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Content

1 Introduction

Parallel imports, also known as gray-market imports, are goods legitimately produced under protection of a copyright, trademark or patent, and that are placed into circulation in one country and then imported into a second country without the permission of the owner of the intellectual property rights attached to the product in the second country. For instance, it is permissible for a trading firm to purchase quantities of prescription drugs in Portugal and import them into Germany without the approval of the local distributor owning the licensed patent rights.[1]

Parallel imported products are not counterfeited or pirated but are legitimate products. However, they may not carry the original producer's warranty and may be packaged differently. Moreover, parallel importing firms ordinarily purchase a product in one country at a price that is lower than the price at which the product is sold in the second country (arbitrage between markets).

The ability of an owner of intellectual property rights to exclude parallel trade stems from the importing country's treatment of exhaustion of intellectual property rights. On the one hand, under a regime of national exhaustion intellectual property rights end upon first sale within a country, and right-holders are awarded the right to prevent parallel imports from other countries. Hence, right owners retain full rights for distributing their goods either themselves or through authorized dealers; this also includes the right to exclude imports.[2] On the other hand, a regime of international exhaustion makes parallel imports from other countries legal, as rights are exhausted upon first sale anywhere. Countries permitting parallel imports do not provide rightful owners with full rights for distributing their goods themselves, effectively invalidating any right to control the import of goods in circulation abroad. A third option is regional or community exhaustion. Under a regime of regional or community exhaustion rights are exhausted upon first sale within any member country of the community and parallel trade is allowed within the community. However, parallel imports from a non-member country are prohibited.

In particular, the regulation of parallel imports in the field of pharmaceuticals has become a critical issue in the global trading system, as the welfare effects of parallel imports of pharmaceuticals are generally ambiguous.[3] In particular, there is tension between two major objectives of public policy. On the one hand, a major long-run public policy objective is to

[1] See Maskus (2001, p. 1).
[2] See Maskus (2000b, pp. 208).
[3] See Maskus and Chen (2004) and Danzon and Towse (2003). See also Maskus (2001) and Ganslandt and Maskus (2004, pp. 1036).

stimulate the innovation and development of new medicines by awarding pharmaceutical producers with a patent on new medicines. In particular, pharmaceutical producers shall benefit from the higher prices of medicines protected by a patent, in order to be able to cover high R&D costs. On the other hand, public policy should also ensure broad access to affordable existing medicines in the short-run. Hence there is a trade-off between access to affordable medicines in the short-run and higher (monopoly) drug prices to stimulate R&D in the long-run.

The research-intensive pharmaceutical sector relies heavily on patents, as Mansfield (1986) has shown.[4] In particular, the value of a patent depends on the monopoly power afforded in terms of scope for price differentiation, which depends on the existence of barriers to parallel trade. Put differently, the value of a patent is partly determined by the scope for price discrimination within the area of exhaustion. Furthermore, the narrower the area of exhaustion the greater is the scope for price differentiation, and thus the higher is *ceteris paribus* the value of a patent.[5] Consequently, advocates of strong patent rights for new pharmaceutical products support a global policy of banning parallel imports.[6] For instance, representatives of the pharmaceutical industry argue that if parallel importation of pharmaceuticals were allowed it would reduce profits in the research-intensive pharmaceutical sector, and thus would reduce the incentives to invest in R&D for new drugs.[7] Furthermore, they argue that this would slow down innovation of new pharmaceuticals.

Nevertheless, policy makers in many developing countries not endowed with the technical and non-technical input factors required for innovation support an open regime of parallel imports. In particular, they place a larger emphasis on the affordability of pharmaceuticals than on promoting R&D abroad, arguing that it is important to be able to purchase pharmaceuticals from the cheapest sources possible. Of course, the vast majority of new inventions in the world has been and is still generated by the pharmaceutical companies in the developed nations.[8] For instance, the big multinational pharmaceutical companies, in terms of world market sales, are all headquartered either in Europe or in the U.S., as Annex I.1 shows.

[4] For instance, Mansfield (1986) in a ranking of industries' reliance on patent protection for innovation showed that the pharmaceutical sector is more than twice as dependent on patent protection as the next sector (chemicals). See also Bale (1998).
[5] See Ganslandt and Maskus (2004, p. 1037).
[6] For instance, see Barfield and Groombridge (1998). See also Bale (1998).
[7] For instance, Danzon (1998) argues that a segmented equilibrium with price-discriminating monopolies can be optimal from a welfare perspective.
[8] See Sykes (2002, p. 47).

The opposition to restricting parallel trade in most developing countries reflects concerns that domestic prices for pharmaceuticals would actually be higher under price discrimination. However, as we will see in the following it is questionable whether this is a valid argument from an economic point of view. In economic parlance, parallel trade of pharmaceutical products limits the scope for third-degree price discrimination of a monopolistic pharmaceuticals producer.[9] In third-degree price discrimination, a monopolistic pharmaceuticals producer sells output to different people or to segmented markets at different prices, but individuals in the same segmented market or group pay the same price per unit of output.[10] If average income and price elasticities of demand differ across segmented markets, optimal prices for a monopolist are likely to be different in those locations. In general, the monopolist will charge relatively high prices in markets with low price elasticity of demand, typically in highly developed countries, and relatively low prices in markets with high price elasticity of demand, typically in developing countries. Parallel imports limit the scope for third-degree price discrimination in the sense that the price in a low income country with a high price elasticity of demand is likely to increase as a result of parallel trade, whereas the price in a high income country with a low price elasticity of demand is likely to fall.[11]

Section 2 of this paper outlines the legal framework regarding parallel trade. In particular, we focus on Article 6 of the Agreement on Trade-Related Aspects of Intellectual Property Rights (henceforth, TRIPS Agreement) and on the regime of regional exhaustion in the EU.

Section 3 gives an overview of the two main strands of the existing formal literature on parallel trade. The first strand of formal papers analyzes the determinants of parallel trade. However, the second strand involves the dynamic effects of parallel trade on the decision to invest in R&D for new products.

In Section 4 this author contributes to the first strand of literature mentioned above and develops a new double marginalization model as a three-stage game of complete information, played between a monopolistic producer of pharmaceuticals in one country and an exclusive distributor in another country. In particular, I analyze the question as to why parallel imports in a game with complete information may actually occur in equilibrium.

The paper concludes with some ideas for further research. In particular, it suggests the introduction of asymmetric information with regard to local demand functions, in order to

[9] Throughout the analysis we assume that a patent on a new pharmaceutical product gives the manufacturing firm that holds the patent a temporary monopoly.
[10] See Robinson (1933), Schmalensee (1981), Varian (1985), and Hausman and MacKie-Mason (1988) for an analysis of the effect on social welfare of third-degree price discrimination.
[11] See Ganslandt, Maskus and Wong (2005, pp. 216). See also Sykes (2002, pp. 63) and Scherer (1980, pp. 316).

analyze the question whether, in a game with incomplete information, parallel imports occur in equilibrium.

2 Legal Framework regarding Parallel Trade

Under a regime of national exhaustion of IPRs, an IPR owner can prevent competition resulting from the parallel import of his product from a foreign country where it is sold either by himself or by an authorized dealer.[12] For instance, the IPR owner can take action against a parallel importing firm for infringing a patent, copyright or trademark. Furthermore, the owner can include a restriction notice in licensing and purchasing agreements in order to prevent parallel trade, i.e. by attaching a label to the product which indicates that the product is not for re-sale in its home country or by implementing supply quota.[13] However, the extent to which such private contractual means can be lawfully adopted depends on whether they are considered to be anticompetitive by prevailing competition laws.[14]

In contrast, under a regime of international exhaustion (regional exhaustion), the IPR owner looses his exclusive privilege after the first distribution of the product, with the result that parallel imports from abroad (from countries inside the region) are not prohibited. As we shall see in more detail in the following sections, the European Court of Justice (ECJ) held in various cases that the free circulation of goods within the common market takes precedence over the protection of intellectual property rights and that parallel trade within the common market is legal, at least within very broad limits.[15] Furthermore, private contractual provisions in licensing and purchasing agreements explicitly prohibiting parallel trade within the common market would automatically be void on the grounds that these are incompatible with the common market.[16]

In the remainder of the section, I shall first describe the treatment of the principle of the exhaustion of intellectual property rights within the WTO framework focusing on Article 6 of

[12] For instance, see Straus and Katzenberger (2002) for a comprehensive overview of the legal foundations of the different regimes of exhaustion of patent rights.
[13] See Holmberg et al. (2003) who report that quantity limits for parallel import products are highly significant for the Swedish market. See also "Pfizer Moves to Try to Stop Drugs From Canada", The New York Times, 14 January 2004. For an overview of reactive and proactive strategies of multinational companies to combat parallel trade activities see Cavusgil and Sikora (1988). For instance, the authors identified price cutting, supply interference, and acquisition of the re-importing firm as reactive strategies. Furthermore, the authors identified product differentiation, strategic uniform pricing, establishing legal precedence, and lobbying as proactive strategies. See also Palia and Keown (1991).
[14] See Fink (2005, pp. 172). See also Gallini and Hollis (1999).
[15] Hereinafter the following references to cases are to those of the ECJ if not stated otherwise. See Case C-187/80 *Merck & Co. Inc. vs. Stephar B.V. and Petrus Stephanus Exler*. See also Case C-56/64 *Etablissements Consten S.A. and Grundigverkaufs-GmbH. vs. E.E.C. Commission*.
[16] See Article 81 of the EC Treaty.

the TRIPS Agreement. The second part gives a description of the treatment of parallel trade in the EU. Finally, the third part elaborates on the different national legal frameworks regarding parallel trade, i.e. in the United States, Japan, Australia and New Zealand.

