Very preliminary version.

Pricing and Welfare Implications of Parallel Imports in the Pharmaceutical Industry

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Abstract: In this paper we investigate the implications of permitting parallel imports of pharmaceuticals produced by a monopoly, from one country to another. We use a model where countries differ in the patients' level of co-payment for buying pharmaceuticals, and patients differ in the utility obtained from the consumption of pharmaceutical drugs. We show that there is room for parallel imports only if the differences in terms of co-payment and distribution of the population between the two countries are large enough. The presence of a parallel importer makes the prices charged by the monopoly converge. As a consequence, consumers in the exporting country are worse off, while the utility of consumers in the importing country increases. Moreover, public expenses of pharmaceuticals decrease in both countries. The effects on the total welfare are discussed for two particular cases: On the one hand, when the countries differ in their health system only, parallel imports are shown to be welfare decreasing; On the other hand, when the countries differ in the health needs of their patients only, parallel imports are shown to enhance the total welfare.

Keywords: Parallel Imports, Welfare.

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1. Introduction

Parallel imports (PI) are goods produced under intellectual property right (IPR) protection, distributed in one market by the local owner of the IPR and then imported into a second market without the authorization of the right-holder. Parallel trade occurs in the majority of countries and affects a wide range of goods. Under the WTO/TRIPs rules, countries may decide for themselves how to handle PI. Article 6 states that:

> *For the purposes of dispute settlement under this Agreement, subject to the provisions of Articles 3 and 4, nothing in this Agreement shall be used to address the issue of the exhaustion of intellectual property rights.*

Since intellectual property rights are granted on a territorial basis, the *exhaustion* of these rights, which is sometimes referred to as the 'first sale doctrine' constitutes the technical issue. When a good that benefits from IPR protection is sold, its distributor has realized the benefits of his/her rights, and these are considered exhausted. This implies that the purchaser of the good may resell it, even in competition with the original manufacturer. The key issue is the territory considered. Under a principle of national exhaustion PI may be prevented, since the local distributor holds the right to sell the good within the country, so any unauthorized commercialization of the same good within the country borders is illegal. However, under a principle of international exhaustion PI are legal, since the rights are considered exhausted upon first sale anywhere. In the EU the legal framework is characterized by a regional exhaustion principle, so PI are permitted within the EU zone but excluded when coming from non-members[1]. Moreover, the European Court of Justice has mantained the view that free circulation of goods (stated in the Treaty of Rome) precedes IPR rules[2].

[1] In the case *Silhouette International vs Hartlauer* (C-355/96), the ECJ allowed the authorized local distributor in the UK to prevent PI from outside the European Economic Area.
[2] January 1, 1996: The EC rejected a request from ten member states to ban PI of cheap drugs from Spain and Portugal.

PI occur because there exist significant price differences for the same good in different countries. In the case of pharmaceutical drugs, prices differ substantially among countries[3] and the volume of parallel trade in some markets is very important[4]. These price differences reflect the diversity of market conditions existing in different countries, based on price regulations, degree of competition among producers or differences in income. The access to medicines in poor countries has recently raised much concern over the convenience to allow PI of pharmaceutical drugs. This controversy has been well illustrated by the South Africa case. In 1997, the government of South Africa passed legislation (the Medicines and Related Substances Control Amendment Act, Act 90 of 1997) that set up a system to permit the parallel trade of medicines, in order to make the access to medicines more affordable to the population. However, the Pharmaceutical Manufacturers' Association of South Africa (PMA) filed a lawsuit to block it, and both the US and the EU placed a lot of pressure on the South African government to modify Act 90, adopting the argument that this act was in violation of the TRIPs agreement. Finally, they both softened their position and subsequently the PMA dropped the suit.

In this paper, we try to shed some light on the ongoing debate over the benefits and drawbacks from allowing parallel imports among countries. To make the analysis tractable, we do not address the dynamic effects on R&D of allowing parallel trade of medicines and we limit our study to explore the static effects. Contrary to previous studies in which differences in income are considered[5], we investigate the effects of allowing parallel imports of pharmaceutical drugs between two countries that are different in terms of both, health systems and drug needs. In our model, different co-payments reflect differences in health systems, while as a consequence of having different drug needs, patients' valuations of the same drug will differ.

