $\hat{\Pi}^{EE}$, $\tilde{\Pi}^{EE}$ and $\overline{\Pi}^{EE}$ we can calculate $\hat{\Pi}^{EE} - \overline{\Pi}^{EE}$ and $\hat{\Pi}^{EE} - \tilde{\Pi}^{EE}$ which are both positive[10] when a<1. Since $\hat{\Pi}^{EE}$ dominates both $\tilde{\Pi}^{EE}$ and $\overline{\Pi}^{EE}$, (PT, PT) is the equilibrium of choice for the manufacturer when parallel imports are possible (the existence conditions are satisfied). Therefore, an equilibrium with no parallel imports is only possible when the market conditions are such that parallel imports are not possible - (4.1) does not hold.

Lemma 2 *When parallel trade is allowed by law in both countries, under (ET, ET), the manufacturer always prefers to let parallel trade flow in both directions.*

Hence, for the contract configuration (ET, ET), when both countries allow parallel trade, the equilibrium is (PT, PT) when the market conditions permit it (parallel imports exist). When the parameters of the model are such that the demand for parallel imports is not positive at the profit maximizing wholesale prices $\left(\hat{w}^K\right)^{EE}$ and $\left(\hat{w}^J\right)^{EE}$, the equilibrium is then (No PT, No PT). This is illustrated[11] by Figure 1. The downward sloping curve on the diagram is obtained by making (4.1) hold with equality.

[Figure 1 here]

[10] See Appendix 1.

As we can see from Figure 1, parallel trade is possible in both directions when the arbitrage cost is low and when the products are poor substitutes (α is low).

4.3 The Case of (ET, No ET)

Suppose the manufacturer uses ET in country K but No ET in country J. When *both* retailers engage in parallel trade – (PT, PT), the optimal wholesale prices $\hat{w}^K(a,t)^{EN}$ and $\hat{w}^J(a,t)^{EN}$ are presented in Table 2. Parallel imports exist in country K when (3.4) holds or:

$$4(1-a)-(17-a)t>0 \tag{4.3}$$

and parallel imports flow into country J if the existence condition is satisfied at the current wholesale prices or, after simplification:

$$\left(3-2a-a^2\right)-\left(16+a-a^2\right)t>0 \tag{4.4}$$

The wholesale prices $\left(\hat{w}^K\right)^{EN}$ and $\left(\hat{w}^J\right)^{EN}$ are not the same because of the different contracts the manufacturer has with retailers. We see that the wholesale price in country K (where the manufacturer uses ET) is less than the wholesale price in country J (where M uses No ET). Moreover, in country K the wholesale price is greater with parallel trade than without parallel trade (since $w^K=0$ in this case) but in country J, parallel trade causes the wholesale price to decrease compared to a situation without parallel trade (when $w^J=1/2$). When the manufacturer wants to accommodate parallel imports in country K, given that $p_2^J = w^J + t$ and $p_2^J \le p_1^K$, the manufacturer has to decrease w^J. On the other hand, the manufacturer has to increase w^K to keep p_1^K above p_2^J. When parallel trade goes in both let the manufacturer's profit be $\hat{\Pi}^{EN}$.

When only retailer R^K engages in parallel trade – (PT, No PT), the optimal wholesale prices $\left(\tilde{w}^K\right)^{EN}$ and $\left(\tilde{w}^J\right)^{EN}$ are presented in Table 2. Parallel imports are possible (or (3.5) holds) for the corresponding wholesale prices when:

$$4(1-a)-(8-3a)t>0 \tag{4.5}$$

When parallel trade goes to country J only (R^K does the parallel trade), the manufacturer's profit is given by $\tilde{\Pi}^{EN}$. Note that this equilibrium also corresponds to a situation when only country J allows parallel trade with (ET, No ET).

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[11] For parallel imports to exist, the lower limit a must satisfy (2.6) or $a \le \frac{4t+(5+4a)}{2(7+2a)}$.

When only retailer R^J engages in parallel trade – (No PT, PT), the optimal wholesale prices $\left(\breve{w}^K\right)^{EN}$ and $\left(\breve{w}^J\right)^{EN}$ are presented in Table 2. The demand for parallel imports is positive for the corresponding wholesale prices when the existence condition is satisfied, or:

$$(1-a)-(3-a)t>0 \qquad (4.6)$$

With parallel trade going in one direction to country K only, manufacturer's profit is $\left(\breve{\Pi}\right)^{EN}$. Note that this equilibrium also corresponds to a situation when only country K allows parallel trade with (ET, No ET).

Let us determine the manufacturer's equilibrium choice concerning parallel import for the contract configurations (ET, No ET) and (No ET, ET)[12]. Because the two countries are identical, the equilibrium with (ET, No ET) and the equilibrium with (No ET, ET) are the same. Let us look at the situation when both countries allow parallel trade and the configuration is (ET, No ET).

As we mentioned, a set of wholesale prices represent equilibrium prices if the corresponding retail prices are equilibrium prices at the retail level (parallel imports are possible). Hence, it is not sufficient that the manufacturer prefers to let parallel trade flow or stop parallel trade. It is necessary that the corresponding existence conditions are satisfied.

Figure 2 shows[13] the equilibrium of the EN subgame for different values of t and α. The solid curves on the diagram represent the parameter values where: $\tilde{\Pi}^{EN}=\hat{\Pi}^{EN}$, $\overline{\Pi}^{EN}=\tilde{\Pi}^{EN}$, $\breve{\Pi}^{EN}=\hat{\Pi}^{EN}$, $\tilde{\Pi}^{EN}=\breve{\Pi}^{EN}$ and $\overline{\Pi}^{EN}=\breve{\Pi}^{EN}$. The dotted lines on the diagram represent various other conditions that we will explain in detail later. As we mentioned earlier, the retailers always engage in parallel trade when possible. Let us take a closer look at the regions identified in Figure 2. The manufacturer prefers to have parallel imports in both countries in the region labeled (PT, PT), he prefers to have parallel imports going into country J only in the region labeled (PT, No PT), he prefers to have parallel imports only into country K in the

[12] When the manufacturer uses ET in country J but No ET in country K and both retailers engage in parallel trade, the optimal wholesale prices are given by $\left(\hat{w}^J\right)^{NE}=\left(\hat{w}^K\right)^{EN}$ and $\left(\hat{w}^K\right)^{NE}=\left(\hat{w}^J\right)^{EN}$ in Table 2 provided that parallel imports exist - (4.3) and (4.4) hold. The manufacturer's profit is given by $\hat{\Pi}^{NE}=\hat{\Pi}^{EN}$. If only retailer R^J engages in parallel trade, the optimal wholesale prices are given by $\left(\breve{w}^J\right)^{NE}=\left(\tilde{w}^K\right)^{EN}$ and $\left(\breve{w}^K\right)^{NE}=\left(\tilde{w}^J\right)^{EN}$ given that (4.5) holds. Manufacturer's profit is given by $\breve{\Pi}^{NE}=\tilde{\Pi}^{EN}$. On the other hand, when only retailer R^K engages in parallel trade, the optimal wholesale prices are given by $\left(\tilde{w}^J\right)^{NE}=\left(\breve{w}^K\right)^{EN}$ and $\left(\tilde{w}^K\right)^{NE}=\left(\breve{w}^J\right)^{EN}$ provided that (4.6) holds. Manufacturer's profit is in this case given by $\tilde{\Pi}^{NE}=\breve{\Pi}^{EN}$.

[13] Also, a has to satisfy (2.6) or $a\le\frac{(3+a)^2+(1-a)(4+a)t}{2(13+3a)}$.

region labeled (No PT, PT) and he prefers a situation with no parallel trade in the region labeled (No PT, No PT). Also, for any t and α, in each region, the corresponding existence conditions hold.

[Figure 2]

In Figure 2, the region labeled (No PT, No PT) is divided into 3 other sub-regions, labeled (1), (2) and (3). In all three, the equilibrium is (No PT, No PT). We chose to identify the sub-regions because of the different reasons we end up with a (No PT, No PT) equilibrium. Sub-region (1) is bordered to the right by $\tilde{D}_2^K = 0$. The demand for parallel imports provided by retailer R^K in country J is positive below this border. Hence, parallel imports to country J are possible in sub-region (1) if the manufacturer allows them. However, the manufacturer prefers not to have parallel imports in this case. Hence, the (No PT, No PT) equilibrium is the result of manufacturer's choice to eliminate parallel imports for the parameter values corresponding to sub-region (1). For the same reason we end up with an equilibrium with no parallel trade in sub-region (3). Even if the retailers would prefer (PT, No PT) and parallel trade would be possible, the manufacturer stops parallel imports by choosing the appropriate wholesale prices. In sub-region (2), however, the equilibrium with no parallel trade is the result of the existence conditions not being satisfied.