2.1 Parallel Trade and the WTO

In general, countries are free to determine their preferred exhaustion regime for each form of intellectual property rights. Put differently, countries can freely decide on whether to allow or ban parallel trade, as long as they are not bound by an international agreement. However, no international convention or multilateral agreement on intellectual property rights has so far mandated a particular regime of exhaustion of intellectual property rights.[17]

The only provision in the various multilateral agreements of the WTO that explicitly addresses the treatment of parallel trade is Article 6 of the TRIPS Agreement. In particular, American negotiators in the Uruguay Round tried to incorporate a global standard of national exhaustion into the TRIPS Agreement, in order to ban parallel imports aimed at protecting innovative industries, such as the pharmaceutical industry, as well as other industries, such as the music and film industries. However, it was impossible to reach such an agreement with regard to a global standard of national exhaustion, because the views on the net benefits of parallel imports were too divergent. For instance, some WTO members such as Switzerland and the USA tried to include the principle of national exhaustion in the Agreement, while other countries such as Australia, India and New Zealand defended the principle of international exhaustion.[18] Therefore, Article 6 of the TRIPS Agreement simply prescribes 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.*"

Hence, it seems that the compromise reached in Article 6 is simply to exclude the treatment of parallel imports from dispute settlement and to preserve the territorial privilege for regulating parallel trade.[19] Furthermore, Paragraph 5(d) of the Declaration on the TRIPS Agreement and

[17] See Fink (2005, pp. 173).
[18] See Gervais (2003, pp. 11). See also Chard and Mellor (1989), and Gallus (2005, pp. 78).
[19] See Gervais (2003, p. 11). See also Maskus (2001, p. 4) and Yusuf and Moncayo von Hase (1992). However, after failing to include the principle of national exhaustion in the TRIPS Agreement, the U.S. then exchanged commitments on limiting parallel trade with Singapore in the U.S.-Singapore Free Trade Agreement, which

Public Health (hereafter "Doha Declaration") affirmed this interpretation. In particular, it prescribes that:

"*The effect of the provisions in the TRIPS Agreement that are relevant to the exhaustion of intellectual property rights is to leave each Member free to establish its own regime for such exhaustion without challenge, subject to the MFN and national treatment provisions of Articles 3 and 4.*"[20]

Indeed, the flexibility to allow parallel trade was crucially important for many developing countries, as they perceived parallel imports to be an effective antidote to concerns about potential price increases for pharmaceuticals, due to strengthened patent protection in the course of the ratification and implementation of the TRIPS Agreement.[21] Furthermore, many developing countries were in favor of permitting parallel trade, arguing that it would allow licensees in developing countries to obtain export markets for high-technology products, such as pharmaceuticals.[22]

2.2 Parallel Trade in the EU

The European Union (EU) applies a regime of regional exhaustion to all fields of intellectual property within the Community.[23] Put differently, exhaustion applies upon first sale anywhere in the EU. In particular, the ECJ has held that free circulation of goods within the common market takes precedence over protection of intellectual property rights.[24] For instance, in the initial case for patents, *Merck vs. Stephar*, the ECJ came to the conclusion that a holder of a patent who decides to market his product in two EU countries cannot prevent parallel trade between the two countries, i.e. by bringing summary proceedings against the parallel-importing firm for patent infringement, despite differences in patent protection in

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came into force in 2004, and with Australia in the U.S.-Australia Free-Trade Agreement, which came into force in 2005. For instance, the International Intellectual Property Alliance provides a detailed list regarding the current status of U.S. negotiations on Free Trade Agreements with several other countries on http://www.iipa.com./fta_issues.html (last visited January 11, 2007). See also Gallus (2005, pp. 77).

[20] The full text is available on http://www.wto.org/English/tratop_e/dda_e/dohaexplained_e.htm (last visited January 12, 2007). See also Garrison (2006, p. 53).

[21] See Maskus (2001, pp. 11) and Maskus (2000b, p. 209). See also Watal (2001).

[22] See Szymanski and Valletti (2005, pp. 714). See also Abbott (1998) who supported the developing countries' point of view, arguing that a restriction on parallel trade was an unjustified inhibition of free trade.

[23] See Case C-15/74 *Centrafarm BV and Others vs. Sterling Drug Inc.*, and Case C-355/96 *Silhouette International Schmiedt GmbH & Co. KG vs. Hartlauer Handelsgesellschaft mbH* . See also Barnard (2004, pp. 162). See also Maskus (2000a, pp. 1272).

[24] See Ganslandt and Maskus (2004, pp. 1038).

those countries.[25] Furthermore, the primacy of free circulation of goods within the common market over patent protection has been upheld by the ECJ's ruling in *Merck vs. Primecrown*. In particular, the ECJ held that the existence of differential national price regulations in pharmaceuticals in the EU does not justify the prevention of parallel imports – i.e. by taking action against infringement of a patent – from EU countries with lower (regulated) prices to EU countries with higher (regulated) prices.[26] Indeed, varying national regulatory practices that result in differences in prices for the same pharmaceutical product across EU countries are a major cause for arbitrage, as parallel-importing firms are able to buy pharmaceutical products from wholesalers in low-price countries such as Portugal, Spain or Greece and re-sell them in high-priced countries such as Germany, Sweden or the UK.[27] Recent evidence regarding parallel trade of pharmaceutical products within the EU shows that parallel trade is a considerable business activity. For instance, the York Health Economics Consortium (2003) estimated that the UK market for parallel-traded pharmaceutical products represented around £1,300 million (€2,000 million) in 2002. Furthermore, the consortium estimated that parallel-traded pharmaceuticals accounted for around 10 per cent of the total drug bill in Denmark in 2002.[28]

Nevertheless, exhaustion in the EU has important limitations. Most importantly, the ECJ concluded in *EMI vs. CBS* and *Silhouette vs. Hartlauer* that exhaustion does not extend to countries outside the common market.[29] Hence, the ECJ established a regime of regional exhaustion or "Community exhaustion" but rejected the principle of international exhaustion.[30] Furthermore, the ECJ established in *Pharmon vs. Hoechst* that regional exhaustion does not extend to products that are marketed in a member state under a compulsory license.[31]

Another important issue with regard to potential restrictions for parallel trade within the common market is the question as to whether supply quotas for foreign wholesalers imposed by original manufacturers are illegal under Article 81 of the EC Treaty. Most importantly, the

[25] See Case C-187/80 *Merck & Co. Inc. vs. Stephar B.V. and Petrus Stephanus Exler*. See also the initial cases for trademarks, Case C-56/64 *Etablissements Consten S.A. and Grundigverkaufs-GmbH. vs. E.E.C. Commission*, and for copyrights, Case C-78/70 *Deutsche Grammophon Gesellschaft mbH. vs. Metro-SB-Grossmärkte GmbH & Co. K.G.*. See also Ganslandt and Maskus (2004, pp. 1038).
[26] See Joined Cases C-267-268/95 *Merck & Co. Inc. and Others vs. Primecrown Limited and Others*. See also Case C-15/74 *Centrafarm BV and others vs. Sterling Drug Inc* . See also Wagener, Eger and Fritz (2006, p. 230), Danzon (1998, pp. 295) and Maskus (2000a, pp. 1272).
[27] See Kanavos and Costa-Font (2005, pp. 755).
[28] See also Valletti and Szymanski (2006, p. 501).
[29] See Case C-51/75 *EMI Records Limited vs. CBS United Kingdom Limited*. See Case C-355/96 *Silhouette International Schmiedt GmbH & Co. KG vs. Hartlauer Handelsgesellschaft mbH*.
[30] See also Szymanski and Valletti (2005, pp. 712).
[31] See Case C-19/84 *Pharmon B.V. vs. Hoechst AG*. See Maskus (2000a, pp. 1272). See also Ganslandt and Maskus (2004, pp. 1039).

ECJ concluded in *Bundesverband der Arzneimittel-Importeure and Commission of the European Communities vs. Bayer* that unilateral supply quota systems are not necessarily prohibited under Article 81 of the EC Treaty, as long as they do not constitute a contractual agreement prohibiting parallel trade.[32] Put differently, unilateral restraints on sales from an original manufacturer to foreign wholesalers are not necessarily illegal under Article 81 of the EC Treaty. However, any contractual agreement explicitly prohibiting parallel trade within the common market would be void under Article 81 of the EC Treaty.

To sum up, on the one hand, the EU system basically allows parallel imports within its territory, despite differences in national intellectual property regimes and national price regulations, as long as the product has not been marketed in a member state under a compulsory license. On the other hand, parallel imports from outside the EU are not allowed under the EU system, so that IPR owners can invoke their rights and prevent competition from parallel imports.

2.3 National Legal Frameworks regarding Parallel Trade

Exhaustion policies vary widely between developed and developing countries and even among developed countries themselves, as the following summary shows.[33] Let us first consider national policies with regard to parallel trade in some high-income countries such as the United States, Japan, Australia and New Zealand.