[3] As an example, prices set by Glaxo, Ciba-Geigy and Pfizer were from 43 to 69 times as much for the same drug in the US as in India. Also, by comparing the UK list price for HIV drugs to the best price from five parallel importers, the average savings was 41 percent. Source: Informedica.
[4] In 1997, parallel imports accounted for 9% of total market in Denmark, 8% in the Netherlands and 7% in the UK. Source: GIRP European Pharmaceutical Data 1997 (IMS).
[5] See Ganslandt and Maskus 2001.

In this sense, some authors (Danzon, 1998) have pointed out that PI make poor (exporting) countries worse off, and the richest (importing) countries better off. However, this would be true if prices reflected only income and countries differed only in terms of their income. More generally, prices reflect the willingness to pay, and this not only reflects income, but also the valuation of the good. Depending on their endemic situation, countries may differ in the mean valuation of a drug and, as a consequence, PI could now benefit the ones with a higher valuation and worsenen the ones with a lower valuation. This argument is very relevant, especially with regards to the question raised by Maskus (2001) : « Why might the prices be higher in poor countries ? ». This question is based on the finding reported by Maskus (2001) that « prices are elevated in such countries as South Africa, Mexico and Brazil relative to those in Canada, Spain and Italy ».

It has been argued in the literature that PI undermine price discrimination and, consequently, they cause a welfare loss (Ganslandt et al. 2001, Danzon 1998, Darba and Rovira 1998). However, this statement ignores the increase in the level of competition caused in the importing country when a parallel trader enters this market. Thus, as we will see below, the global effect on welfare is ambiguous: on the one hand, it increases because of harsher competition in one of the markets and, on the other hand, it decreases as a result of the lower price discrimination across countries.

In the next section we describe the model. Section 3 discusses the equilibrium of the game. In Section 4 we analyze the welfare implications of allowing PI. Finally, we conclude in Section 5.

2. The Model

We consider a multinational firm producing a patented drug. We assume that the variable cost of producing the drug is zero. The producer acts as a monopolist given the patent on his product. He sells the drug in two countries, *A* and *B*, at prices p_A and p_B, respectively. If parallel imports are tolerated, one or more wholesalers can buy the drug in country *i*, *i*= *A*,

B, at price p_i, and re-sell it in the other country at price p_w, and at no cost except the price paid for the drug in the first country.

Each country has a population whose size is normalized to one. Individuals in both countries are assumed to have a utility additively separable in the consumption of a numeraire composite good and the consumption *x* of the drug, with $x = \{0,1\}$. They have an income *I* at their disposal to buy the composite good and one or zero unit of the drug. In each country, individuals differ in their valuation of the drug, reflected in *q*, with:

$$q \sim U\,[\underline{q_i}\,,\,\overline{q_i}\,],$$

in country *i*, *i*= *A*, *B*, and

$$\overline{q_i} - \underline{q_i} = 1.$$

Moreover, we assume that individuals prefer to consume the drug supplied by the monopolist to the one supplied by the parallel importer. Therefore, their valuation of the drug is weighted by *w*, with $w = 1$ if the drug is supplied by the monopolist, and $w = r < 1$ if the drug is supplied by the parallel importer. This assumption reflects the fact that, according to Maskus (2001) among others, "goods that are parallel imported may not be perceived to be of the same quality between markets, even if they were placed on the market originally by the manufacturer, because of differences in packaging or guarantees".

We assume that the expenses for drug consumption of an individual, *px*, are partially reimbursed by some public health insurer in both countries, so that the individuals only pay a share a_i of it in country *i*. Therefore, the indirect utility function of any individual in country *i* can be written as:

$$U_i = I + Max\{q - a_i p_i\,;\, rq - a_i p_w\,;\, 0\},$$

if there are parallel imports available in country *i*. Otherwise, the utility function reduces to:

$$U_i = I + Max\{q - a_i p_i\,;\, 0\}.$$

The timing of our game goes as follows. If parallel trade is permitted, and assuming a priori that parallel trade takes place from country *A* towards country *B*, then the monopolist sets the prices p_A and p_B in the first stage of the game so as to maximize his profits:

$$\Pi_m = p_A(D_A + D_w) + p_B D_B ,$$

where D_i, i =*A*, *B*, stands for the demand of the drug directly supplied by the monopolist in country *i*, and D_w stands for the demand faced by the parallel importer in the importing country, *B*. Then, in the second stage of the game, the parallel importer sets the price p_w, as a Stackelberg follower. If the parallel importer is unique, he sets p_w so as to maximize his profit:

$$\Pi_w = (p_w - p_A)D_w.$$

If there are many wholesalers competing with each other in the parallel imports market, then they set a price equal to their marginal cost: $p_w = p_A$. In the third stage of the game, the individuals in both countries choose to consume either one unit of the drug supplied by the monopolist, or one unit of the parallel import if it is available, or nothing, so as to maximize their utility. If parallel trade is legally forbidden, then the second stage of the game previously described vanishes, and $D_w = 0$.