Lemma 3. *Under (ET, No ET), the manufacturer chooses to accommodate parallel trade when the arbitrage cost is low and the goods are poor substitutes. When the arbitrage cost is large and the goods are close substitutes, the manufacturer chooses wholesale prices so that the retailers find it unprofitable to engage in parallel trade.*

As we can see in Figure 2, parallel trade to country K occurs when the arbitrage cost t is small. As we mentioned earlier, with (ET, No ET), country J is the "low price" country and country K is the "high price" country. The difference between the highest retail price in country J and the lowest retail price in country K is exactly equal to t. When t increases, for the parallel market to be profitable in country K, the manufacturer has to keep increasing w^K, sacrificing sales of the authorized product. At some point, it becomes more profitable for the manufacturer not to have a parallel market in country K at all.

When t is relatively large, parallel imports are profitable as long as the two goods are poor substitutes (α is low). When the quality of the parallel import gets closer to the quality of the authorized product, the manufacturer has to decrease the retail price of the authorized product because too many customers switch to parallel imports. At some point, the manufacturer is better off selling only through authorized dealers in each country so it chooses the wholesale prices such that there is no parallel trade.

5 Equilibrium and Prices

In the previous section we found the equilibrium strategy for the retailers and the manufacturer for each contract configuration in the situation where parallel trade is allowed by law. In this section we consider the four possible contract configurations - (ET, ET), (ET, No ET), (No ET, ET) and (No ET, No ET) - and look at manufacturer's decision of choosing the optimal combination of contracts for given parameter values.

Proposition 1. *When parallel trade is allowed by law in both countries and the existence conditions are satisfied, (ET, ET) is a dominant strategy for the manufacturer.*

A formal proof is provided in Appendix 2. First let us compare (ET, ET) and (ET, No ET). We saw that when M has No ET in country J but ET in country K, then country J has low retail prices compared with country K. In this situation, the manufacturer has to choose a relatively large w^K to keep the price for the authorized good in country K above the retail price of the parallel import. This has an adverse effect on the demand for both the authorized product and the parallel import in country K. If M switches to ET in country J, the wholesale price in country K can now be lowered causing an increase in the demand for the authorized product and the parallel import. As a result, price equalization between countries occurs both for retail and wholesale prices thus leading to higher profit for the manufacturer.

Second, (ET, ET) is preferred to (No ET, No ET) because with ET the manufacturer collects profit from parallel import sales in addition to the profit collected from sales of the authorized product. The equilibrium contract configuration is shown in Figure 3. As we can see, (ET, ET) is preferred when the arbitrage cost and the quality parameter are both low, provided that parallel trade exists. When parallel imports are not feasible the manufacturer is indifferent between (ET, ET), (ET, No ET), (No ET, ET) and (No ET, No ET).

[Figure 3 here]

Let us now take a closer look at the equilibrium retail prices. As we saw with Proposition 1, when parallel imports are allowed by both countries and when they exist, the manufacturer prefers to use ET in both countries. When parallel imports are not allowed, M is indifferent between ET and No ET. What happens with the retail price of the authorized good when we move from a situation when parallel imports are not allowed by law to a situation when parallel imports are allowed? We can now derive the following result:

Proposition 2. *Parallel trade increases the retail price for the authorized product.*

A formal proof is provided in Appendix 3. We showed with Proposition 1 that when parallel trade is allowed, the manufacturer prefers to use ET in both countries, which creates a gray market in each country. Now the manufacturer serves two consumer types: the "high income" consumers that purchase the authorized product and the "low income" consumers that purchase the parallel import. The manufacturer can increase its profit by increasing the retail price for the authorized good (which is the high quality good) now purchased by the "high income" consumers. However, some substitution will take place because some of the consumers that used to buy the authorized product when parallel trade was not allowed will now purchase the parallel import. When switching from "no parallel trade" to "parallel trade" not only p_1^K increases but the parallel import must be sold for less than the price of the authorized product in the absence of parallel imports, $\overline{p}_1^K$, to attract consumers. The manufacturer is able to increase the retail price for the authorized good in both countries due to the contract configuration chosen by the manufacturer (ET, ET). In this context, ET allows the manufacturer to benefit from parallel imports in both countries.

Since the two countries are identical, when the manufacturer uses ET in both countries (ET, ET), the retail prices for the authorized good (parallel import) are the same in the two countries. It can be easily shown[14] that the authorized good is sold at a higher price than the parallel import regardless of the parameter values. In other words, in each country, $\hat{p}_1 \geq \hat{p}_2$. This is not surprising since the parallel import is perceived by the consumer as the "low quality" good and thus parallel imports must have a lower price to have a positive demand in equilibrium.

6 Welfare analysis and policy implications

In this section we compare a situation when parallel trade is allowed with a situation when parallel trade is prohibited. Which one is preferred by the manufacturer? What about the consumers?

First we calculate the Consumers' Surplus in each country as the sum of individual consumer utilities in that country. Hence, in country K, the Consumers' Surplus is given by:

$$CS^K = \int_{\tilde{y}^K}^{b} q\left(y^K - p_1^K\right) dy^K \qquad (6.1)$$

when only the authorized good (good 1) is available and $\tilde{y}^K = p_1^K$. When, in addition to the authorized product, the parallel import is available, the Consumers' Surplus is

[14] We calculate $\hat{p}_1^K - \hat{p}_2^J = \frac{3(1-a)-6t}{2(2a+7)}$ which is non-negative when (4.1) holds.

$$CS^K = \int_{\hat{y}^K}^{\tilde{y}^K} a q\left(y^K - p_2^J\right) dy^K + \int_{\tilde{y}^K}^{b} q\left(y^K - p_1^K\right) dy^K \qquad (6.2)$$

with $\hat{y}^K = \frac{p_1^K - a p_2^J}{1-a}$ and $\tilde{y}^K = p_2^J$. When parallel trade is not allowed by law, regardless of the contract chosen by the manufacturer, the Consumers' Surplus is:

$$CS^K = \frac{q}{8} \qquad (6.3)$$

Recall that the utility of a consumer who does not buy the good is equal to zero. Hence, the Consumers' Surplus is given by the sum of the utility of the consumers who buy the parallel import and the utility of the consumers who purchase the authorized product.

We saw that when parallel imports are not permitted by law in either country, the manufacturer collects $\Pi\left(\overline{w}^K, \overline{w}^J\right) = \frac{1}{2}$ regardless of the contract configuration chosen. When parallel trade is permitted by law in both countries, we saw with Proposition 1 that the manufacturer always prefers to use ET in both countries when parallel imports exist - the region labeled (PT, PT) in Figure 3 - and is indifferent between ET and No ET when parallel trade does not take place. When parallel imports are available, some consumers switch from authorized goods to parallel imports since the latter is cheaper. Moreover, some consumers that found the authorized good too expensive when parallel trade was not allowed may buy the parallel import when it becomes available

We can now derive the following result:

Proposition 3. *a) When both countries allow parallel imports, the manufacturer always prefers a situation where parallel trade is permitted by law to one where it is not. b) When both countries allow parallel imports, the consumers always prefer a situation where parallel trade is not permitted by law to one where it is.*

a) This result comes directly from the analysis of the previous section. Note that this result holds whether or not parallel imports take place since, if it does not, the manufacturer's profit is not lower than if parallel imports are not allowed.

b) We saw that when parallel trade is allowed by law and it takes place, the manufacturer chooses ET in both countries and, in this case, retailers in both countries engage in parallel trade. We calculate:

$$CS^K\Big|_{NoPT} - CS^K\Big|_{PT} = \frac{1}{8} \frac{\left[2(1+8a) + \left(4a^2 - 17a + 13\right)\right]\left[(1-a) - 2t\right]}{(1-a)(7+2a)^2}$$

which is always positive when there is a positive demand for paralle l imports.

In the previous section we saw that the equilibrium when parallel trade is not allowed is equivalent to the equilibrium when parallel trade is allowed and the manufacturer chooses (No ET, No ET). This result is not surprising given the setup of our model but comes in opposition to the general view expressed in the literature that parallel imports are beneficial for the consumer and adversely affect the manufacturer. In our model, parallel imports allow the manufacturer to extract additional rents by using exclusive territory contracts. As a consequence, the consumers with a high reservation price that purchase the authorized product end up paying a higher price for the good, thus having lower utility. As for the consumers that did not purchase the product in the absence of parallel imports, their utility increases when parallel trade is permitted by law. However, this result shows that the utility gain for consumers with low reservation price (or income) cannot offset the loss in utility for the consumers with high reservation price, and thus the Consumers' Surplus decreases when parallel trade is introduced.