The U.S. has a mixed policy on parallel imports. Within its territory, the country employs what is known as the "first-sale doctrine", under which rights of the seller or manufacturer are exhausted when a good has been first placed on the national market outside the vertical distribution chain.[34] Hence, price discrimination against American consumers is ruled out, as U.S. firms cannot prevent consumers from re-selling goods anywhere within the United States.

With regard to parallel imports in trademarked goods, the U.S. applies a "common-control exception", affirmed by the U.S. Supreme Court.[35] This rule allows trademark owners

[32] See Joined cases C-2/01 P and C-3/01 P *Bundesverband der Arzneimittel-Importeure e.V. and Commission of the European Communities vs. Bayer AG*. See also Smits (2006, pp. 65).
[33] See Maskus (2000b, pp. 209). See also Fink (2005, pp. 173), Maskus and Chen (2005, p. 193, Table 8.1), and Maskus (2001, pp. 3).
[34] See U.S. Supreme Court case *Bobbs-Merrill Co. vs. Straus*, 210 U.S. 339 (1908). The "first sale doctrine" was later codified in section 109(a) of the Copyright Act of 1976. See also Szymanski and Valletti (2005, pp. 712), and Maskus and Chen (2004, p. 553).
[35] See U.S. Supreme Court case *K Mart Corporation vs. Cartier*, 486 U.S. 281 (1987). See also Maskus (2001, p. 5), Gallini and Hollis (1999, pp. 7), Palia and Keown (1991, pp. 49), Maskus and Chen (2004, pp. 553), and Kanavos et al. (2004, pp. 36).

to block parallel imports, i.e. by using statutory provisions relating to the exclusion of imports, except when the foreign and U.S. trademark owners are in a parent-subsidiary relationship or when both the U.S. and foreign trade mark owners are owned by the same entity. Furthermore, the trademark owner's ability to block parallel imports rests on his ability to demonstrate that the imported product is not identical in quality to the original product and that it could cause consumer confusion. One may argue that these principles suggest that parallel imports of pharmaceutical products are permitted, as they are identical to the original product; however, U.S. law explicitly prohibits the re-importation of pharmaceutical products unless the drug is imported by the original manufacturer of the drug (21 U.S.C. 381 (d)).[36]

However, because of the large differences in prices for prescription drugs between the U.S. and Canada, parallel trade in pharmaceuticals became an important issue in the 2004 U.S. presidential elections, as many states encouraged American consumers to buy from parallel-trading internet pharmacies, despite the dubious legality of parallel trade in pharmaceuticals under federal law.[37] For instance, Graham and Robson (2000) estimated that brand-name drugs are significantly cheaper in Canada than in the U.S. at both the wholesale and retail level.[38] Indeed, parallel trade has become a considerable business activity, as recent IMS estimates suggest. For instance, compared to 2002, the value of U.S. re-importation of prescription drugs from Canada increased by 134 per cent to US$1.100 million in 2003.[39]

However, other high-income countries such as Japan, Australia, and New Zealand are substantially more open to parallel trade than the U.S.. In Japan, parallel imports in trademarked and patented goods are allowed with two exceptions.[40] First, parallel imports are not allowed in case the original sale of the product was subject to foreign price regulation. Second, parallel imports can be explicitly barred by contractual provisions. Another high-income country that has a far more liberal view on parallel trade is Australia.[41] Furthermore, New Zealand applies a system of international exhaustion with respect to copyright.[42]

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[36] See the Prescription Drug Marketing Act of 1987. See Valletti and Szymanski (2006, p. 500).
[37] See Szymanski and Valletti (2005, pp. 713). See also Valletti and Szymanski (2006, p. 500).
[38] See also the 1998 U.S. House of Representatives Minority Staff International Report that compared the international prices of prescription drugs. In particular, the report concluded that prices for pharmaceutical products in Maine were 70 per cent higher than in Canada and 102 per cent higher than in Mexico.
[39] See http://open.imshealth.com/IMSinclude/i_article_20040726.asp (last visited, January 10, 2007).
[40] For instance, see *BBS Kraftfahrzeugtechnik AG. vs. K.K. Racimex Japan, K.K. Jap Auto Products* (Japanese Supreme Court decision from July 1st, 1997).
[41] For instance, see the Australian Copyright Amendment (Parallel Importation) Bill 2002 to the Copyright Act 1968, available on http://www.aph.gov.au/LIBRARY/Pubs/bd/2001-02/02bd133.htm (last visited January 25, 2007).
[42] See Copyright (Removal of the Prohibition on Parallel Importing) Amendment Act 1998. See also Copyright (Parallel Importation of Films and Onus of Proof) Amendment Act 2003, available on the New Zealand Ministry of Economic Development homepage, http://www.med.govt.nz/ (last visited January 11, 2007). See also Fink (2005, p. 174).

However, the Copyright Amendment Act 2003 reintroduced a partial ban on the parallel importation of films.

Furthermore, as the summary of exhaustion regimes of various developing and least-developed countries in Annex I.2 shows, the exhaustion regimes and thus the restraints on parallel trade vary widely in the developing world. A large number of countries, such as Argentina, India and South Africa, apply a regime of international exhaustion.[43] More specifically, Argentina and South Africa have enacted laws permitting parallel imports of pharmaceutical products.[44] However, just to name a few, countries such as Brazil, Mexico, and Nigeria adopt a regime of national exhaustion of IPRs and thus allow the right holder to prevent parallel trade.[45]

To summarize, exhaustion regimes and thus the restraints on parallel trade vary widely between developed and developing countries and even amongst developed countries. Furthermore, these differences in exhaustion regimes and the corresponding divergent views on the net benefits of parallel imports have created a fierce debate in recent years. However, as we shall see in the following sections, the law and economics approach to parallel trade appears to be a highly attractive and promising field of research, given the complex legal and economic issues involved, which can significantly contribute to this debate.

3 Literature on Parallel Trade and R&D for Pharmaceuticals

Before proceeding with the model, I will give an overview of the two main strands of the existing formal literature on parallel imports.[46] First, the vast majority of formal papers applying game-theoretic tools analyzes the determinants of parallel imports, i.e. price discrimination by monopolistic manufacturers, vertical price control by multinational enterprises or national price regulations. However, the second and limited strand of literature involves the dynamic effects of parallel trade on the decision to invest in R&D for new products, which is certainly a crucially important issue for the research-intensive pharmaceutical industry.

[43] See Kanavos et al. (2004, p. 39).
[44] See Section 15C of the South African Medicines and Related Substances Control Amendment Act, 1997. See also Maskus (2001, pp. 5).
[45] See the analysis of the intellectual property laws of over 70 developing and least-developed countries undertaken by Thorpe (2002).
[46] For an overview of less formal policy-oriented reviews on parallel trade see Szymanski and Valletti (2005, pp. 715). See Tarr (1985), Danzon (1998), Darbà and Rovira (1998), NERA (1999), and OECD (2002).

3.1 The Determinants of Parallel Trade

Maskus (2000a and 2000b) provides an excellent overview of the economic theories on the causes of parallel trade and the main arguments in favour of banning parallel imports.

First, in many circumstances efficient international distribution of goods and services requires multinational enterprises that typically build markets through exclusive territorial dealership rights, in order to vertically control the operations of their official licensees. Nevertheless, in foreign markets it may be difficult to enforce private contractual provisions prohibiting sales outside the authorized distribution chain, so that parallel trade may occur.[47] In particular, Maskus and Chen (2004) elaborate on this idea and offer a sophisticated theory of parallel imports in the context of vertical price controls.[48] Maskus and Chen (2004) analyze the nature of contractual relationships between a domestic manufacturer and a foreign independent and exclusive distributor through which the manufacturer sells his product abroad, in order to determine the optimal level of parallel trade. In particular, the manufacturer offers the distributor a two-part wholesale tariff consisting of a wholesale price and a franchise fee. The analysis suggests that the possibility of parallel trade affects the manufacturer's pricing decision when fixing the wholesale price it charges the foreign distributor. Furthermore, the threat of parallel trade may reduce vertical pricing efficiency and thus reduce social welfare. However, Maskus and Chen (2004) conclude that the effect of parallel trade on global welfare is not unambiguous. In fact, they show that global welfare is U-shaped with respect to the cost of engaging in parallel trade, i.e. transportation costs. First, suppose that parallel trade costs are very low, i.e. transportation costs tend toward zero. In this case, Maskus and Chen (2004) conclude that the manufacturer cannot deter parallel trade in equilibrium by raising the wholesale price and thus that a welfare-reducing distortion in the vertical pricing scheme is not created. Put differently, parallel trade has good welfare properties if trade costs are sufficiently low, as it reallocates goods between the two countries without creating welfare-reducing distortions in the vertical pricing scheme. However, consider now the other extreme case, that parallel trade costs are so high that parallel trade is not feasible. In this case, the authors conclude that parallel trade is not a real threat and that the manufacturer sets an efficient wholesale price. If, however, trade costs are neither too low nor too high the manufacturer can deter parallel trade by raising the wholesale price and thus reducing vertical pricing efficiency. Finally, the authors suggest that the optimal policy

[47] See Maskus (2000a, p. 1277). See also Maskus and Chen (2002).
[48] See also Gallini and Hollis (1999) who explore the nature of the contractual relationships between trademark or copyright owners and authorized distributors that may employ trademark and copyright law to prevent parallel trade.

regarding parallel trade shall either reduce any existing trade barriers and thus trade costs as much as possible or raise trade costs as much as possible. However, the optimal policy should not leave trade costs at some intermediate value.[49]