We solve the game by backward induction to derive the Nash subgame perfect equilibrium. We assume throughout the paper the following inequality:

$$\frac{\bar{q}_A}{a_A} < \frac{\bar{q}_B}{a_B},$$

to account for the differences between the countries, and to guarantee that if parallel trade takes place, it does so from country *A* towards country *B*.

3. The equilibrium of the game

We first present, as a benchmark case, the equilibrium of the game when parallel imports are legally forbidden. In the last stage of the game, individuals choose to consume either one unit of the good supplied directly by the monopolist in their country, or nothing. Given the utility:

$$U_i = I + Max\{q - a_i p_i ; 0\},$$

only the individuals in country *i* with a valuation for the drug $q \geq a_i p_i$ are going to buy one unit of the good. Therefore, the demand faced by the monopoly in country *i* is:

$$D_i = \bar{q}_i - a_i p_i \text{, } i = A, B.$$

Given these demands, the monopolist sets the prices p_A and p_B so as to maximize his profit:

$$\Pi_m = p_A D_A + p_B D_B = p_A(\bar{q}_A - a_A p_A) + p_B(\bar{q}_B - a_B p_B) .$$

The equilibrium prices that maximize this profit are:

$$p_i^* = \frac{\bar{q}_i}{2a_i} \text{, } i = A, B.$$

This equilibrium monopoly price increases with the maximum valuation for the drug in the country, and decreases with the patients' level of co-payment for the drug. The assumption:

$$\frac{\bar{q}_A}{a_A} < \frac{\bar{q}_B}{a_B},$$

implies that the price is lower in country *A*:

$$p_A^* < p_B^* .$$

In this benchmark case, the monopoly producer discriminates as much as possible the prices between the two countries.

In country *i*, only the individuals with a valuation:

$$q > \frac{\bar{q}_i}{2},$$

buy the drug, at the equilibrium. The resulting equilibrium demands for the drug are therefore :

$$D_i^* = \frac{\bar{q}_i}{2} \text{, } i = A, B.$$

These demands do not depend on the level of the patients' co-payment for buying the drug, since the price faced by the individuals in both countries, $a_i p_i$, only depends on the maximum valuation for the drug in their country.

At the equilibrium, the monopoly profit is :

$$\Pi_m^* = \frac{1}{4}\left(\frac{\bar{q}_A^{\,2}}{a_A} + \frac{\bar{q}_B^{\,2}}{a_B}\right).$$

The consumer surplus is, in country i :

$$CS_i^* = \int_{\underline{q}_i}^{\bar{q}_i/2} I\, dq + \int_{\bar{q}_i/2}^{\bar{q}_i} \left(I + q - \frac{\bar{q}_i}{2}\right) dq \ .$$

Given our assumption $\overline{q_i} - \underline{q_i} = 1$, the consumer surplus reduces to :

$$CS_i^* = I + \frac{\bar{q}_i^{\,2}}{8}.$$

The public expenses for paying a share $1-a_i$ of the drug in country i are :

$$PE_i^* = (1-a_i)\, p_i^* D_i^* = \frac{1-a_i}{a_i}\left(\frac{\bar{q}_i}{2}\right)^2.$$

When parallel imports are legally permitted, the demands for both the parallel import and the drug supplied by the producer are realized in the third stage of the game. We assume, *a priori*, that parallel trade, if it takes place, does so from country *A* towards country *B*. Then, in country *A* where the drug is not available as a parallel import, the individuals with a valuation $q \geq a_A p_A$ buy one unit of the drug supplied by the monopoly producer in this country. Therefore,

$$D_A = \bar{q}_A - a_A p_A .$$

In country *B* where parallel imports are available, only the individuals with a valuation :

$$q \in \left[\frac{a_B p_w}{r}; \frac{a_B (p_B - p_w)}{1-r}\right],$$

maximize their utility buying one unit of the parallel import :

$$rq - a_B p_w \geq Max\{q - a_B p_B; 0\}.$$

Therefore,

$$D_w = Max\left\{\frac{a_B (p_B - p_w)}{1-r} - \frac{a_B p_w}{r}; 0\right\},$$

which is equivalent to :

$$D_w = \begin{cases} 0 & if \;\; p_w \geq r p_B, \\ \dfrac{a_B (r p_B - p_w)}{r(1-r)} & if \;\; p_w \leq r p_B. \end{cases}$$

For parallel trade to be attractive to the individuals in country *B*, we need a price p_w not only lower than p_B, but lower than rp_B, to account for the fact that, *ceteris paribus*, individuals prefer the drug supplied by the monopolist to the parallel import.