Consider now the domestic welfare. As in Motta (1993) we assume that the domestic welfare in country K is calculated as the sum of Consumers' Surplus and manufacturer's profit generated by sales to retailer R^K. Hence, the domestic welfare does not take into account the profit earned by the monopolist in the other country. In country K,

$$W^K(a,a,t) = CS^K(a,a,t) + w^K(a,a,t)\left[D_1^K(a,a,t) + D_2^K(a,a,t)\right] + F^K(a,a,t) \qquad (6.4)$$

We can then show:

Proposition 4. *a) The introduction of parallel trade increases the domestic welfare when the arbitrage cost is low and the goods are poor substitutes. b) When the goods are close substitutes, domestic welfare decreases when parallel trade is allowed by law.*

As shown with Proposition 3, when parallel imports become legal, the Consumers' Surplus decreases, having an adverse effect on the domestic welfare in country K. However, manufacturer's profit improves when parallel trade is introduced thus leading to an increase in the domestic welfare. When both t and α are low, the domestic welfare increases because the profit effect dominates. More specifically, this happens when:

$$\left(12a^2 + 3a - 15\right) + \left(58 + 32a\right)t \le 0 \qquad (6.5)$$

When the arbitrage cost and the quality difference are relatively large, the decrease in Consumer Surplus dominates and the domestic welfare decreases. More specifically, domestic welfare decreases when (6.5) does not hold, provided, that parallel imports are possible.

When we computed the Consumers' Surplus we simply added the utility for each consumer. It is customary in the public economics literature to assign weights[15] to individual utilities depending on the consumer's reservation price or income. For instance, the weight assigned to the utility of an individual consumer can increase as the reservation price for the good of that consumer gets smaller. In this case the Consumers' Surplus in country K is given by:

$$CS^K = \int_{\hat{y}^K}^{b} b\left(y^K\right) q\left(y^K - p_1^K\right) dy^K \qquad (6.6)$$

when only the authorized good (good 1) is available and $\hat{y}^K = p_1^K$. Also,

$$CS^K = \int_{\hat{y}^K}^{\tilde{y}^K} b\left(y^K\right) a\, q\left(y^K - p_2^K\right) dy^K + \int_{\tilde{y}^K}^{b} b\left(y^K\right) q\left(y^K - p_1^J\right) dy^K \qquad (6.7)$$

with $\hat{y}^K = \dfrac{p_1^K - a p_2^J}{1-a}$ and $\tilde{y}^K = p_2^J$ when, in addition to the authorized product, the parallel import is sold. In (6.6) and (6.7), *b(y)* is decreasing[16] in y.

When weights are assigned to individual utility, the contribution of consumers with low reservation prices to Consumers' Surplus is now higher. The gain in utility for these consumers offsets the loss in utility by the high reservation price consumers so that the total effect of allowing parallel trade is a net increase in the Consumers' Surplus.

Since in this case both the consumers and the manufacturer prefer a situation when parallel trade is allowed to one when it is not, the introduction of parallel trade leads to an unambiguous increase in the domestic welfare.

Endogenous quality parameter a

When parallel trade is allowed by law, suppose the manufacturer can choose the difference in quality between the authorized good and the parallel import. Let us look at how α affects manufacturer's profit for each contract configuration discussed in the previous sections. With (ET, ET), the manufacturer's profit is given by $\hat{\Pi}^{EE}$. With (ET, No ET) or (No ET, ET) M's profit is $\hat{\Pi}^{EN}$, $\tilde{\Pi}^{EN}$ or $\breve{\Pi}^{EN}$, depending on the parameter values. As for (No ET, No ET) the profit $\overline{\Pi}^{NN}$ is equal to *1/2*. We can now derive the following result:

[15] In the public economics literature they are called "dis tributional weights". See, for example, Stiglitz (2000).

[16] For example, when $b(y) = 1/y - 1$, the weight assigned to the consumer with the highest reservation price ($y=1$) is zero and the weight assigned to the consumers that buy the parallel import is relatively large.

Proposition 5. *When parallel trade is allowed by law, the manufacturer chooses the maximum quality difference between the authorized product and the parallel import ($a = \underline{a}$).*

A formal proof is provided in Appendix 4. As α decreases, the manufacturer's profit increases. When a parallel import is sold alongside the authorized product, the lower the quality of the parallel import with respect to the authorized product, the higher the demand for parallel imports because fewer customers switch from the authorized product to the parallel import. This tends to increase M's profit since the authorized good is more profitable than the parallel import. Therefore, if the manufacturer were to choose the quality difference between the products, he will choose the smallest possible α.

Policy Choice Regarding Parallel Imports

Until now, we assumed the governments in the two countries followed the same policy with respect to parallel trade i.e. to allow it or not. However, it is possible that only one country permits parallel imports while the other country opposes such a policy. In Appendix 5 we derive the equilibrium contracts, prices and profits when only one country allows parallel imports.

Suppose each country has to choose whether to allow parallel imports (legal parallel trade - LPT) or not (illegal parallel trade - IPT) and the two countries play a simultaneous game, where each chooses the policy that maximizes the domestic welfare. Let the domestic welfare in country K (J) be the sum of the Consumers' Surplus and the part of the manufacturer's profit generated by sales in country K (J) as defined above.

When both countries allow parallel trade, we showed that both firms choose ET when feasible. When only one country allows parallel imports we show in Appendix 5 that the optimal contract configuration depends on the parameters of the model: a, a and t. Hence, the equilibrium of the "welfare game" depends of the parameters of the model. Figure 4 identifies 4 regions in the parameter space. They correspond to different contract combinations when one or both countries allow parallel trade.

[Figure 4 here]

When *both* countries allow PT, because of symmetry, the manufacturer chooses the same contract in both countries. More specifically, it chooses ET in regions A, B and C and is indifferent between ET and No ET in region D. When only *one* country allows parallel trade, the equilibrium contract combinations are no longer the same in both countries. For example, when country J allows parallel trade, in region A the

contracts are (ET, ET) or (ET, No ET)[17]. In region B the contracts are (No ET, ET) and in region C the firm eliminates parallel imports by choosing No ET in both countries or parallel trade is not feasible. As for region D, the manufacturer is indifferent between (ET, ET), (ET, No ET), (No ET, ET) and (No ET, No ET).

To determine the Nash equilibrium, for each region identified in Figure 4 we can construct the following payoff matrix.

		Country J	
		Legal Parallel Trade (LPT)	Illegal Parallel Trade (IPT)
Country K	Legal Parallel Trade (LPT)	$(W^K)_{LPT,LPT}$, $(W^J)_{LPT,LPT}$	$(W^K)_{LPT,IPT}$, $(W^J)_{LPT,IPT}$
	Illegal Parallel Trade (IPT)	$(W^K)_{IPT,LPT}$, $(W^J)_{IPT,LPT}$	$(W^K)_{IPT,IPT}$, $(W^J)_{IPT,IPT}$

We can now derive the following result:

Proposition 6: *IPT is a dominant strategy regardless of the parameter values.*

A formal proof is provided in Appendix 6. Let us look at the intuition for this result. We want to show that a country does not benefit from switching from IPT to LPT, regardless of the strategy followed by the other country (IPT or LPT). For example, for country J, we want to show that $(W^J)_{IPT,IPT} \geq (W^J)_{IPT,LPT}$ and $(W^J)_{LPT,IPT} \geq (W^J)_{LPT,LPT}$. We consider the parameter values corresponding to the four regions identified in Figure 4, one by one.

a) Let us first consider the case when the arbitrage cost is low and the two goods are poor substitutes (α is low). Hence, the parameters are consistent with region A in Figure 4. First suppose parallel trade is illegal in both countries. With illegal parallel imports, the manufacturer is indifferent between ET and No ET and consumers pay the same retail prices in both countries. Let us assume the manufacturer uses ET in both countries (so that both wholesale prices are zero). Now suppose one country, country J, decides to allow parallel imports. To accommodate parallel trade in country J the manufacturer increases the wholesale price w^J. This leads to an increase in the retail price for the authorized product in country J. Since the markup on the authorized product is higher, the manufacturer may want to control the price for the parallel import to limit the number of customers switching from the authorized product to the parallel import. This can be done by increasing the wholesale price w^K. Since it

[17] Recall that the first contract in the brackets is offered by the manufacturer to retailers in country K and the second one to retailers in country J.

is retailer R^K that does the parallel trade, an increase in w^K also leads to an increase in the retail price for the authorized product in country K. As a result, consumer utility declines in both countries despite the fact that more consumers buy differentiated products in J. Although there is no change in contracts (ET is still preferred in both countries), the manufacturer's profit increases when parallel imports are allowed. While the part of the profit generated by sales to retailer R^K increases (because R^K now sells parallel imports), the profit collected from retailer R^J declines (recall that in this case R^J only sells a more expensive authorized product in the domestic market). Hence, in country J, both the consumer utility and the manufacturer profit decrease, thus leading to a decline in the domestic welfare.