A second determinant for parallel trade is that parallel importing firms have the incentive to free ride on investments in marketing as well as on the before- and after-sales services of official licensees and authorized distributors.[50] For instance, assume that an authorized distributor in the territorial market *A* invests in marketing and sales activities that are associated with the sale of a certain product in market *A*. Consequently, the distributor in market *A* will charge a markup on top of the procurement cost so that he can earn a return on those investments. Furthermore, suppose that the marketing and sales activities mentioned above are substantially cheaper in the territorial market *B,* or that they are not even provided by the authorized distributor in territorial market *B*. In this case, parallel importing firms that purchase the product in market *B* and re-sell the product in market *A* free ride on the investments in marketing and sales services made by the official distributor in market *A*.[51]

Third, in some industries such as the pharmaceutical industry national governments intervene in private markets by regulating prices in order to achieve particular social objectives, i.e. to make medicines affordable for low-income consumers and to limit public health budgets. As these government interventions result in significant international price differences there is a potential for arbitrage between markets, as parallel importing firms may purchase a certain product in more regulated (lower-price) markets and re-sell the product in less regulated (higher-price) markets.[52] In a recent paper, Bordoy and Jelovac (2005) identify international differences between the regulatory regimes in the pharmaceuticals area as a main determinant of international price discrimination.[53] In particular, the authors explore the welfare implications of permitting parallel trade of pharmaceutical products in a model in which countries may differ along two dimensions. First, countries may be different in terms of governmental health insurance reimbursement policies, as is reflected in the patient's level of co-payment for buying a pharmaceutical product. Second, countries may differ in terms of drug needs, as is reflected in the distribution of the valuations for the pharmaceutical product among their population. In particular, Bordoy and Jelovac (2005) show that parallel trade increases total welfare when countries share the same health system and only differ in the distribution of the valuations for the pharmaceutical product among their population. In this

[49] See Maskus and Chen (2004, p. 561).
[50] See also Chard and Mellor (1989) and Barfield and Groombridge (1998).
[51] See Maskus (2000a, pp. 1275) , Maskus (2000b, pp. 212), and Fink (2005, pp. 176).
[52] See also Danzon (1997).
[53] See also Szymanski and Valletti (2005, pp. 715).

case, parallel trade leads to an efficient re-allocation of consumption from consumers with a relatively low valuation of the pharmaceutical product in the exporting country towards consumers with a relatively high valuation of that product in the importing country. If, however, the countries only differ in terms of their health insurance reimbursement policies, parallel trade decreases total welfare, as it re-allocates drug consumption from consumers with relatively high valuation of the pharmaceutical product towards consumers with relatively low valuation of that drug. However, Bordoy and Jelovac (2005) do not consider the dynamic effects of parallel trade on R&D for new pharmaceutical products.

In a recent paper, Ganslandt and Maskus (2004) also take into account international differences between the regulatory regimes in the pharmaceuticals area. However, the authors in particular focus on the econometric analysis of the price impact of parallel trade in pharmaceutical products within the European Union. Interestingly, despite the importance of parallel trade from a welfare perspective, their analysis is the first systematic economic investigation into the price impacts of parallel trade in pharmaceuticals. In particular, Ganslandt and Maskus (2004) explore the effect of the entry of parallel traders on the prices of pharmaceutical producers in Sweden from 1994 to 1999. Prior to Sweden's entry into the European Union on 1 January 1995 parallel imports of pharmaceuticals were prohibited. However, after its entry Sweden had to adopt the EU-wide principle of exhaustion of patent distribution rights and thus permitted parallel trade. Therefore, the Swedish market provides a natural example for testing and estimating the effect of the exogenous shock to the patented pharmaceutical market, due the introduction of parallel trade. Ganslandt and Maskus (2004) found that the prices of pharmaceutical products subject to competition from parallel trade fell relative to other pharmaceutical products over the period 1994-1999. In particular, the authors came to the conclusion that parallel trade significantly reduced prices, by 12-19 per cent, relative to other pharmaceutical products not subject to competition from parallel trade. Arguably, parallel trade represents a significant form of competition in Sweden.

Finally, Richardson (2002) analyzes a two-stage game in which welfare-maximizing national governments simultaneously choose whether to permit or prohibit parallel trade in the first stage. In the second stage, a monopolistic manufacturer of a homogenous good sets a price for that good in each country. By assumption, welfare in the country in which the monopolist is located is given by the sum of the domestic consumer surplus and the global profits of the monopolist. However, welfare in all other countries is simply domestic consumer surplus. The author shows that it is a global Nash equilibrium for all countries to permit parallel trade, resulting in a globally uniform price for the product. The idea behind

this result is the following. On the one hand, the countries that prefer to permit parallel trade are those countries that would be discriminated against if parallel trade were prohibited, i.e. high-price countries with a relatively low price elasticity of demand. Those countries can prevent price discrimination by permitting parallel trade. On the other hand, those countries that might favour discrimination, i.e. low-price countries with a relatively high price elasticity of demand, cannot enforce price discrimination on a global scale when high-price countries permit parallel trade. Finally, he examines more realistic settings, taking tariffs and lobbying by producers into account in order to analyze the question as to why barriers to parallel trade can actually be observed in practice. However, Richardson (2002) does not take into consideration the dynamic effects of parallel trade on the monopolist's decision to invest in R&D for new products.

3.2 Dynamic Effects of Parallel Trade on the Investment in R&D

As I have already mentioned earlier, the question as to how much a monopolistic manufacturer is willing to invest in R&D for new products is clearly of crucial importance to the research-intensive pharmaceutical industry. However, the literature on this issue is rather limited. To the best of my knowledge, Valletti and Szymanski (2006), Szymanski and Valletti (2005), Valletti (2006), Rey (2003), and Li and Maskus (2006) are the few exceptions of formal papers that look at the dynamic aspects of parallel trade in the context of R&D for new medicines.

In particular, this issue has been addressed in a recent paper by Valletti and Szymanski (2006) who have extended the well-known analysis of Malueg and Schwartz (1994) by endogenizing the quality of the good sold. More specifically, Valletti and Szymanski (2006) consider a model of product innovation in which a higher investment in R&D enables the manufacturer to discover products with higher quality. In particular, Valletti and Szymanski (2006) analyze a two-stage game in which a manufacturer chooses the quality of the product sold in the first stage and then chooses prices in the second stage. Furthermore, Valletti and Szymanski (2006) discuss the following basic trade-off between the positive *ex post* welfare properties of parallel trade, and the negative *ex ante* impact of parallel trade on aggregate welfare, respectively. In the second stage of the game, taking the level of product quality as fixed, a uniform pricing regime induced by parallel trade *ex post* results in higher aggregate welfare as long as demand dispersion across markets is sufficiently low. However, in the first stage of the game, the threat of parallel trade reduces *ex ante* the incentive to invest and thus results in lower product quality.

In a recent paper, Szymanski and Valletti (2005) analyze the policy implications of parallel trade in a model of vertical product differentiation with endogenous product quality. However, Szymanski and Valletti (2005) also take into account the possibility that national governments may impose price caps as well as compulsory licences on patented products. Szymanski and Valletti (2005) come to the conclusion that parallel trade entirely destroys the incentives to invest in R&D for new products if the national government of a foreign country issues a compulsory license on the patented product and unilaterally sets a fixed price equal to marginal cost to be paid to the patent holder. If, however, the manufacturer has the option to either supply a high-quality product or a low-quality product to the foreign country and the foreign government offers the manufacturer a binding contract to issue a compulsory license at a capped price only for the low-quality product, then parallel trade has no effect on investment incentives.[54]

In another recent game-theoretic article, Valletti (2006) analyzes the question as to how a uniform pricing regime induced by parallel trade *ex ante* affects the incentives of a monopolistic manufacturer of pharmaceuticals to invest in R&D for new pharmaceutical products where the level of investment affects the quality of the new pharmaceutical product. Valletti assumes that the markets in which the manufacturer sells his products differ in terms of marginal cost of manufacturing and delivering the product as well as in consumer demand in terms of the maximum willingness-to-pay of consumers. However, in his analysis of the incentives to invest in R&D, Valletti reaches the conclusion that two trade-offs arise. On the one hand, when differential pricing is demand-based, uniform pricing induced by parallel trade has good *ex post* welfare properties but bad *ex ante* properties in terms of lower incentives to invest in R&D in order to obtain a better-quality product. On the other hand, when differential pricing is cost-based, uniform pricing induced by parallel trade has bad *ex post* welfare properties but good *ex ante* properties in terms of higher incentives to invest in R&D in order to obtain a better-quality product.

Rey (2003) provides another formal analysis that looks at the dynamic aspects of parallel trade. As in most countries pharmaceutical products are not directly purchased by consumers but by national governments at a regulated price, Rey (2003) analyzes the relationship between pharmaceutical companies and national governments in a game where two national governments *H* and *L* contribute towards spurring investment through regulated prices. On the one hand, government *H* has a high willingness to pay and places strong emphasis on high R&D for new medicines. On the other hand, government *L* has a low willingness to pay and

[54] See Szymanski and Valletti (2005, p. 735).

places less emphasis on high R&D for new medicines. In particular, the author shows that, once parallel trade is permitted, there is an equilibrium where government *H* reduces its contribution to R&D and sets a lower price, while government *L* maintains the same policy as in the absence of parallel trade. Put differently, in this equilibrium parallel trade leads to a uniform alignment on the lowest level of R&D, which adversely affects both countries due to reduced incentives to invest in R&D for new medicines.