Individuals in country *B* with a valuation :

$$q \geq \frac{a_B (p_B - p_w)}{1-r},$$

are better off buying one unit of the good supplied by the monopolist, if the parallel import attracts some individuals in country *B*, i.e. if $p_w \leq r p_B$. Otherwise, individuals with a valuation $q \geq a_B p_B$ buy one unit of the good supplied by the monopolist in country *B*. Therefore, the demand for the drug supplied directly by the monopolist in country *B* is :

$$D_B = \begin{cases} \bar{q}_B - a_B p_B & if \;\; p_w \geq r p_B, \\ \bar{q}_B - \dfrac{a_B (p_B - p_w)}{1-r} & if \;\; p_w \leq r p_B. \end{cases}$$

In the second stage of the game, the parallel importer(s) can buy drugs in country *A*, and decide upon the price p_w, anticipating the demands D_A, D_B and D_w previously derived. If the parallel imports market is a competitive one, then the equilibrium parallel import price is :

$$p_w = p_A.$$

This price attracts consumers in country *B* only if $p_w = p_A \leq r p_B$. That is, only if the difference in the prices charged by the monopolist in both countries is big enough. Otherwise, i.e. if prices p_A and p_B are too similar, there would be no room for the parallel importers to enter the market in country *B*.

If there is only one monopolistic parallel importer, then the equilibrium price is the one that maximizes his profit :

$$\Pi_w = (p_w - p_A) D_w = \begin{cases} 0 & if \;\; p_w \geq r p_B, \\ (p_w - p_A) \dfrac{a_B (r p_B - p_w)}{r(1-r)} & if \;\; p_w \leq r p_B. \end{cases}$$

If the difference between p_A and p_B is high enough : $p_A \le rp_B$, then the parallel importer enters the market with the following equilibrium price :

$$p_w = \frac{p_A + rp_B}{2}.$$

Otherwise, i.e. if $p_A > rp_B$, there would be no parallel imports available in country *B*.

In stage 1, the monopoly producer sets the prices p_A and p_B to maximize his profit, anticipating the parallel import price and the demands D_A, D_B and D_w. The demand for the drug supplied by the monopoly producer in country *A* is unaffected by the decision of the parallel importer in stage 2. Therefore, the demand D_A that is anticipated in stage 1 is :

$$D_A = \bar{q}_A - a_A p_A .$$

Given the subgame perfect equilibrium in stage 2, the demand for parallel imports in country *B* that is anticipated in stage 1 is :

$$D_w = \begin{cases} 0 & if \;\; p_A \ge rp_B, \\ \dfrac{a_B(rp_B - p_A)}{r(1-r)} & if \;\; p_A < rp_B, \end{cases}$$

whenever the market for parallel imports is competitive or monopolistic.

The demand D_B that is anticipated in stage 1 depends on the market for parallel imports. If it is a competitive market, then :

$$D_B = \begin{cases} \bar{q}_B - a_B p_B & if \;\; p_A \ge rp_B, \\ \bar{q}_B - \dfrac{a_B(p_B - p_A)}{1-r} & if \;\; p_A < rp_B. \end{cases}$$

If it is a monopolistic market, then :

$$D_B = \begin{cases} \bar{q}_B - a_B p_B & if \;\; p_A \ge rp_B, \\ \bar{q}_B - \dfrac{a_B((2-r)p_B - p_A)}{2(1-r)} & if \;\; p_A < rp_B. \end{cases}$$

Given these demands, the equilibrium prices p_A and p_B that maximize the producer's profit :

$$\Pi_m = p_A(D_A + D_w) + p_B D_B ,$$

are presented in table 1. The corresponding demands (D_A, D_B and D_w), profits (Π_A and Π_B), consumer surplus (CS_A and CS_B), and public expenses (PE_A and PE_B), are also presented in table 1.