Now suppose that country K allows parallel imports but country J does not. We look at the same parameter values as above and suppose the contract combination is (ET, ET)[18]. Retail prices for the authorized product in country J exceed the price for the parallel import and both wholesale prices are positive. What happens when country J also allows parallel imports? To accommodate parallel imports in country J, the manufacturer must decrease w^K which decreases the retail price for the authorized product in country K. In country J, since the authorized product is the "high quality" product, the manufacturer increases the wholesale price w^J so that the retail price for the authorized product now increases. As a result, consumer utility in country K improves because most of the consumers (who buy the authorized product) now pay lower prices. In country J, however, the consumer utility declines because the retail price for the authorized product increases. As for the manufacturer, it collects more profit from country K but not from country J. Hence, the domestic welfare in country J declines when it allows parallel imports. It is interesting that the welfare in country K improves even when country K does not change its policy. The reason for the welfare increase is twofold: first, the authorized product becomes cheaper in country K and this increases the consumer utility and, second, the manufacturer's profit increases because retailer R^K sells parallel imports in addition to the authorized product.

b) Now let us look at the case when the arbitrage cost is low and the goods are close substitutes. The parameter values are such that we are in region B of Figure 4. In this case, the firm chooses ET in both countries when both countries allow parallel trade but chooses asymmetric contracts, (ET, No ET) or (No ET, ET), when only one country allows parallel trade. More specifically, the manufacturer prefers an ET contract in the country that receives parallel imports. In other words, retailers that engage in parallel trade have a No ET contract. First suppose that both countries follow a policy that doesn't allow parallel trade. We showed that in this case, in each country, the manufacturer is indifferent between ET and No ET. Suppose the contract combination is (ET, ET) and suppose that country J allows parallel trade. The analysis is similar to the one presented above with only one exception. Since the parallel import and the

[18] As we discussed in Appendix 4, when only country J allows parallel imports, the manufacturer is indifferent between (ET, ET) and (ET, No ET) when t and α are small.

authorized product are now closer substitutes, the price of the parallel import becomes closer to the price of the authorized product. To keep the price of the parallel import relatively high requires a high w^K which can be better accomplished by switching contracts to No ET in country K. As we showed above, the welfare in country J declines when it moves from IPT to LPT when country K keeps prohibiting parallel trade (IPT).

Now suppose that country K allows parallel imports but country J does not. For high degree of substitutability, the contract combination is (ET, No ET). What happens when country J also allows parallel imports? To accommodate parallel imports in country J, the manufacturer has to decrease w^K. Because of the No ET contracts in country J, the retail prices have to satisfy: $p_1^K > p_2^J \geq p_1^J > p_2^K$ which reduces the profit collected by the manufacturer in country J (which now becomes the "low price" country). To avoid this situation, the manufacturer is better off by switching contracts to ET in country J. This increases the retail price p_1^J (which leads to lower Consumer Utility in country J) but decreases both p_1^K and p_2^J, and thus the profit of the manufacturer from country J. Hence, the welfare in country J declines when it opens its borders to parallel trade.

c) In region C, in addition to the two goods being close substitutes, the arbitrage cost is relatively large. When both countries allow parallel trade the manufacturer chooses ET in both countries but prefers to switch to No ET (and eliminate parallel trade) when only one country allows parallel imports. Suppose the equilibrium is (IPT, LPT). We saw that when only one country has LPT, it is in the interest of the manufacturer to stop parallel trade by using the appropriate wholesale prices. Now suppose country J switches to LPT (allows parallel trade when country K also allows it). The manufacturer now exploits the fact that parallel trade can go in both directions and switches contracts to ET in both countries. As a result, retail prices for the authorized product increase in both countries thus leading to a decline in the Consumer Utility. The manufacturer, however, benefits from the change in policy - its profit in both countries increases. However, the increase in profit cannot offset the decline in Utility and the domestic welfare decreases. As for the situation when a country switches from IPT to LPT, given that the other country has IPT, there is no change in the equilibrium since the manufacturer keeps the No ET contracts in both countries.

d) As for the other region of Figure 4 (region D), as we showed in a previous Section, parallel imports do not take place for the parameters corresponding to region D so, in this case, a country is indifferent between IPT and LPT.

Since the two countries are identical the above analysis also proves that it is not beneficial for country K to switch from IPT to LPT. This proposition is interesting because it shows that in a model

where contractual arrangements are endogenous, parallel imports are not the pro-competitive tool that they are sometimes believed to be.

7 Conclusion

We show that when manufacturers use retailers or distributors to sell their products to consumers, differences in contracts that the manufacturer offers to retailers in the two countries can generate parallel trade. An ET contract (associated with a low wholesale price) in one country might induce a retailer in that country to resell the good for profit in the other country, thereby generating parallel imports which compete with the authorized sales. We show that manufacturers do not always fight to stop parallel trade and that they may have incentives to have their products sold along with "unauthorized" counterpart. This occurs when there are qualitative differences between the goods sold by the parallel importer and those sold by the authorized dealers, creating separate markets for those two types of products.

When the law permits retailers to engage in parallel trade, we find that regardless of the contract configuration, parallel imports are cheaper than the authorized products in each country. In this case, some consumers switch from the authorized product and some other consumers that did not buy the good previously, buy the parallel import, when available.

When parallel imports are permitted by law in both countries and the manufacturer uses (ET, ET) we show that it is in the interest of the manufacturer to let retailers make parallel imports available to consumers when the arbitrage cost is relatively low and the authorized good and the parallel import are poor substitutes. In this case, although the retail prices for the authorized goods are the same in both countries we do observe parallel trade taking place because an ET contract is associated with low wholesale prices[19]. Therefore, ET contracts give retailers in both countries incentives to engage in parallel importing, provided it is not too costly to do so. When the manufacturer uses several competitive retailers in each country, an equilibrium with parallel imports and No ET in both countries is not possible when the countries are identical. This is interesting because it suggests that the manufacturer can eliminate parallel trade by simply choosing the appropriate contract configuration, in this case (No ET, No ET).

We show that the manufacturer prefers a situation where parallel imports are allowed by law to a situation when they are not. In our model the manufacturer controls the authorized markets as well as the parallel markets in both countries through the wholesale prices. This gives him flexibility but also constrains him in some sense since the retail prices in these markets are all interconnected. Consumers'

[19] Another tool that the manufacturer can use to deter parallel imports is to use an ET contracts without a franchise fee since a higher wholesale price may be sufficient to deter parallel imports. However, in his situation we find that it is not in the interest of the manufacturer to choose a contract without a franchise fee. A contract with No ET is more profitable than a contract with ET and no franchise fee.

Surplus is maximized when several distributors are present in each country and there are no parallel imports. While parallel trade makes the good available to low income consumers, it also makes the authorized product more expensive for the customers who buy it thus leading to lower Consumers' Surplus.

What are the policy implications of the above analysis? Is it a good idea for a country to let parallel imports occur and to become soft on its competition policy that restricts ET? Our model shows that consumers are, on average, worse off when parallel imports are introduced. However, parallel imports are beneficial to the producers. This is interesting because it contrasts with the view expressed in the literature that parallel trade benefits consumers through reduced retail prices. We showed that this may not be the case when the parallel import and the product sold by the authorized dealer are not perfect substitutes. While parallel trade makes a low price good available to low income consumers, it gives the manufacturer incentives to extract more rents from the high income consumers by increasing the price of the authorized products.

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Appendix 1: Using $\hat{\Pi}^{EE}$, $\tilde{\Pi}^{EE}$ and $\overline{\Pi}^{EE}$ we calculate

$$\hat{\Pi}^{EE} - \overline{\Pi}^{EE} = \frac{[(1-a)-2t]^2}{(1-a)(7+2a)}$$

which is always positive when a<1. We also calculate

$$\hat{\Pi}^{EE} - \tilde{\Pi}^{EE} = \frac{(10-21a+21a^2-10a^3)}{4(1-a)(7+2a)(6-a)} - \frac{(40-44a+12a^2-8a^3)t}{4(1-a)(7+2a)(6-a)} + \frac{(40-4a+a^2-2a^3)t^2}{4(1-a)(7+2a)(6-a)}$$

which is also positive for $a<1$.

Appendix 2: Proof of Proposition 1.