Finally, in a recent article Li and Maskus (2006) extend the model set out by Maskus and Chen (2004), as mentioned above, to a framework with endogenous investment in process innovation, in order to analyze the impact of parallel trade on cost-reducing R&D in a vertical-pricing model in which a manufacturer invests in cost-reducing R&D and sells its product in another market through a distributor. In particular, they show that the distortions associated with parallel trade reduce the monopolist's incentive to invest in cost-reducing R&D.

However, I shall contribute to the first strand of formal literature on the determinants of parallel trade, with my double marginalization model to be elaborated in the following sections. Moreover, two follow-up papers shall focus on the dynamic effects of parallel trade on the investment in R&D.

4 Double Marginalization Game with Complete Information

4.1 The model

This paper develops a three-stage double marginalization game with complete information.[55] Player One is a monopolistic manufacturing pharmaceutical firm located in country *A*, henceforth *m*. Player Two is a single authorized independent firm located in country *B*, henceforth *r*, and is responsible for the distribution and retail of the manufacturer's product. We assume that efficient international distribution of the pharmaceutical product requires the manufacturer to build a market in country *B* through exclusive territorial dealership rights.[56] For instance, suppose that the exclusive distributor in country *B* has already established costly distribution channels.[57] Furthermore, we assume that the two

[55] See Feess (2000, pp. 319) for an excellent introduction on monopoly theory. See also Weise, Brandes, Eger and Kraft (2005, pp. 305). See also Fudenberg and Tirole (1996, pp. 65).
[56] See Maskus and Chen (2002, 2004) who originally formulated the theory of parallel imports in the context of vertical price controls.
[57] Furthermore, as noted by Maskus (2000b, p. 213), exclusive territorial dealership rights facilitate the manufacturer's monitoring of marketing efforts as well as the enforcement of product quality in foreign markets. One may also argue that the exclusive distributor can collect information on local tastes at lower costs than the

countries differ in per capita income and in price elasticity of demand for a new medicine. The main purpose of this model is to analyze the pricing strategies of a producer of pharmaceuticals and an exclusive distributor. In particular, we analyze the question as to whether parallel imports may occur in equilibrium or not.

The strategies available to the manufacturer and the distributor are the different prices they might charge. We will assume that negative prices are not feasible, but that any non-negative price can be charged.[58] Thus the strategy space of the manufacturer can be represented as $S_m = [0,\infty)$, non-negative real numbers. A typical strategy for the manufacturer is to choose a non-negative price.[59] The strategy space of the distributor can be represented as $S_r = [0,\infty)$. Moreover, we assume that the payoff functions for the manufacturer and the distributor are simply their profit. The timing of the game is as follows:

In the first stage, the manufacturing firm chooses the wholesale price p_B^w at which he sells the pharmaceutical product to the distributor in country *B*.

In the second stage, the distributor chooses the retail price p_B in country *B*.

In the third stage, the monopolist and the exclusive distributor simultaneously choose the price at which they sell the product in country *A* in a Bertrand model of duopoly.[60] We assume that the product re-imported by the distributor from country *B* to country *A* is a perfect substitute for the product sold by the manufacturing firm in country *A*.

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manufacturer and that the distribution process exhibits economies of scale (Gallini and Hollis (1999, p. 2)). Hence, in the presence of large set-up costs of distribution channels, large costs of collecting information on local tastes and economies of scale in distribution, it can be an efficient means for the manufacturer to leave the responsibility for distribution and retail of the product with the single independent distributor. Indeed, many multinational firms build international marketing and production networks, maintain head offices in various countries and are organized around subsidiaries which have significant decision-making power for the local market.

[58] For instance, assume that disposal costs are equal to zero.

[59] See Gibbons (1992, pp. 55).

[60] One may argue that the application of a Cournot quantity competition framework instead of a Bertrand price competition would be more suitable to model the strategic interaction at the third stage. However, from the author's point of view, Bertrand's approach has a certain modeling advantage over the Cournot setup and seems to be a better approximation to reality in the pharmaceutical industry for various reasons. First, as already noted earlier, parallel trade is an important issue in the context of third-degree price discrimination, as parallel trade erodes the monopolist's ability to discriminate prices across markets. Hence, one may argue that prices and not quantities should be the decision variables in a model that elaborates on these issues in the first place. Second, since prices are the decision variables in our model and not just an endogenous consequence of the firms' output decisions, we do not need to resort to any additional mechanism such as an (artificial) auctioneer to determine the market-clearing price (Vega-Redondo (2003, pp. 153). Put differently, the main modeling advantage of the Bertrand setup is that it includes an explicit description of all components required for understanding how the market actually operates, whereas the Cournot framework resorts to an additional theoretical mechanism to determine the market-clearing price. Finally, since the marginal cost of production in the pharmaceutical industry is negligibly small, one may also argue that capacities and output can be changed relatively easily compared to other industries. Hence, it may not be possible to vindicate the Cournot setup on the grounds of the well-known argument originally formulated by Kreps and Scheinkman (1983) that - by introducing capacity constraints - a two-stage game in which firms simultaneously choose capacities in the first stage and (Bertrand) prices in the second stage is equivalent to a one-stage Cournot game.

Consider a model with two countries *A* and *B*. Demand for a specific pharmaceutical product in country *A* is

$$D_A(p_A) = \gamma a - b p_A \tag{1}$$

with $\gamma > 1$. p_A denotes the price in country *A*. Furthermore, *b* is proportional to the marginal utility of money.[61] The pharmaceutical product is produced by a monopolistic manufacturing firm that holds a patent on the medicine in both countries. For simplicity, we assume that marginal costs of production *c* are equal to zero in both countries. This is a common assumption in models that deal with the strategic decisions of pharmaceutical companies, as the marginal cost of production are negligibly small compared to the cost of research and development. Demand for the pharmaceutical product in Country *B* is

$$D_B(p_B) = a - b p_B . \tag{2}$$

γ is a measure for the homogeneity of the two countries. If γ tends towards 1 the two countries are virtually homogenous. Put differently, the higher γ the more heterogeneous the two countries are.

As $\gamma > 1$, we can see from (1) and (2) that the price elasticity of demand[62] in country *A*, $E^A(p)$, is lower than the price elasticity of demand in country *B*, $E^B(p)$, for any given price *p* as

$$E^A(p) = \left| \frac{bp}{\gamma a - bp} \right| < \left| \frac{bp}{a - bp} \right| = E^B(p). \tag{3}$$

Thus, standard economic theory tells us that, in the absence of parallel imports, the single manufacturer engages in third-degree price discrimination and sets a price in country *A* that exceeds the price in country *B*.[63] Put differently, the larger the market and the more inelastic

[61] See Gansland and Maskus (2004, p. 1040). For instance, consider a linear-quadratic utility function such as $U(x,y) = \alpha x - \beta x^2/2 + \upsilon(y)$. In this case, the system of demand functions mentioned above can be obtained approximately from the linear-quadratic utility function, as long as the expenditure on *x* is a relatively small share of the consumer's budget and $a = \alpha/\beta$ and $b = \upsilon'(m)/\beta$, assuming that $\upsilon'(m) > 0$ and $\upsilon''(m) < 0$.

[62] See Schäfer and Ott (2004, pp. 71) for a definition of the price elasticity of demand. See also Varian (1996, pp. 266) and Pindyck and Rubinfeld (2005, pp. 32).

[63] In third-degree price discrimination, the monopolist sells output to different people or segmented markets at different prices, but individuals in the same segmented market or group pay the same price per unit of output. For instance, different admission prices for students or senior citizens in cinemas, theaters, amusement parks etc.

demand is, the higher is the price. Small markets with elastic demand curves receive the product at a lower price.

Furthermore, we assume that there is an exclusive distributor in country *B* that is officially approved by the authorities in country *A* for re-importing the quantities of the pharmaceutical product he can buy from the monopolistic manufacturing firm in country *A*. Hence the distributor sells to consumers in country *B* at first, but may also engage in parallel trade from country *B* to country *A*. We also assume that arbitrage by individual consumers between *B* and *A* is prohibited. We moreover suppose that the marginal costs of engaging in parallel trade are *t*. For instance, the costs of re-packaging are incurred by the parallel-importing distributor as well as other parallel trade-specific transaction costs such as import duties on parallel trade.[64] Furthermore, we assume that the parallel import product is a perfect substitute for the product sold by the original pharmaceutical producer in country *A*.

4.2 Analysis

Before we proceed to the analysis of the three-stage double marginalization game with complete information as outlined in the previous section – this game being played between a monopolistic manufacturer in country *A* and an exclusive distributor in country *B* in order to endogenously derive the prices charged in country *A* and country *B* – consider the following two benchmark cases:

In the first case to be elaborated in section 4.2.1, the question as to how the manufacturer would choose prices for maximizing profits if he directly served customers in both countries and parallel imports were prohibited is analyzed. Hence, we first analyze the manufacturer's optimal decision in the absence of an exclusive distributor in country *B* and thus without potential competition from parallel imports as a first benchmark.