For the sake of clarity, we use the following notation :

$$\Delta \in \{\Delta_0, \Delta_m, \Delta_c\},$$

with :

- $\Delta = \Delta_0 = 0$, if $r a_A \bar{q}_B \leq a_B \bar{q}_A$, and/ or if parallel imports are legally forbidden.
- $\Delta_m = \dfrac{r a_A \bar{q}_B - a_B \bar{q}_A}{2\left(r(2-r) a_A + a_B\right)}$, if $r a_A \bar{q}_B > a_B \bar{q}_A$, parallel imports are permitted, and their market is monopolistic.
- $\Delta_c = \dfrac{r a_A \bar{q}_B - a_B \bar{q}_A}{2\left(r a_A + a_B\right)}$, if $r a_A \bar{q}_B > a_B \bar{q}_A$, parallel imports are permitted, and their market is competitive.

Table 1

	Country *A*	Country *B*	Parallel importer
Prices	$p_A = \dfrac{1}{a_A}\left(\dfrac{\bar{q}_A}{2} + \Delta\right)$	$p_B = \dfrac{1}{a_B}\left(\dfrac{\bar{q}_B}{2} - r\Delta\right)$	$p_w = \dfrac{r}{a_B}\left(\dfrac{\bar{q}_B}{2} - \Delta\right)$
Demands	$D_A = \dfrac{\bar{q}_A}{2} - \Delta$	$D_B = \dfrac{\bar{q}_B}{2}$	$D_w = \Delta$
Cons. surplus	$CS_A = CS_A^* - \dfrac{\Delta}{2}\left(\bar{q}_A - \Delta\right)$	$CS_B = CS_B^* + \dfrac{r\Delta}{2}\left(\bar{q}_B + \Delta\right)$	
Profits	$\Pi_m = \Pi_m^* - \dfrac{\Delta}{2a_A a_B}\left(r a_A \bar{q}_B - a_B \bar{q}_A\right)$		$\Pi_w = \Delta\left\{\dfrac{r}{a_B}\left(\dfrac{\bar{q}_B}{2} - \Delta\right) - \dfrac{1}{a_A}\left(\dfrac{\bar{q}_A}{2} + \Delta\right)\right\}$
Public expenses	$PE_A = \dfrac{1-a_A}{a_A}\left\{\left(\dfrac{\bar{q}_A}{2}\right)^2 - (\Delta)^2\right\}$	$PE_B = \dfrac{1-a_B}{a_B}\left\{\left(\dfrac{\bar{q}_B}{2}\right)^2 - r(\Delta)^2\right\}$	

The term Δ allows us to present the equilibrium solution in Table 1 in an uniform way, independently on the situation considered : either no market for parallel imports, or

monopolistic parallel imports market, or competitive parallel imports market. Thus, in order to compare these three situations, it is enough to focus on Δ.

If $r a_A \bar{q}_B \leq a_B \bar{q}_A$, then allowing or not parallel imports does not make any difference, since $\Delta = \Delta_0 = 0$. In that case, the market conditions in both countries are very similar. That can be seen adding our assumption on the market assymetry :

$$\frac{\bar{q}_A}{a_A} < \frac{\bar{q}_B}{a_B},$$

to the condition characterizing the situation discussed now :

$$r a_A \bar{q}_B \leq a_B \bar{q}_A < a_A \bar{q}_B .$$

With such a similarity between the market conditions of both countries, the room for the monopoly producer to price discriminate is very limited, whenever parallel imports are tolerated or not. Therefore, no parallel importer could take advantage of this price difference to attract clients in country *B*.

If $r a_A \bar{q}_B > a_B \bar{q}_A$, market conditions in both countries are different enough, so that parallel trade occurs if it is allowed. We can discuss the effects of allowing parallel imports, independently on whether the parallel imports market is competitive or monopolistic. In both cases, Δ>0, which can be compared to the benchmark situation where parallel imports are forbidden and Δ=0.

In Table 1, we see that allowing parallel imports makes the prices in both countries converge : p_A increases and p_B decreases. This is an intuitive result, and it is explained by the following trade-off faced by the monopoly producer. The latter would like to enjoy the benefits associated with the price discrimination, and limit the competition associated with the parallel trade in country *B*. The trade-off arises because the stronger the price discrimination, the bigger the room for parallel imports.