Since only one manufacturer chooses contracts for retailers in each country, we need to show that the manufacturer's profit under (ET, ET) is higher than the profit under (ET, No ET), (No ET, ET) and (No ET, No ET) for any parameter values. Since the manufacturer's profit under (ET, No ET) and (No ET, ET) is the same (countries are symmetric), we only need to show that $\Pi^{EE}(w^K, w^J) \geq \Pi^{EN}(w^K, w^J)$ and $\Pi^{EE}(w^K, w^J) \geq \Pi^{NN}(w^K, w^J)$ for any parameter values. Different conditions divide the parameter space into several regions. We look at each one separately.

a) When it is best for the manufacturer to let parallel imports flow in both directions with (ET, ET) and with (ET, No ET) the following conditions hold: $(\hat{D}_2^K)^{EE} > 0$, $(\hat{D}_2^K)^{EN} > 0$, $(\hat{D}_2^J)^{EN} > 0$, $\hat{\Pi}^{EE} \geq \tilde{\Pi}^{EE}$ and $\hat{\Pi}^{EN} \geq \tilde{\Pi}^{EN}$. The first three conditions are the existence conditions[20] with (ET, ET) and (ET, No ET), respectively. The last two conditions reflect the fact that the manufacturer prefers to have parallel trade in both countries with (ET, No ET)[21]. As we mentioned, with (No ET, No ET) there is no parallel trade. We calculate:

$$\hat{\Pi}^{EE} - \hat{\Pi}^{NN} = \frac{(1-a-2t)^2}{(1-a)(7+2a)} \geq 0 \qquad \text{(A1.1)}$$

which is always positive for $\alpha<1$. We also calculate:

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[20] Here $(\hat{D}_2^K)^{EE}$ is the demand for the parallel imports in country K when the manufacturer chooses the wholesale prices $(\hat{w}^K)^{EE}$ and $(\hat{w}^K)^{EE}$.

[21] Recall that, because of the asymmetric contracts, an equilibrium with No PT in one country is possible with (ET, No ET) but not with (ET, ET).

$$\hat{\Pi}^{EE} - \hat{\Pi}^{EN} = \frac{\left(9 - 7a + 15a^2 + 13a^3 + 2a^4\right)t^2}{4(1-a)(7+2a)(13+3a)} + \frac{\left(34a + 28a^2 - 14a^3 - 4a^4 - 44\right)t}{4(1-a)(7+2a)(13+3a)} + \frac{\left(39a - 25a^2 + a^3 + 2a^4 - 17\right)}{4(1-a)(7+2a)(13+3a)}$$

It can be shown that the above expression is also positive when the existence conditions are satisfied.

b) If $\left(\hat{D}_2^K\right)^{EE} > 0$, $\left(\tilde{D}_2^J\right)^{EN} > 0$, $\hat{\Pi}^{EE} \geq \tilde{\Pi}^{EE}$, $\hat{\Pi}^{EN} \leq \tilde{\Pi}^{EN}$ and $\breve{\Pi}^{EN} \leq \tilde{\Pi}^{EN}$ parallel trade exists in both directions only when the manufacturer chooses (ET, ET). With (ET, No ET) parallel imports flow in one direction only, from country K to country J. Using the appropriate profit functions we calculate:

$$\hat{\Pi}^{EE} - \tilde{\Pi}^{EN} = \frac{\left(40 - 4a + a^2 - 4a^3\right)t^2}{4(1-a)(7+2a)(6-a)} + \frac{\left(44a + 12a^2 - 8a^3 - 40\right)t}{4(1-a)(7+2a)(6-a)} + \frac{\left(21a^2 - 10a^3 - 21a + 10\right)}{4(1-a)(7+2a)(6-a)}$$

It can be shown that the above expression is also positive when the appropriate conditions hold.

c) When $\left(\hat{D}_2^K\right)^{EE} > 0$, $\left(\tilde{D}_2^J\right)^{EN} > 0$, $\hat{\Pi}^{EE} \geq \tilde{\Pi}^{EE}$, $\hat{\Pi}^{EN} \leq \breve{\Pi}^{EN}$ and $\tilde{\Pi}^{EN} \leq \breve{\Pi}^{EN}$ parallel trade exists in both directions only when the manufacturer chooses (ET, ET). With (ET, No ET) parallel imports only go from country J to country K. Using $\hat{\Pi}^{EE}$ and $\breve{\Pi}^{EN}$ we calculate:

$$\hat{\Pi}^{EE} - \breve{\Pi}^{EN} = \frac{\left(42 + 4a - 14a^2 - 4a^3\right)t^2}{2(1-a)(7+2a)(7+a)} + \frac{\left(4a + 6a^2 + 4a^3 - 14\right)t}{2(1-a)(7+2a)(7+a)} + \frac{7\left(a^2 - 2a + 1\right)}{2(1-a)(7+2a)(7+a)}$$

It can be shown that the above expression is also positive when the above conditions are satisfied.

d) When $\left(\hat{D}_2^K\right)^{EE} > 0$, $\hat{\Pi}^{EE} \geq \tilde{\Pi}^{EE}$, $\hat{\Pi}^{EE} \geq \overline{\Pi}^{EE}$ parallel trade is possible only when the manufacturer chooses (ET, ET). Since (A1.1) holds here, and choosing (No ET, No ET) or (ET, No ET) yield the same profit, the manufacturer prefers (ET, ET) to all other contract combinations.

e) Finally for $\left(\hat{D}_2^K\right)^{EE} \leq 0$ parallel trade is not possible so, as we showed previously, the manufacturer is indifferent between (ET, ET), (ET, No ET) and (No ET, No ET).

Appendix 3: Proof of Proposition 2.

When there is no parallel trade, the retail price for good 1 in country K is given by:

$$\left(\overline{p}_1^K\right)^{EE} = \left(\overline{p}_1^K\right)^{EN} = \left(\overline{p}_1^K\right)^{NN} = \frac{1}{2}$$

With (ET, ET), when parallel trade is allowed the retail price for the authorized product is:

$$\left(\hat{p}_1^K\right)^{EE} = \frac{(8+a)-2t}{2(2a+7)}$$

We calculate $\left(\hat{p}_1^K\right)^{EE} - \left(\overline{p}_1^K\right)^{EE} = \frac{(1-2t-a)}{2(7+2a)}$ which is positive for any parameter values where parallel imports take place or $(1-a)-2t>0$ (the region labeled (PT, PT) in Figure 1).

Appendix 4: Proof of Proposition 5.

We calculate $\frac{\partial \hat{\Pi}^{EE}(a,a,t)}{\partial a} = \frac{[9(1-a)+(10+8a)t][2t-(1-a)]}{(1-a)^2(7+2a)^2}$ which is always negative when parallel imports are feasible. The second term in the numerator is the negative of the existence condition (4.1). This expression is thus negative when parallel imports are possible.

Appendix 5: The equilibrium contracts when only one country allows parallel trade.

In this Appendix we consider the case where one country allows parallel imports while the other does not. Specifically we assume that country J allows parallel trade while country K does not.

The Retail Stage

At the retail stage, retailer R^K can sell the products domestically and abroad in country J, but retailer R^J can only sell into its domestic market. When retailers in both countries have exclusive territory contracts (ET, ET) and a retailer R^K engages in parallel trade, the equilibrium is given by the retail prices $\left(\tilde{p}_1^K\right)^{EE}$, $\left(\tilde{p}_1^J\right)^{EE}$ and $\left(\tilde{p}_2^K\right)^{EE}$ in Table 1, provided that the existence condition (3.3) holds. When the manufacturer uses ET in country K but No ET in country J and a retailer R^K engages in parallel trade, the equilibrium retail prices $\left(\tilde{p}_1^K\right)^{EN}$, $\left(\tilde{p}_1^J\right)^{EN}$ and $\left(\tilde{p}_2^K\right)^{EN}$ when (3.4) holds. With (No ET, No ET) the solution at this stage is given by $\left(\tilde{p}_1^K\right)^{NN}$, $\left(\tilde{p}_1^J\right)^{NN}$ and $\left(\tilde{p}_2^K\right)^{NN}$ given that the existence condition (3.6) holds. Since only country J allows parallel imports it is retailer R^K that does the parallel importing and the two possible equilibria for country (K, J) are (PT, No PT) and (No PT, No PT).

The Manufacturing Stage

Let us now look at manufacturer's choice of wholesale prices and franchise fees. We look at the four contract configurations discussed above.

Case 1: (ET, ET)

Let us consider (PT, No PT) first. The wholesale prices $\left(\tilde{w}^K\right)^{EE}$ and $\left(\tilde{w}^J\right)^{EE}$ in Table 2 are the equilibrium wholesale prices at the manufacturing stage if $\tilde{\Pi}^{EE} \geq \overline{\Pi}^{EE}$ provided that parallel imports exist - (4.2) holds. Using $\tilde{\Pi}^{EE}$ and $\overline{\Pi}^{EE}$ we can calculate $\tilde{\Pi}^{EE} - \overline{\Pi}^{EE}$ which is positive when

$$\left(a^2 - 4a + 8\right)t^2 - 4(1-a)(2-a)t + (1-a)(2-3a) \geq 0 \qquad \text{(A4.1)}$$

In other words, the manufacturer prefers (PT, No PT) to (No PT, No PT) when (A4.1) holds, provided that there is a positive demand for parallel imports, or (4.2) holds.