In the second case to be elaborated in section 4.2.2, a two-stage double marginalization game with complete information played between the manufacturer in country *A* and the distributor in country *B* is analyzed. The manufacturing firm can engage in the retail of the pharmaceutical product in country *A*, but can only sell the product in country *B* through a distributor. Furthermore, the distributor in country *B* has a monopoly on the retailing business in country *B*. However, we assume that parallel imports are not allowed, i.e. under a regime of national exhaustion of intellectual property rights.

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are typical examples for third-degree price discrimination. See Varian (1999, pp. 440) for a general model of third-degree price discrimination.

[64] See NERA (1999, pp. 15). See also Maskus and Chen (2004, p. 566) and Li and Maskus (2006, p. 447).

Finally, we will relax the latter assumption in the analysis of the three-stage double marginalization game with complete information which is to be elaborated in section 4.2.3, in which potential competition may arise from parallel imports in order to answer the question as to whether parallel imports may occur in equilibrium or not.

4.2.1 Third-degree price discrimination under a regime of national exhaustion

We assume that parallel imports are prohibited, that there is no exclusive distributor in country *B* and that the manufacturing firm can engage in third-degree price discrimination. The manufacturing firm maximizes profits generated in country *A* according to

$$\max_{p_A}(\gamma a - bp_A)p_A \tag{4}$$

which gives the following first order condition

$$\gamma a - 2bp_A = 0\,. \tag{5}$$

The profit maximizing (monopoly) price is consequently

$$p_A^* = \frac{\gamma a}{2b}\,. \tag{6}$$

Furthermore, the manufacturing firm maximizes profits generated in country *B* according to

$$\max_{p_B}(a - bp_B)p_B \tag{7}$$

which gives the following first order condition

$$a - 2bp_B = 0\,. \tag{8}$$

The profit maximizing price is consequently

$$p_B^* = \frac{a}{2b}. \tag{9}$$

By looking at (6) and (9) it becomes apparent that in the case of national exhaustion and price discrimination the manufacturing firm will set a price p_A^* in country *A* that exceeds the price p_B^* in country *B,* as the price elasticity of demand in country *A* is lower than that in country *B*, seeing as $\gamma > 1$. By inserting (6) into (1) we have

$$D_A(p_A^*) = \gamma a - b\left(\frac{\gamma a}{2b}\right) = \frac{\gamma a}{2}. \tag{10}$$

Moreover, by inserting (9) into (2) we obtain

$$D_B(p_B^*) = a - b\left(\frac{a}{2b}\right) = \frac{a}{2}. \tag{11}$$

Correspondingly, total profit $\Pi(p_A^*, p_B^*)$, defined as the sum of the profit generated in country *A*, $\Pi_A(p_A^*)$, and the profit generated in country *B*, $\Pi_B(p_B^*)$, is given by

$$\Pi(p_A^*, p_B^*) = \Pi_A(p_A^*) + \Pi_B(p_B^*) = p_A^* D_A(p_A^*) + p_B^* D_B(p_B^*)$$

$$\Leftrightarrow \Pi(p_A^*, p_B^*) = \frac{\gamma a}{2b}\frac{\gamma a}{2} + \frac{a}{2b}\frac{a}{2}$$

$$\Leftrightarrow \Pi(p_A^*, p_B^*) = \frac{(\gamma a)^2 + a^2}{4b}. \tag{12}$$

Interestingly, we can see from (12) that the total profit of the monopolist increases if γ increases. Put differently, the higher the market size in country *A* for a given *a* the higher is the monopolist's total profit under a regime of national exhaustion and price discrimination. Comparing (6) to (9) we find that the difference between the profit-maximizing price in country *A* and the profit-maximizing price in country *B* increases if countries are increasingly heterogeneous.

4.2.2 Double marginalization game without parallel imports

As already noted in section 3.1, a major determinant of parallel trade elaborated in the formal literature on parallel trade is that multinational firms that build markets through exclusive territorial dealership and distribution rights may find it difficult to enforce private contractual provisions that prohibit parallel trade outside the authorized distribution chain.[65] For instance, recent EU case law suggests that a private contractual provision prohibiting parallel trade, at least within the common market, would be void.[66] To give an example, a German pharmaceutical company that sells a patented pharmaceutical product at low prices to Portugal while charging a high price in Germany cannot prevent parallel trade simply by declaring that the export product is "not for re-sale in Germany".

In game-theoretic parlance, suppose that the manufacturing firm can itself become involved in the retail of the pharmaceutical product in country *A*, but sells the product in country *B* through an exclusive distributor. Furthermore, we assume that the distributor in country *B* has a monopoly on the retailing business in country *B*.[67] We make the simplifying assumption that retailing in country *B* does not involve any cost, except for the cost incurred by the distributor in buying the units of the pharmaceutical product from the manufacturing firm. Demand for the pharmaceutical product at the retail level is given by the demand curve $D_B(p_B) = a - bp_B$, where p_B is the retail price in country *B*.

In the first stage, the manufacturing firm sets a wholesale price p_B^w for the distributor, and the distributor sets a price p_B for the retail trade in country *B* in the second stage.[68] To keep matters simple, we will first assume that the distributor is not allowed to re-import the pharmaceutical product into country *A,* and that arbitrage by individual consumers between the two countries is prohibited. The distributor is quoted a wholesale price p_B^w, which the distributor must pay per unit at wholesale.

Using backward induction we start with the second stage. In the second stage, the distributor chooses which retail price p_B he will charge his customers in country *B*. The

[65] See Maskus (2000b, pp. 231) and Maskus and Chen (2004).
[66] The following references to cases are to those of the ECJ. See Case C-187/80 *Merck & Co. Inc. vs. Stephar B.V. and Petrus Stephanus Exler*. See also Case C-56/64 *Etablissements Consten S.A. and Grundigverkaufs-GmbH. vs. E.E.C. Commission*, and Case C-78/70 *Deutsche Grammophon Gesellschaft mbH. vs. Metro-SB-Grossmärkte GmbH & Co. K.G.*. See also Joined Cases C-267-268/95 *Merck & Co. Inc. and Others vs. Primecrown Limited and Others*.
[67] For an example of a monopoly selling to another monopoly see Kreps (1990, pp. 309).
[68] See Spengler (1950). See also Kreps, (1994, pp. 273) and Tirole (1995, pp. 379).

distributor, facing wholesale price p_B^w, will treat p_B^w as his marginal cost and will set p_B to maximize his profit $\pi(p_B)$.[69] Thus

$$\max_{p_B}\left(p_B - p_B^w\right)D_B(p_B). \tag{13}$$

By inserting (2) into (13) and reformulating (13) we obtain the following first order condition

$$\frac{\partial\pi\left(p_B, p_B^w\right)}{\partial p_B} = a - 2bp_B + bp_B^w = 0$$

$$\Leftrightarrow p_B = \frac{a + bp_B^w}{2b}. \tag{14}$$

Furthermore, this gives

$$\pi\left(p_B^w\right) = \left(\frac{a + bp_B^w}{2b} - p_B^w\right)\left(a - b\left(\frac{a + bp_B^w}{2b}\right)\right)$$

$$\Leftrightarrow \pi\left(p_B^w\right) = \frac{\left(a - bp_B^w\right)^2}{4b}. \tag{15}$$

In the first stage, the manufacturing firm sets the wholesale price at p_B^w, anticipating that the distributor will purchase $\frac{a - bp_B^w}{2}$. Hence the manufacturer's profit generated in country *B,* $\Pi_B(p_B^w)$,[70] will be

$$\Pi_B(p_B^w) = p_B^w\left(\frac{a - bp_B^w}{2}\right)$$

$$\Leftrightarrow \Pi_B(p_B^w) = \frac{a}{2}p_B^w - \frac{b}{2}p_B^{w2} \tag{16}$$

which gives the following first order condition

[69] Note that the manufacturer's profit is denoted by Π and the distributor's profit by π, respectively.

[70] The profit generated in country *A* equals the profit given by $\Pi_A(p_A^*) = (\gamma a)^2 / 4b$. See (12).

$$bp_B^w = \frac{a}{2}$$

$$\Leftrightarrow p_B^{w*} = \frac{a}{2b}. \qquad (17)$$

Inserting (17) into (14) and reformulating (14) we obtain

$$p_B = \frac{3}{2}\frac{a}{2b}$$

$$\Leftrightarrow p_B = \frac{3}{2} p_B^{w*}. \qquad (18)$$

We can see from (18) that the distributor marks up the price of the pharmaceutical product by 50 per cent, compared to the wholesale price p_B^{w*}. However, if the manufacturer were directly engaged in the retail business in country *B*, he would set a price $p_B^* = a/2b$, as elaborated in the previous section. Put differently, if the manufacturer were to sell the pharmaceutical product directly, more would be sold at a lower price than when the manufacturer must go through a distributor that has a monopoly on the retailing business in country *B*.
Inserting (17) into (16) we obtain the equilibrium profit of the manufacturer generated in country *B*

$$\Pi_B = \frac{a^2}{8b}. \qquad (19)$$

Moreover, by inserting (17) into (15) we obtain the equilibrium profit of the distributor

$$\pi = \frac{a^2}{16b}. \qquad (20)$$

So far, we have assumed that the distributor is not allowed to re-import quantities of the pharmaceutical product into country *A*, i.e. under a global regime of national exhaustion. In the following section, we relax this assumption and allow for parallel imports, in order to explore the important strategic decision faced by the manufacturer as to at which wholesale

price the pharmaceutical product is sold to the distributor in country *B,* anticipating that part of the quantities sold can be re-imported.