The main difference between a competitive parallel import market and a monopolistic one can be understood when realizing that $\Delta_m < \Delta_c$. This implies that the price convergence

due to parallel imports is stronger when the parallel import market is competitive. This happens because the afore-mentionned trade-off and its resulting price effect are stronger when the potential competition from parallel importers is stronger, thus when the parallel imports market is competitive. Consequently, all the remaining effects associated with parallel imports are stronger when the parallel import market is competitive.

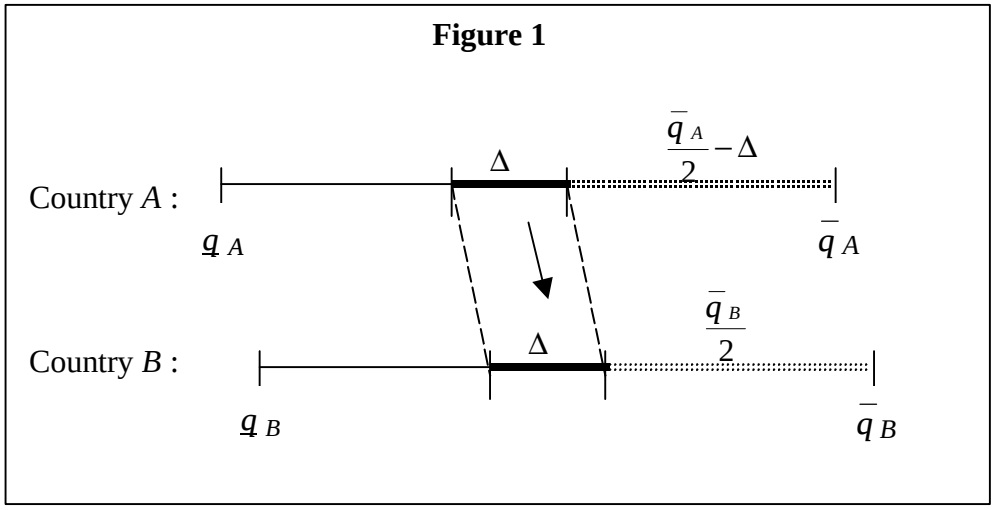
The price set by the parallel importer is naturally higher or equal than the price paid in country *A*, and it is lower that the price of the competing drug supplied by the producer in country *B*. Given the convergence in price, we have that :

$$p_A^* < p_A \leq p_w < p_B < p_B^*.$$

Therefore, individuals in country *B* enjoy better prices than without parallel imports, while individuals in country *A* face a higher price.

Analyzing the demands in Table 1, we depict a re-allocation of the drug consumption from country *A* to country *B*. This can be seen graphically in Figure 1 :

Figure 1



Clearly, the consumers in country *B* are better off, enjoying more consumption at lower prices. The opposite happens in country *A*. This justifies that CS_A is lower and CS_B is higher when $\Delta>0$ than when $\Delta=0$.

The monopoly producer profit is reduced due to both the competition from parallel imports in country *B*, and the lower price discrimination. The profit of the parallel importer(s) is *a fortiori* at least as high as when they do not operate on the market.

Last, the public expenses are shown to be lower in both countries when parallel imports are tolerated.

5. The welfare analysis

We now analyze how the changes induced by the parallel imports affect the total welfare. We define the total welfare as the sum of consumers' surplusses net of the public expenses in both countries, and profits of both the monopoly producer and the parallel importer(s) :

$$TW = CS_A + CS_B - PE_A - PE_B + \Pi_m + \Pi_w.$$

We already know that, on the one hand, parallel imports, when they take place, provoque a positive effect on the total welfare through CS_B, PE_A, PE_B, and eventually Π_w (if the parallel importer is a monopoly ; otherwise, Π_w=0). On the other hand, they have a negative effect on the total welfare through CS_A and Π_m. In order to determine the circumstances under which the positive effect outweight the negative one, it is useful to compare the total welfare when parallel imports are allowed, with the one characterizing the benchmark case :

$$TW = TW^* + \frac{\Delta}{2}\left(r\bar{q}_B - \bar{q}_A - (1+r)\Delta\right),$$

with :

$$TW = CS_A^* + CS_B^* - PE_A^* - PE_B^* + \Pi_m^* + \Pi_w^*,$$

and :

$$\Pi_w^* = 0.$$

Therefore, the parallel imports increase the total welfare only if :