The manufacturer prefers an equilibrium without parallel imports (No PT, No PT) when (A4.1) does not hold even though parallel imports are possible. Hence, as in the previous case, the equilibrium when only one country allows parallel imports, is determined by the existence condition (4.2). In other words, when a demand for parallel imports exist, retailers will choose to offer them. The equilibrium is depicted[22] in Figure 5.

[Figure 5 here]

In the diagram, the equilibrium is (PT, No PT) when the arbitrage cost is low and the goods are poor substitutes (α is low) and No PT, No PT) when arbitrage is costly and α is high. In the region labeled (1) in Figure 5, the manufacturer prefers (No PT, No PT) to (PT, No PT) and chooses the wholesale prices which eliminate demand for parallel imports in country J. As for the case where only country K allows parallel imports but not country J, because of symmetry, the equilibrium is identical to the one described above.

Case 2: (ET, No ET)

In country K, only the authorized good is available while in the other country, provided there is a positive demand, a parallel import is also sold.

With (PT, No PT), the solution is given by $\left(\tilde{w}^K\right)^{EN}$ and $\left(\tilde{w}^J\right)^{EN}$ in Table 2 provided that parallel imports are possible - (4.5) holds. The manufacturer collects $\tilde{\Pi}^{EN}$. With (No PT, No PT), the manufacturer collects $\overline{\Pi}^{EN} = \frac{1}{2}$. Hence, the equilibrium is (PT, No PT) when $\tilde{\Pi}^{EN} - \overline{\Pi}^{EN} \geq 0$, provided that (4.5) holds. The equilibrium is (No PT, No PT) when $\tilde{\Pi}^{EN} - \overline{\Pi}^{EN} < 0$. We calculate $\tilde{\Pi}^{EN} - \overline{\Pi}^{EN}$ which is positive when

$$\left(a^2 - 4a + 8\right)t^2 - 4(1-a)(2-a)t + (1-a)(2-3a) \geq 0 \qquad \text{(A4.2)}$$

[22] The parameter a has to satisfy (2.6) or $a \leq \frac{4 + (4-a)t}{2(6-a)}$.

The manufacturer prefers an equilibrium without parallel imports (No PT, No PT) when (A4.2) does not hold. Hence the equilibrium when only country J allows parallel imports with (ET, No ET), is determined by the existence condition (4.5).

It is interesting that the profits $\tilde{\Pi}^{EE}$ and $\tilde{\Pi}^{EN}$ are the same even if the corresponding wholesale prices are not. In both cases the manufacturer uses ET in country K, the country where parallel imports originate and where only the authorized good is sold. Hence, in country K, the pricing strategy for the manufacturer is the same with (ET, ET) or (ET, No ET). The story is different in country J. With ET the manufacturer collects the retail surplus with the franchise fee so that the wholesale price is lower than with No ET (where the wholesale price is the sole source of profit). However, the retail prices are the same with (ET, ET) and with (ET, No ET) because the manufacturer is choosing the profit maximizing wholesale prices. Since retailers that engage in parallel trade have ET, there is no constraint that connects the retail prices between the two countries. Hence, a switch in contracts from ET to No ET in country J when the manufacturer keeps ET in country K, will have no effect on retail prices and manufacturer's profits. Since a franchise fee is no longer available, the only thing that changes is the wholesale price in country J, which increases. From the manufacturer's point of view, (ET, ET) and (ET, No ET) are equivalent in this situation.

Hence, the equilibrium in Figure 5 also corresponds with (ET, No ET); (PT, No PT) is an equilibrium when the arbitrage cost is low and the goods are poor substitutes (α is low) whereas (No PT, No PT) is the equilibrium when arbitrage is relatively costly and α is high. Note that in the region labeled (1) on the diagram the first choice is (No PT, No PT) and he chooses the wholesale prices such that parallel trade is deterred.

Case 3: (No ET, ET)

With (PT, No PT), the solution is given by $\left(\tilde{w}^{K}\right)^{NE} = \left(\breve{w}^{K}\right)^{EN}$ and $\left(\tilde{w}^{J}\right)^{NE} = \left(\breve{w}^{J}\right)^{EN}$ in Table 2 provided that parallel imports are possible - (4.6) holds. The manufacturer collects a profit equal to $\tilde{\Pi}^{NE} = \breve{\Pi}^{EN}$. With (No PT, No PT), the manufacturer collects $\overline{\Pi}^{NE} = 1/2$. Hence, the manufacturer prefers PT to No PT when $\tilde{\Pi}^{NE} - \overline{\Pi}^{NE} \geq 0$, provided that (4.6) holds. We calculate $\tilde{\Pi}^{NE} - \overline{\Pi}^{NE}$ which is positive when

$$\left(1+a^{2}\right)t^{2} - 2(1-a)(3-a)t + (1-a)^{2} \geq 0 \qquad \text{(A4.3)}$$

The manufacturer prefers an equilibrium without parallel imports (No PT, No PT) when (A4.4) does not hold. However, since retailers choose PT, the equilibrium when only country J allows parallel imports with (No ET, ET) is determined by the existence condition (4.6). The equilibrium is shown[23] in Figure 6.

[Figure 6 here]

(No PT, PT) is preferred by the manufacturer when the arbitrage cost is low and the goods are poor substitutes (α is low) whereas (No PT, No PT) is the equilibrium when arbitrage is relatively costly and α is high. In Figure 6, as in the previous figures, the region labeled (1) shows the combination of parameters where the manufacturer prefers (No PT, No PT) and acts to prevent parallel trade. In the following section we will see that the manufacturer can achieve the desired equilibrium (No PT, No PT) not by changing its pricing strategy but by choosing a different contract configuration.

As for the case when parallel imports go only to country K, with (No ET, ET) it is identical to the one where only country J allows parallel imports and the contract configuration is (ET, No ET).

Equilibrium Contracts

We showed that (No ET, No ET) corresponds with an equilibrium without parallel trade. When the manufacturer uses ET in both countries (ET, ET), the manufacturer collects the profit in (4.8) and the equilibrium is shown in Figure 5. With (ET, No ET) the manufacturer's profit is given by (4.16) and the equilibrium is also the one in Figure 5. As for (No ET, ET), the manufacturer receives the profit in (4.19) and Figure 6 shows the equilibrium.

Now we want to determine what is the contract configuration[24] most preferred by the manufacturer when parallel imports are possible only in country J.

[Figure 7 here]

As we can see, when the arbitrage cost and the quality parameter are both small, the manufacturer prefers (ET, ET) or (ET, No ET), as discussed above. As the parallel import and the authorized product become closer substitutes, the price for the authorized product decreases, the price for the parallel import increases and the difference between them becomes smaller. This reduces the profit for the manufacturer. When M switches contracts to No ET in country K, the retailer R^K prices at cost in the authorized market in country K and on the gray market in country J. Now the manufacturer extracts profit from retailer R^K only through the wholesale price. Naturally, it will increase the wholesale price in country K. Note that there is no change in contracts in country J. However, to be able to sell parallel imports in country J, M has to

[23] We choose a to satisfy (2.6) or $a \le \frac{4+(4-a)t}{2(6-a)}$ (the market is big enough to accommodate parallel imports).

[24] The equilibrium is shown in Figure 7. The figure was constructed with $a \le \frac{4+(4-a)t}{2(6-a)}$ or (2.6) holds.

take into account that $p_1^J \geq p_2^K$. Since $p_2^K = w^K + t$ and $p_1^K = w^K$ (so that $p_2^K \geq p_1^K$), M has to increase w^J enough so that $p_1^J \geq p_2^J$. Therefore, a switch in contracts from ET to No ET in one country, increases both wholesale prices and retail prices in both countries as well, leading to an overall increase in profit.

We can also distinguish in Figure 7 parameter values for which the manufacturer uses (No ET, No ET) - regions labeled (1) and (2) - to deter parallel imports. This happens when the arbitrage cost and α are relatively large so that, even when parallel imports are possible they become unprofitable for the manufacturer. As for the case when parallel imports are no longer possible, the manufacturer is indifferent between (ET, ET), (ET, No ET), (No ET, ET) and (No ET, No ET), as we can see from Figure 7.

Appendix 6. Proof of Proposition 6.