4.2.3 Double marginalization game with parallel imports

The main purpose of the double marginalization game with complete information elaborated in this section is to analyze the pricing strategies of the manufacturing firm *m* and the exclusive distributor *r*. In particular, I wish to analyze the question as to whether parallel imports may or may not occur in equilibrium.

In the first stage, the manufacturing firm chooses the wholesale price p_B^w at which it sells the pharmaceutical product to the distributor in country *B*.

In the second stage, the distributor chooses the retail price p_B in country *B*.

In the third stage, the monopolist and the distributor simultaneously choose the price at which they sell the product in country *A* in a Bertrand duopoly model.

We solve the game starting with the last stage and working backwards to the first stage, in order to look for the sub-game perfect Nash equilibrium.

4.2.3.1 Backward induction

We start with the last stage where the manufacturer and the distributor play a Bertrand game and simultaneously choose prices for the pharmaceutical product in country *A*.[71] We assume that the pharmaceutical product re-imported by the distributor from country *B* to country *A* is a perfect substitute for the product sold by the manufacturing firm in country *A*. In looking for the Bertrand equilibrium this section will demonstrate different scenarios in terms of the prices the manufacturer and the distributor are charging, as well as in terms of the demand they are serving in country *A*, whereby prices and demand served must be consistent with the following rules:[72] if the manufacturer and the distributor charge unequal prices, the demand served by the low-price firm must equal all demand at that price. Furthermore, the high-price firm gets no sales. However, if the manufacturer and the distributor charge the same price, total market demand is equally divided between them. Let us suppose that the quantity consumers demand from the manufacturer is

[71] See Bertrand (1883). See also Feess (2000, pp. 411). See also footnote 61 for various arguments in support of the application of a Bertrand framework instead of a Cournot framework.
[72] See Kreps (1990, p. 331).

$$q_A^m = \begin{cases} \gamma a - bp_A^m & \text{if } p_A^m < p_A^r \\ \dfrac{\gamma a - bp_A^m}{2} & \text{if } p_A^m = p_A^r \\ 0 & \text{if } p_A^m > p_A^r. \end{cases} \tag{21}$$

Similarly, the quantity that consumers demand from the distributor is given by

$$q_A^r = \begin{cases} \gamma a - bp_A^r & \text{if } p_A^r < p_A^m \\ \dfrac{\gamma a - bp_A^r}{2} & \text{if } p_A^r = p_A^m \\ 0 & \text{if } p_A^r > p_A^m. \end{cases} \tag{22}$$

By assumption the manufacturer has fixed cost of zero and marginal cost of zero. Furthermore, we assume that the distributor also has fixed cost of zero. However, by assumption, the distributor treats the sum of the wholesale price p_B^w and the per unit cost of engaging in parallel trade t as his marginal cost of selling the pharmaceutical product in country A in the third stage.

First we note that price can never be less than marginal cost, since then either firm would increase its profits by producing less. On the one hand, the manufacturer could supply a positive quantity of the product as long as the price is non-negative, as his marginal costs are zero. On the other hand, the distributor would not charge a price smaller than his marginal cost $p_B^w + t$. Hence, the manufacturer can monopolize the market in country A and steal all of the customers from the parallel importing distributor by setting a price that is infinitesimally smaller than the marginal cost of the distributor. Put differently, the manufacturer will always set the price $p_A^m < p_B^w + t$. Consequently, the distributor will not stay in the market in country A and will not engage in parallel trade. At this point we can already formulate one of the main results of the analysis of the double marginalization game with complete information.

Result 1 *Parallel imports will never occur in any sub-game perfect Nash equilibrium in a double marginalization game with complete information and Bertrand price competition in the last stage.*

Note that this result holds for any non-negative p_B^w and any positive t.

In the second stage, the distributor anticipates that he will be driven out of the market in country A in the third stage. Hence the maximization problem of the distributor is identical to

the maximization problem we have already discussed in section 4.2.2 [see (13)-(15)]. The distributor will choose a price $p_B = (a + bp_B^w)/2b$ and will realize a profit according to $\pi = \left(a - bp_B^w\right)^2 / 4b$.

Working backwards to the first stage, the maximization problem of the manufacturer is to maximize the total profit generated in country *A* and country *B,* subject to the constraint stated in $p_A^m \leq p_B^w + t$ [73] and subject to the non-negativity restrictions stated in $p_A^m \geq 0$ and $p_B^w \geq 0$. Mathematically, what the constraint and the non-negativity restrictions do is to narrow the range of the profit function. After the constraints are added we can admit only those values of p_A^m and p_B^w which satisfy the constraints. Note that we have to adopt the Kuhn-Tucker Method to find a maximum, as we are dealing with an optimization problem with inequality constraints. In fact, the Kuhn-Tucker Method is just a generalization of the Lagrange-Multiplier Method for optimization problems with inequality constraints.[74] Adopting the Kuhn-Tucker Method, we first have to identify the maximization problem. Secondly, we will define the Lagrange function by multiplying each constraint with the corresponding Lagrange multiplier and by adding it to the original profit function. And thirdly, we will derive the first-order conditions that a solution for the maximization problem must satisfy.

First, the maximization problem has the following format:

$$max\,\Pi(\,p_A^m, p_B^w\,) = \left(\gamma a - bp_A^m\right) p_A^m + p_B^w \left(\frac{a - bp_B^w}{2}\right)$$

$$\begin{array}{ll} \text{subject to} & p_A^m \geq 0 \\ \text{and} & p_B^w \geq 0 \\ \text{and} & p_A^m - p_B^w \leq t. \end{array} \qquad (23)$$

Second, let us write the classical type of the Lagrangian function, *L*, as follows

$$L(\,p_A^m, p_B^w; \lambda_1, \lambda_2, \lambda_3\,) = \left(\gamma a - bp_A^m\right) p_A^m + p_B^w \left(\frac{a - bp_B^w}{2}\right) + \lambda_1 p_A^m + \lambda_2 p_B^w + \lambda_3 \left(t + p_B^w - p_A^m\right) \qquad (24)$$

Third, we obtain the following first-order conditions:

[73] Note that the manufacturer always sets a price in country *A* that undercuts the distributor's marginal costs. The manufacturer undercuts the distributor's marginal cost at least by an infinitely small ε.

[74] See Kuhn and Tucker (1951). See also Chiang (1984, pp. 722), and Eichberger (2004, pp. 402).

$$\frac{\partial L}{\partial p_A^m} = \gamma a - 2bp_A^m + \lambda_1 - \lambda_3 = 0, \tag{25}$$

$$\frac{\partial L}{\partial p_B^w} = \frac{a}{2} - bp_B^w + \lambda_2 + \lambda_3 = 0, \tag{26}$$

$$\lambda_1 p_A^m = 0, \tag{27}$$

$$\lambda_2 p_B^w = 0, \tag{28}$$

$$\lambda_3 \left(t + p_B^w - p_A^m \right) = 0. \tag{29}$$

$$p_A^m \geq 0, p_B^w \geq 0, \tag{30}$$

$$t + p_B^w - p_A^m \geq 0. \tag{31}$$

$$\lambda_1 \geq 0, \lambda_2 \geq 0, \lambda_3 \geq 0, \tag{32}$$

We must now find solutions $\left(p_A^m, p_B^w, \lambda_1, \lambda_2, \lambda_3 \right)$ that can satisfy all conditions given by (25)-(32). Therefore it is appropriate to discuss various cases that differ as to the extent to which the constraints are binding. For instance, if $\lambda_1 > 0$, it follows from (27) that $p_A^m = 0$. To give another example, if $p_A^m > 0$, it follows from (27) that $\lambda_1 = 0$.[75] As we have three Lagrange multipliers $\lambda_1, \lambda_2, \lambda_3$ that are either positive or equal to zero, we have to distinguish between nine different cases.

After checking each of the nine cases with regard to the question as to whether it satisfies all conditions given by (25)-(32) we obtain two solutions: $\left(p_A^{m*}, p_B^{w*}, \lambda_1^*, \lambda_2^*, \lambda_3^* \right)$ and $\left(p_A^{m**}, p_B^{w**}, \lambda_1^{**}, \lambda_2^{**}, \lambda_3^{**} \right)$. The first solution is given by:

[75] The conditions which imply that either the Lagrange multiplier is zero or a constraint binding are called complementary slackness conditions.

$$\begin{pmatrix} p_A^{m*} = \frac{a}{6b}(2\gamma+1)+\frac{1}{3}t, \\ p_B^{w*} = \frac{a}{6b}(2\gamma+1)-\frac{2}{3}t, \\ \lambda_1^* = 0, \\ \lambda_2^* = 0, \\ \lambda_3^* = \frac{a}{3}(\gamma-1)-\frac{2b}{3}t. \end{pmatrix} \tag{33}$$

We can see from (33) that the optimal price the manufacturer sets in country *A* always exceeds the optimal wholesale price the manufacturer charges the distributor in country *B,* as $\gamma > 1$ and $t > 0$. Furthermore, we can see from (33) that the optimal wholesale price decreases if *t* increases, and that the optimal price the manufacturer sets in country *A* increases if *t* increases, respectively. Put differently, the higher the parallel trade cost *t* for a given γ and thus the less profitable parallel trade the higher is p_A^{m*} and the lower p_B^{w*}.