$$r\bar{q}_B - \bar{q}_A > (1+r)\Delta.$$

Given our assumptions, and the condition for the parallel imports to take place ($r a_A \bar{q}_B > a_B \bar{q}_A$), parallel trade can result either in an increase or in a decrease of the total

welfare. When decomposing the total welfare into the sum of the consumers' surplusses on the one hand, and the sum of the profits net of the public expenses on the other hand, we notice that an increased welfare can occur only when the gain for the consumers in country *B* more than compensates the loss for the consumers in country *A*. This happens because the sum of the profits net of the public expenses always decrease due to parallel trade :

$$\sum_{j=m,w} \Pi_j + \sum_{i=A,B} PE_i = \sum_{j=m,w} \Pi_j^* + \sum_{i=A,B} PE_i^* - (1+r)\Delta^2 .$$

While the sum of the consumers surplusses :

$$\sum_{i=A,B} CS_i = \sum_{i=A,B} CS_i^* + \frac{\Delta}{2}\left(r\bar{q}_B - \bar{q}_A + (1+r)\Delta\right),$$

increases with parallel imports when :

$$r\bar{q}_B - \bar{q}_A + (1+r)\Delta > 0 .$$

This condition holds when countries only differ in the distribution of valuations for the drug, reflected in $\bar{q}_i$, *i*= *A*, *B*. This happens when we consider countries with a similar health system, but with different valuations for the drug due to differences in the endemic illnesses suffered by their populations, for example. In that case, the condition under which parallel imports would take place reduces to $r\bar{q}_B > \bar{q}_A$. Therefore, in this situation, the increase in the consumers surplus in country *B* more than compensates the decrease in the one of country *A*. One explanation for that relies on the re-allocation of the drug consumption from country *A* towards country *B*. The parallel imports would make the individuals in country *A* with a valuation :

$$q \in \left[\frac{\bar{q}_A}{2}, \frac{\bar{q}_A}{2} + \Delta\right],$$

give up consuming the drug. While in country *B*, individuals with a valuation :

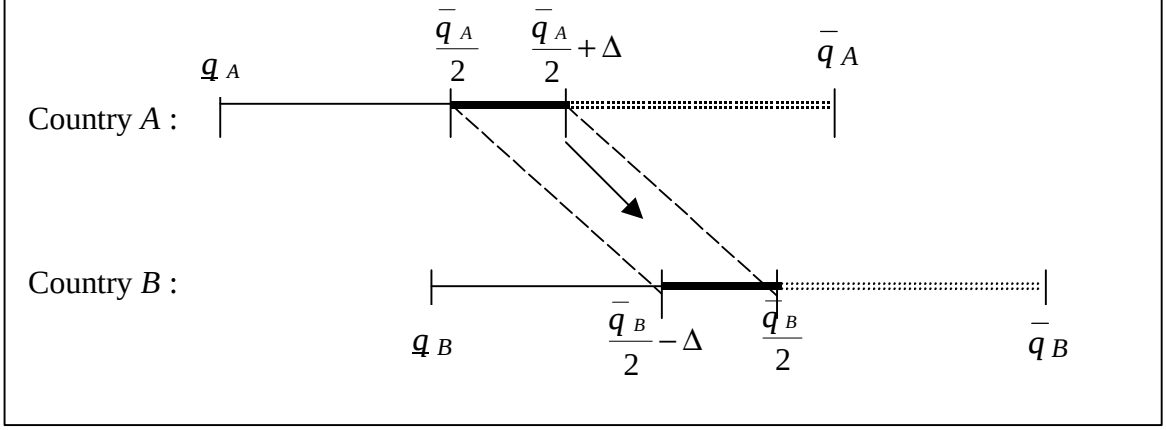
$$q \in \left[\frac{\bar{q}_B}{2} - \Delta, \frac{\bar{q}_B}{2}\right],$$

start consuming the drug thanks to the parallel trade. Therefore, we have a re-allocation from individuals valuing the drug less towards individuals valuing the drug more, since :

$$\frac{\bar{q}_A}{2} + \Delta < \frac{\bar{q}_B}{2} - \Delta,$$

whenever $\Delta \in \{\Delta_m, \Delta_c\}$. This intuition can be seen graphically in Figure 2.

Figure 2



As a general result, we have thus that parallel imports increase the total welfare when they take place between countries differing only in the distribution of the valuations for the drug among their population.