Since the two countries are identical, by symmetry, $\left(W^K\right)_{LPT,IPT} = \left(W^J\right)_{IPT,LPT}$. Hence, we only have to prove that IPT is a dominant strategy for one country or $\left(W^K\right)_{IPT,IPT} \geq \left(W^K\right)_{LPT,IPT}$ and $\left(W^K\right)_{IPT,LPT} \geq \left(W^K\right)_{LPT,LPT}$ for any a, t, and a. For regions A and B in Figure 4 we calculate $\left(W^K\right)_{IPT,IPT} \geq \left(W^K\right)_{LPT,IPT}$. First we calculate:

$$\left(W^K\right)_{IPT,IPT} - \left(W^K\right)_{LPT,IPT} = \frac{\left(12a^2 - a^3 - 32a + 16\right)t^2 + \left(32a - 8a^2 - 64\right)t}{8(a-6)^2(1-a)} + \frac{\left(a^3 + 3a^2 - 32a + 28\right)}{8(a-6)^2(1-a)}$$

and

$$\left(W^K\right)_{IPT,LPT} - \left(W^K\right)_{LPT,LPT} = \frac{\left(48a^4 + 4a^5 - 383a^2 - 131a^3 - 464a + 2096\right)t^2}{8(a-6)^2(1-a)(2a+7)^2} - \frac{\left(184a^4 + 8a^5 - 860a^2 - 470a^3 + 500a + 3104\right)t}{8(a-6)^2(1-a)(2a+7)^2} - \frac{\left(12a^5 - 249a^4 + 171a^2 + 74a^3 + 1020a - 1028\right)}{8(a-6)^2(1-a)(2a+7)^2}$$

which are positive when the parameter values correspond to the ones in Region A. Second we calculate:

$$\left(W^K\right)_{IPT,IPT} - \left(W^K\right)_{LPT,IPT} = \frac{\left(16a^2 - 116a + 4\right)t^2 - \left(32a + 56a^2 + 40\right)t}{8(a+7)^2(1-a)} - \frac{\left(3a^3 + 7a^2 + 41a - 51\right)}{8(a+7)^2(1-a)}$$

and

$$\left(W^K\right)_{IPT,LPT} - \left(W^K\right)_{LPT,LPT} = \frac{\left(96a^4 + 16a^5 - 1059a^2 - 769a^3 - 315a + 2254\right)t^2}{8(a+7)^2(1-a)(2a+7)^2} - \frac{\left(280a^4 + 32a^5 + 32a^2 + 1176a^3 + 3528a + 1960\right)t}{8(a+7)^2(1-a)(2a+7)^2} - \frac{\left(111a^4 + 1059a^2 + 769a^3 + 315a - 2254\right)}{8(a+7)^2(1-a)(2a+7)^2}$$

They are both positive for the parameters corresponding to region B of Figure 4.

As for region C, since only when both countries allow parallel trade we have an equilibrium with parallel imports, $\left(W^K\right)_{IPT,IPT} - \left(W^K\right)_{LPT,IPT} = 0$. We calculate

$$\left(W^K\right)_{IPT,LPT} - \left(W^K\right)_{LPT,LPT} = \frac{\left(9a^2 - 12a^3 + 18a - 15\right)}{8(1-a)(2a+7)^2} - \frac{(116+64a)t^2}{8(1-a)(2a+7)^2} - \frac{\left(56a^2 + 32a - 88\right)t}{8(1-a)(2a+7)^2}$$

which is positive for the parameters corresponding to region C of Figure 4.

Appendix 7. Figures and Tables.

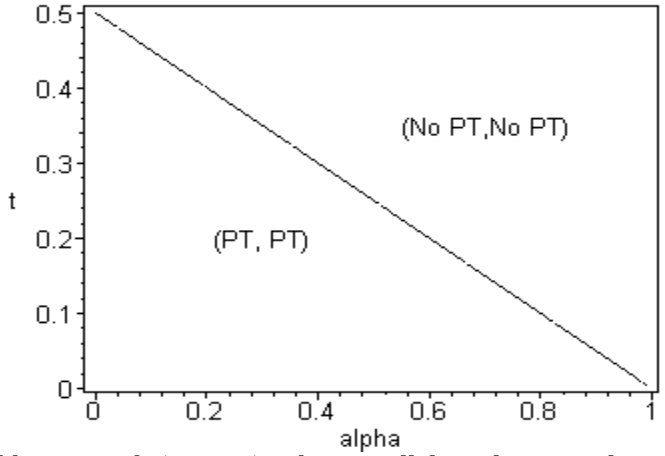

Figure 1. Equilibrium With (ET, ET) When Parallel Trade Is Legal In Both Countries.

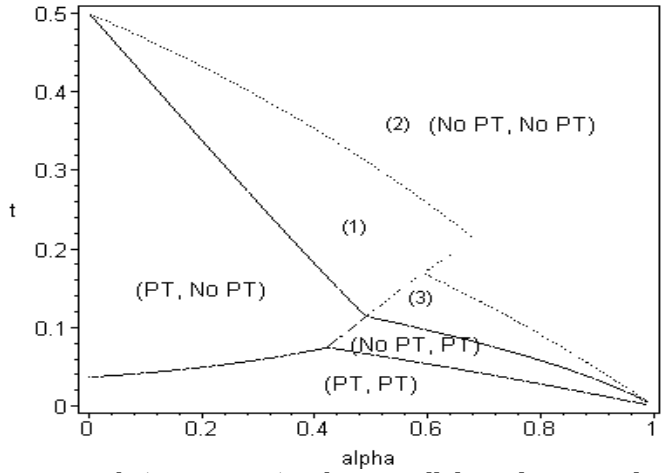

Figure 2. Equilibrium With (ET, No ET) When Parallel Trade Is Legal In Both Countries

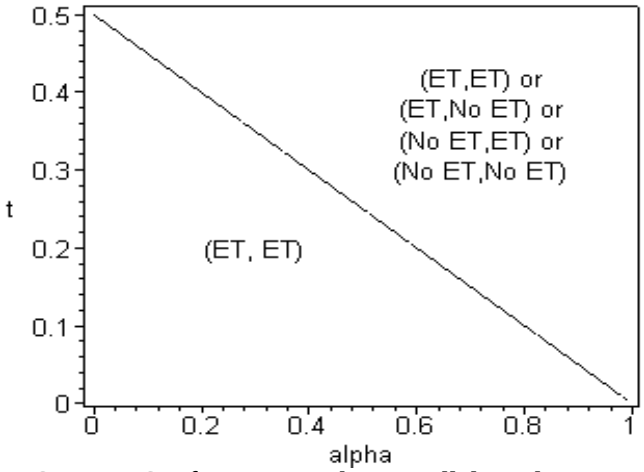

Figure 3. Equilibrium Contract Configuration When Parallel Trade Is Legal In Both Countries

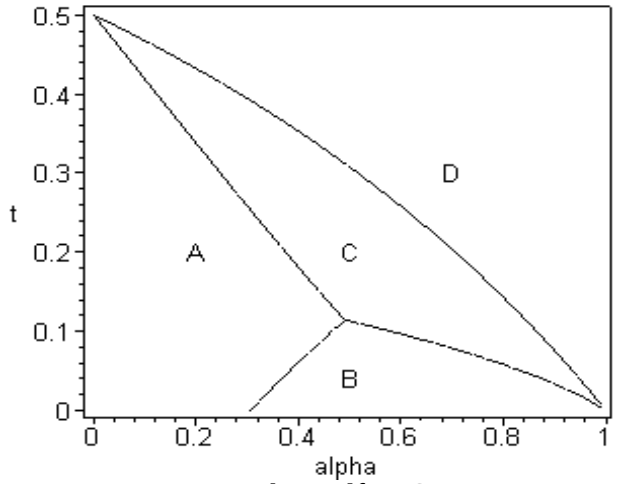

Figure 4. The Welfare Game.