However, we can also see from (33) that the non-negativity restriction for λ_3^* is only satisfied for specific values for the parameter *t*. Therefore, let us now determine this threshold for *t*.

$$\lambda_3^* = \frac{a}{3}(\gamma-1)-\frac{2b}{3}t \geq 0$$

$$\Leftrightarrow t \leq \frac{a}{2b}(\gamma-1). \tag{34}$$

To conclude the discussion with respect to the first solution, the outcome $\left(p_A^{m*}, p_B^{w*}, \lambda_1^*, \lambda_2^*, \lambda_3^*\right)$ given by (33) only satisfies each of the eight conditions given by (25)-(32) if $t \leq \frac{a}{2b}(\gamma-1)$.[76] If, however, $t > \frac{a}{2b}(\gamma-1)$, i.e. for high parallel trade cost and a relatively low γ, $\left(p_A^{m*}, p_B^{w*}, \lambda_1^*, \lambda_2^*, \lambda_3^*\right)$ is not a solution for the maximization problem given

[76] See Annex I.3 for the proof that for the non-negativity restriction for p_B^{w*} to be satisfied it is sufficient that the non-negativity restriction for λ_3^* is satisfied.

by (23), due to the fact that the non-negativity restriction for λ_3^* would not be satisfied. Thus we have to consider the second solution $\left(p_A^{m**}, p_B^{w**}, \lambda_1^{**}, \lambda_2^{**}, \lambda_3^{**}\right)$ given by

$$\begin{pmatrix} p_A^{m**} = \frac{\gamma a}{2b}, \\ p_B^{w**} = \frac{a}{2b}, \\ \lambda_1^{**} = 0, \\ \lambda_2^{**} = 0, \\ \lambda_3^{**} = 0. \end{pmatrix} \tag{35}$$

When we compare (35) with (6) and (17), we find that p_A^{m**} is equal to the monopoly price in a double marginalization game without parallel imports,[77] and p_B^{w**} is equal to the profit-maximizing wholesale price in a double marginalization game without parallel imports, respectively. Intuitively, if the two countries are virtually homogeneous ($\gamma \to 1$) and the parallel trade costs are so high that $t > \frac{a}{2b}(\gamma - 1)$, the distributor will not be willing to engage in parallel trade. Put differently, if $t > \frac{a}{2b}(\gamma - 1)$, the outcome of the double marginalization game with parallel imports is equal to the outcome of the double marginalization game without parallel imports.

4.3 Conclusion

To conclude this section, parallel imports in a double marginalization game with complete information will never occur in the sub-game perfect equilibrium, as it is always beneficial for the manufacturer to monopolize the market in country *A* at the third stage. The fact that the manufacturer's marginal costs are lower than the distributor's marginal costs of engaging in parallel trade is decisive in this regard. However, the question arises as to how the manufacturer strategically chooses prices in order to prevent the occurrence of parallel trade.

[77] Note that the monopoly price in country *A* in a double marginalization game without parallel imports is equal to the monopoly price under third-degree price discrimination given by (6).

As I have shown, this depends on the level of the parameters γ and t for given values for a and b. If $t > \frac{a}{2b}(\gamma - 1)$, potential competition from parallel trade does not arise and thus the manufacturer will always charge the monopoly price $p_A^{m**} = \gamma a / 2b$ in country A and the optimal wholesale price $p_B^{w**} = a / 2b$ in country B. One tentative interpretation of this outcome is that parallel trade is a non-credible threat if parallel trade cost are high and the two countries are virtually homogeneous, i.e. if $\gamma \to 1$. If, however, $t \leq \frac{a}{2b}(\gamma - 1)$, potential competition from parallel trade arises and the manufacturer strategically sets the wholesale price in country B and the price in country A, in order to prevent that parallel trade occurs.

Nevertheless, given the fact that we have shown that parallel imports do not occur in the equilibrium of a game with complete information, the question arises as to why we can actually observe parallel imports in international trade. One answer to this puzzle might be that either the distributor has better information on local demand in country B than the manufacturer, or that the manufacturer has better information on local demand in country A than the distributor. This idea for further research will be discussed in the following section.

5 Ideas for Further Research

5.1 Double Marginalization Game with Asymmetric Information

As we can see from the previous section, in a double marginalization game with complete information parallel imports will never occur in equilibrium and the monopolistic manufacturer can always monopolize the market in country A by undercutting the distributor's price. However, this result may change in a game with incomplete information with regard to local demand functions.[78] For instance, the manufacturer may overestimate or underestimate the size of the market in country B, or the distributor may overestimate or underestimate the size of the market in country A.

Therefore, I propose to transform the game mentioned above into a Bayesian game with incomplete information by introducing Nature as a player in the game and by introducing

[78] See Fudenberg and Tirole (1996, pp. 209). See also Vega-Redondo (2003, pp. 336).

moves by Nature that determine the type of demand in country *B* and the type of demand in country *A*, respectively.[79]

In the transformed game, the manufacturer's incomplete information about the type of demand in country *B* becomes imperfect information about Nature's moves with regard to country *B*. Moreover, the distributor's incomplete information about the type of demand in country *A* becomes imperfect information about Nature's moves with regard to demand in country *A*, so that the transformed game can be analyzed through standard techniques.[80] The introduction of moves by Nature is reasonable and realistic, as it simply means that local sellers of goods have better information on local demand than sellers from abroad.[81]

The main purpose of this section is to explore the following hypothesis:

Hypothesis 1: *Depending on Nature's choices with regard to local demand functions parallel imports may occur in equilibrium.*

I suggest a multi-stage double marginalization game with incomplete information that may have the following time structure:

In the first stage, the monopolistic manufacturer chooses the price at which he charges the distributor in country *B*. However, the manufacturer can only form expectations about the distributor's pricing decision as Nature resolves its uncertainty with regard to the demand function in country *B,* after he has already made his decision.

In the second stage, Nature chooses the demand in country *A* and country *B*. On the one hand, only the distributor knows Nature's exact choice with regard to demand in country *B*. On the other hand, the manufacturer has superior information with regard to demand in country *A*.

In the third stage, the distributor chooses the price he charges his customers in country *B*. In the fourth stage, manufacturer and distributor play a Bertrand game of price competition.

[79] See Harsanyi (1967-68). In a Bayesian game players are seeking to maximize their expected payoff, given their beliefs about the other players.
[80] For a Bayesian Nash-Equilibrium with two players see Feess (2000). See also Gibbons (1992) and Holler and Illing (2003).
[81] I thank Eberhard Feess for his comment on this aspect. See also Gallini and Hollis (1999, p. 2).

Annex:

Annex I.1 Pharmaceutical sales in 2004

Company	**Pharmaceutical sales, in billion dollars (2004)**	**Headquartered in**
Pfizer	55.1	USA
GlaxoSmithKline	32.8	UK, USA
Sanofi-Aventis	27.4	France
Johnson&Johnson	24.7	USA
Merck	23.9	USA
Novartis	22.9	Switzerland
AstraZeneca	21.7	UK
Roche	17.8	Switzerland
Bristol-Myers Squibb	15.6	USA
Wyeth	14.3	USA
Abbott Laboratories	14.3	USA
Eli Lilly	12.7	USA
Schering-Plough	6.9	USA
Bayer	6.4	Germany

Sources: IMS Health; www.pharmacy.org; Thomson Datastream

Annex I.2 Summary of exhaustion regimes in 28 developing and least-developed countries

Country	**Exhaustion regime**
Argentina	International exhaustion
Barbados	National exhaustion
Belize	National exhaustion
Bolivia	International exhaustion
Botswana	National exhaustion
Brazil	National exhaustion
Colombia	International exhaustion
Costa Rica	International exhaustion
Dominican Republic	International exhaustion
Guatemala	International exhaustion
Honduras	International exhaustion
India	International exhaustion
Madagascar	National exhaustion
Malaysia	International exhaustion
Mexico	National exhaustion
Morocco	National exhaustion
Namibia	National exhaustion
Nicaragua	International exhaustion
Nigeria	National exhaustion
Peru	International exhaustion
Phillipines	National exhaustion
Republic of Korea	International exhaustion
South Africa	International exhaustion
Sri Lanka	International exhaustion
Suriname	National exhaustion
Tunisia	International exhaustion
Uruguay	International exhaustion
Venezuela	International exhaustion

Source: WIPO (based on notifications made by Members to the WTO), Kanavos et al. (2004, p. 39), Maskus and Chen (2002, p. 322), Thorpe (2002, pp. 29), and Garrison (2006, pp. 53).

Annex I.3 Proof with respect to the non-negativity restriction for the equilibrium wholesale price in country B

In the following we show that for the non-negativity restriction for p_B^{w*} to be satisfied it is sufficient that the non-negativity restriction for λ_3^*, $t \le \frac{a}{2b}(\gamma - 1)$, is satisfied. Recall that

$$p_B^{w*} = \frac{a}{6b}(2\gamma + 1) - \frac{2}{3}t \ge 0$$

$$\Leftrightarrow \frac{2}{3}t \le \frac{a}{6b}(2\gamma + 1)$$

$$\Leftrightarrow t \le \frac{a}{4b}(2\gamma + 1).$$

Hence, the non-negativity restriction for p_B^{w*} is satisfied if the non-negativity restriction for λ_3^* is satisfied as $\frac{a}{4b}(2\gamma + 1) > \frac{a}{2b}(\gamma - 1)$ and 1>-2.

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