Another interesting case considers two countries differing only in their health care system, reflected in the co-payment for buying the drug. We can think of countries with similar health needs and different social security systems. Some countries in the European Union satisfy these characteristics. In this case, $\bar{q}_A = \bar{q}_B = \bar{q}$, and the condition for parallel trade to take place is $r a_A > a_B$. The total welfare can be rewritten as :

$$TW = TW^* - \frac{\Delta}{2}\left((1-r)\bar{q} + (1+r)\Delta\right).$$

Therefore, parallel imports decrease the total welfare in this case, even when the sum of the consumers surplusses is positive, which occurs only when :

$$r > \frac{\bar{q} - \Delta}{\bar{q} + \Delta}.$$

We have now a re-allocation of the drug consumption from individuals in country *A* with a higher valuation :

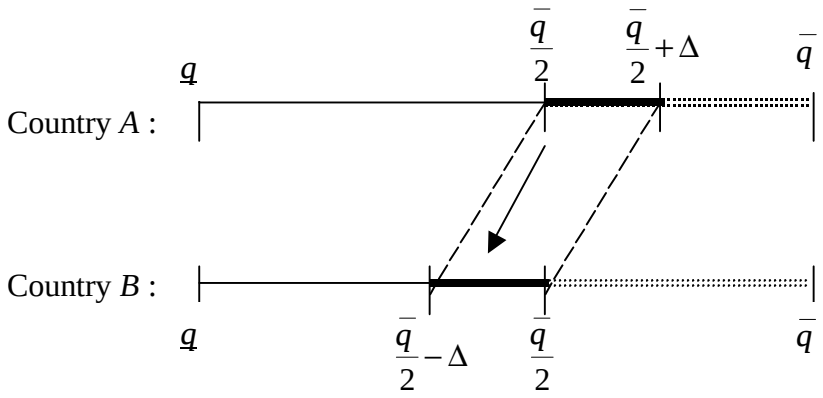
$$q \in \left[\frac{\bar{q}}{2}, \frac{\bar{q}}{2} + \Delta\right],$$

towards individuals in country *B* with a lower valuation :

$$q \in \left[\frac{\bar{q}}{2} - \Delta, \frac{\bar{q}}{2}\right].$$

This can be seen graphically in Figure 3.

Figure 3



6. Conclusion

With this paper, we participate to the ongoing debate over the benefits and drawbacks from allowing parallel trade among countries. We use a model that accounts for the differences between countries in terms of health system (reflected in the level of patients co-payments), and in terms of drug needs (reflected in the patients valuation for the drug). Our main findings are the following.

First, we confirm some results already discussed in the ongoing debate : Parallel trade makes the prices converge between countries, it makes the individuals of the importing country better off, while making the ones of the exporting country worse off, and they decrease the

profit of the monopoly producer. Moreover, we show that the public expenses in both the importing and the exporting countries are reduced with parallel trade.

Second, we show that the effect of parallel imports on the total welfare is ambiguous. This certainly contrasts with the numerous statements made over the negative effect of parallel trade on the total welfare, associated with a lower international price discrimination. These statements ignore the positive effects associated with the increased competition faced by the monopoly producer in the importing country.

We then identify two cases where the effect of allowing parallel trade on the total welfare can be stated unambiguously. On the one hand, parallel trade is shown to increase the total welfare when it takes place between two countries differing in their health needs only. The rationale behind this positive effect relies on the re-allocation of the drug consumption from individuals with relatively less drug needs in the exporting country, towards individuals with relatively higher drug needs.

On the other hand, parallel trade is shown to decrease the total welfare when it takes place between countries differing in their health system only. In that case, the drug consumption is re-allocated from individuals with relatively more drug needs to individuals with relatively less drug needs.

Our analysis is made maintaining the level of income equal between the countries. Therefore, our results are applicable to trade taking place between countries of similar income levels. A direct interpretation of our results would be the following : On the one hand, parallel trade would increase the total welfare when it takes place between two developping countries with the same level of income and patients co-payments, and different drug needs, to account for the higher needs for malaria or AIDS treatment in some developping countries than in other ones. On the other hand, parallel trade between industrialized countries, characterized by similar high income levels and epidemiological conditions, and differents drug reimbursement levels, would decrease the total welfare.

When we consider parallel trade between countries with different income levels, such as the trade between developping countries and developped ones, we should carefully add the well known effects of parallel trade between a poor country and a rich country (re-allocation of the consumption from the poor country towards the rich one) to the effects identified in the present paper.

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