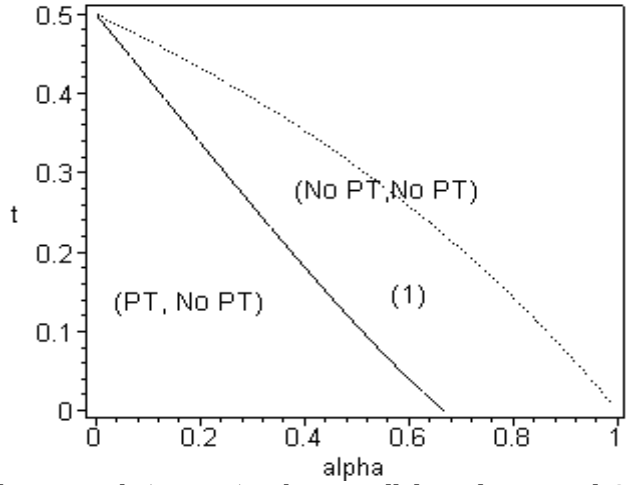

Figure 5. Equilibrium With (ET, ET) When Parallel Trade Is Legal Only In Country J

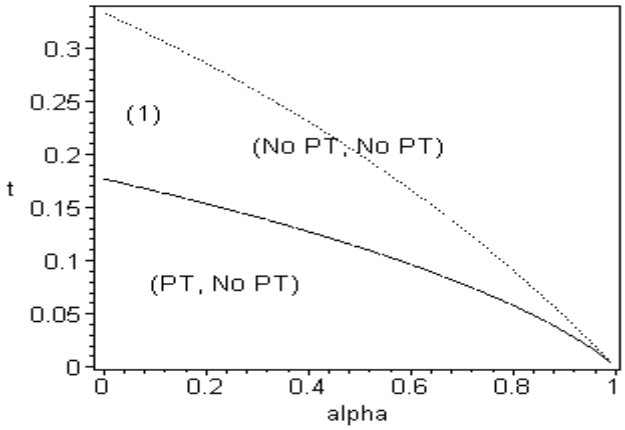

Figure 6. Equilibrium With (No ET, ET) When Parallel Trade Is Legal Only In Country J

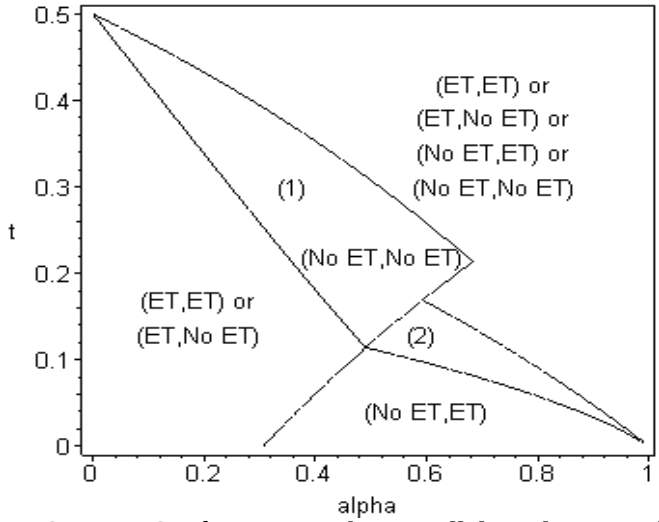

Figure 7. Equilibrium Contract Configuration When Parallel Trade Is Legal Only In Country J

Table 1. Solution to the Retail Stage Problem

	Retailers in both countries engage in parallel trade	Retailers in country K engage in parallel trade	Retailers in country J engage in parallel trade	No parallel trade
(ET, ET)	$\hat{p}_1^K\left(w^K, w^J\right)^{EE} = \frac{2(1-a)+2w^K+aw^J+at}{4-a}$ $\hat{p}_2^K\left(w^K, w^J\right)^{EE} = \frac{(1-a)+w^K+2w^J+2t}{4-a}$ $\hat{p}_1^J\left(w^K, w^J\right)^{EE} = \frac{2(1-a)+2w^J+aw^K+at}{4-a}$ $\hat{p}_2^J\left(w^K, w^J\right)^{EE} = \frac{(1-a)+w^J+2w^K+2t}{4-a}$	$\tilde{p}_2^K\left(w^K, w^J\right)^{EE} = \frac{(1-a)+w^J+2w^K+2t}{4-a}$ $\tilde{p}_1^K\left(w^K\right)^{EE} = \frac{1}{2}\left(1+w^K\right)$ $\tilde{p}_1^J\left(w^K, w^J\right)^{EE} = \frac{2(1-a)+2w^J+aw^K+at}{4-a}$	$\breve{p}_1^K\left(w^K, w^J\right)^{EE} = \frac{2(1-a)+2w^K+aw^J+at}{4-a}$ $\breve{p}_2^J\left(w^K, w^J\right)^{EE} = \frac{(1-a)+w^K+2w^J+2t}{4-a}$ $\breve{p}_1^J\left(w^J\right)^{EE} = \frac{1}{2}\left(1+w^J\right)$	$\overline{p}_1^K\left(w^K\right)^{EE} = \frac{1}{2}$ $\overline{p}_1^J\left(w^J\right)^{EE} = \frac{1}{2}$
(ET, No ET)	$\hat{p}_1^K\left(w^K, w^J\right)^{EN} = \frac{(1-a)+w^K+aw^J+at}{2}$ $\hat{p}_2^K\left(w^K, w^J\right)^{EN} = \frac{w^K+w^J+t}{2}$ $\hat{p}_1^J\left(w^J\right)^{EN} = w^J$ $\hat{p}_2^J\left(w^J\right)^{EN} = w^J+t$	$\tilde{p}_1^K\left(w^K\right)^{EN} = \frac{1+w^K}{2}$ $\tilde{p}_2^K\left(w^K, w^J\right)^{EN} = \frac{w^K+w^J+t}{2}$ $\tilde{p}_1^J\left(w^J\right)^{EN} = w^J$	$\breve{p}_1^K\left(w^K, w^J\right)^{EN} = \frac{(1-a)+w^K+aw^J+at}{2}$ $\breve{p}_1^J\left(w^J\right)^{EN} = w^J$ $\breve{p}_2^J\left(w^J\right)^{EN} = w^J+t$	$\overline{p}_1^K\left(w^K\right)^{EN} = \frac{1}{2}$ $\overline{p}_1^J\left(w^J\right)^{EN} = \frac{1}{2}$
(No ET, No ET)	$\hat{p}_1^K\left(w^K\right)^{NN} = w^K$ $\hat{p}_2^K\left(w^K\right)^{NN} = w^K+t$ $\hat{p}_1^J\left(w^J\right)^{NN} = w^J$ $\hat{p}_2^J\left(w^J\right)^{NN} = w^J+t$	$\tilde{p}_1^K\left(w^K\right)^{NN} = w^K$ $\tilde{p}_2^K\left(w^K\right)^{NN} = w^K+t$ $\tilde{p}_1^J\left(w^J\right)^{NN} = w^J$	$\breve{p}_1^K\left(w^K\right)^{NN} = w^K$ $\breve{p}_1^J\left(w^J\right)^{NN} = w^J$ $\breve{p}_2^J\left(w^J\right)^{NN} = w^J+t$	$\overline{p}_1^K\left(w^K\right)^{NN} = \frac{1}{2}$ $\overline{p}_1^J\left(w^J\right)^{NN} = \frac{1}{2}$

Table 2. Solution to the Manufacturing Stage Problem

	Retailers in both countries engage in parallel trade	Retailers in country K engage in parallel trade	Retailers in country J engage in parallel trade	No parallel trade
(ET, ET)	$\left(\hat{w}^K\right)^{EE} = \frac{(2+7a)-4(a+1)t}{2(2a+7)}$ $\left(\hat{w}^J\right)^{EE} = \frac{(2+7a)-4(a+1)t}{2(2a+7)}$	$\left(\tilde{w}^K\right)^{EE} = \frac{a(2-t)}{6-a}$ $\left(\tilde{w}^J\right)^{EE} = \frac{\left(4+2a-2a^2\right)-\left(8-a^2\right)t}{2(6-a)}$	$\left(\breve{w}^J\right)^{EE} = \frac{a(2-t)}{6-a}$ $\left(\breve{w}^K\right)^{EE} = \frac{\left(4+2a-2a^2\right)-\left(8-a^2\right)t}{2(6-a)}$	$\left(\overline{w}^J\right)^{EE} = 0$ $\left(\overline{w}^K\right)^{EE} = 0$
(ET, No ET)	$\left(\hat{w}^K\right)^{EN} = \frac{(1+a)(3+a)(1-t)}{(3a+13)}$ $\left(\hat{w}^J\right)^{EN} = \frac{2(3+a)(1-t)}{(3a+13)}$	$\left(\tilde{w}^K\right)^{EN} = \frac{a(2-t)}{(6-a)}$ $\left(\tilde{w}^J\right)^{EN} = \frac{4(4-2a)-(2-a)t}{2(6-a)}$	$\left(\breve{w}^K\right)^{EN} = \frac{(3+a)-(2+a)t}{(a+7)}$ $\left(\breve{w}^J\right)^{EN} = \frac{(3+a)-(2+a)t}{(a+7)}$	$\left(\overline{w}^J\right)^{EN} = 0$ $\left(\overline{w}^K\right)^{EN} = 0$
(No ET, No ET)	$\left(\hat{w}^J\right)^{NN} = 0$ $\left(\hat{w}^K\right)^{NN} = 0$	$\left(\tilde{w}^J\right)^{NN} = 0$ $\left(\tilde{w}^K\right)^{NN} = 0$	$\left(\breve{w}^J\right)^{NN} = 0$ $\left(\breve{w}^K\right)^{NN} = 0$	$\left(\overline{w}^J\right)^{NN} = 0$ $\left(\overline{w}^K\right)^{NN} = 0$