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**Managing gray markets – comparing a transfer price
based to a retail price based approach**

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1 Introduction

Gray market products are genuine brand name goods purchased by a gray marketer (or unauthorized retailer) in order to exploit a substantial price difference across countries (Yang et al., 1998). Determining gray markets as a substantial threat to multinational firms, KPMG estimated the annual gray market sales at USD 40 billion resulting in an annual profit loss of USD 5 billion just within the IT sector (KPMG, 2003). Moreover, studies on the health and beauty industry evaluated that gray market products already reached between 20% and 50% of the authorized sales in some markets (Anita et al., 2004). Researchers claim that gray markets jeopardize multinational's performance across several industries by undermining segmented pricing schemes and diluting the brand's image (Cespedes et al., 1988; Anita et al., 2004). Some authors also highlight that gray markets have positive aspects such as creating new distribution channels and thus boosting multinational firms' sales (Autrey and Bova, 2012).

The purpose of this thesis is to analyze how a multinational company can steer gray markets and capitalize on its controlled occurrence. Presenting two price coordination models, I describe how these models influence the price difference. On the one side, in Ahmadi and Yang's model (2000), a manufacturer centrally coordinates the retail prices in two countries in order to narrow or to widen the price gap and therefore allowing or preventing the occurrence of gray markets. On the other side, in Autrey and Bova's model (2012), a multinational firm charges a transfer price in order to vary the retail price in the gray marketer's sourcing country which influences the gray marketer's competitiveness in the selling country. Consequently, both models maximize the manufacturer's profit while considering the potential impact of gray markets. Additionally, they show that allowing gray markets can be preferable compared to preventing and under some certain circumstances even improve a company's profit.

The residual of this thesis is structured as following: Chapter 2 determines the conceptualization of gray markets. Chapter 3 gives an overview on gray market instruments and analyzes their advantages and drawbacks. Based on this evaluation, I present two price coordination instruments to combat gray markets in Chapter 4. Chapter 5 compares the models in terms of model configurations and assumptions. Furthermore, I analyze how and when these models suggest to block gray markets and evaluate the impact of gray markets on manufacturer's sales and profits. Chapter 6 summarizes the findings and suggests further research.

2 Conceptualization of gray markets

2.1 Definition

In this thesis, I draw on the conceptualization of gray markets given by Anita et al. and Yang et al. The latter researchers state that gray marketing “*refers to purchasing a product in a low-priced country and shipping it to a high-priced country to profit from the price difference*” (Yang et al., 1998, p. 433). Anita et al. provide additional insight by defining gray market activity as “*the sale of genuine trademarked products through distribution channels unauthorized by the manufacturer or brand owner*” (Anita et al., 2006, p. 92).

Concerning the first definition, it is predominantly viewed that gray markets occur due to significant price differences across countries (Tan et al., 2000). An international manufacturer may vary prices for the same product in different nations due to country or region specific features such as product demand, economic situation, exchange rates, and taxes (Cespedes et al., 1988; Ahmadi and Yang, 2000). This price gap raises the incentive to the low-priced country distributor to sell the product at a discount to a high-priced one. Therefore, gray marketing is also referred to as price arbitrage (Munk, 1995; Ahmadi and Yang, 2000). In addition, there are other factors such as low transaction costs and global product availability, which are discussed in Chapter 1.3.

Concerning the lawfulness of any marketing transaction, two perspectives can be distinguished: the legitimacy of the product itself and the distribution channel (Duhan and Sheffet, 1988; Lee, 2006). On the one side, gray market goods are genuine goods protected by trademark rights, copyrights, or patents (Clarke and Owens, 2000), and must be differentiated from counterfeit goods, which are black market products and are sold illegally (Anita et al., 2004). Therefore, the gray market product itself is not seen unlawful. On the other side, the legality or illegality of the way the product is distributed is more ambiguous and consequently referred as “gray”. In order to fully skim the different consumer surplus across countries, manufactures try to seal the market and determine authorized dealers that have the exclusive right by contract to distribute the product (Duhan and Sheffet, 1988). In the definition mentioned above, the distributor sells his products in a market without being authorized for it. Manufacturers therefore use legal action based e.g. on their trademark rights to seal the markets and protect price discrimination and profits. Yet international legislation differs in the legitimacy of

gray marketing due to country specific laws. Even within a country, there are many exceptions that vary from case to case and lead to ambiguous rulings.

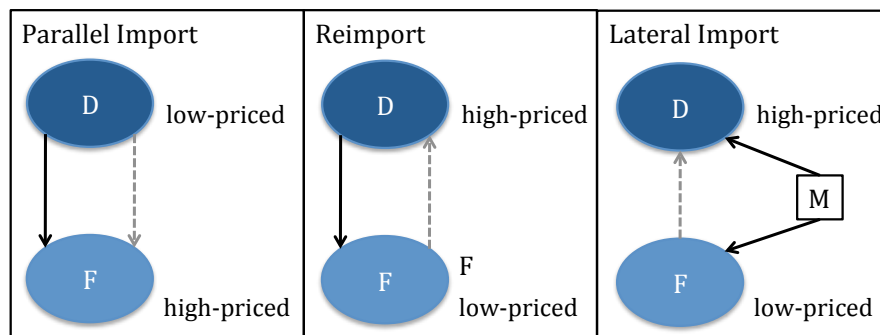
To summarize, there are many different definitions offered, yet most of them contain the same components in essence: gray market goods are 1) legally protected brand name products 2) sold by not authorized distributors in order to profit from 3) substantial price differences between markets (e.g. Duhan and Sheffet, 1988; Clarke and Owens 2000; Yang et al., 1998).

2.2 Three types of gray markets

Assmus and Wiese (1995) identify three distinctive types of gray markets: parallel import, reimport and lateral import. Figure 1 (based on Assmus and Wiese, 1995) illustrates these forms.

Parallel import could occur, when the product is priced lower in the manufacturer's country (here country D) than in the foreign country (henceforth F) even including the additional cost of arbitrage such as shipping costs. For instance, an authorized retailer having the license for selling in D but not in F, could unauthorized import the product into F and thus creating a parallel distribution channel to the original manufacturer's channel (Assmus and Wiese, 1995).

Figure 1: Three types of gray markets



In contrast, reimport could emerge if F is a low-priced country and the product in D is priced at a higher level. In this case, a gray marketer, not authorized retailer or importer, could buy the product in F and reimport it into D, if the price difference is higher than the cost of arbitrage (Assmus and Wiese, 1995).

The third type is called lateral import and could occur if there is a price gap regarding the sold products between two foreign countries, D and a second foreign country F. The manufacturer wants to seal both markets and supply the product separately in order to skim the varying consumer surplus. Yet a retailer from the low-priced country F has an

incentive to export his product to the high-priced country D, if the price gap exceeds the costs of arbitrage (Assmus and Wiese, 1995).

All three gray market types have in common that the gray marketer uses an existing price difference between two countries and can profit from this as long as the price gap offsets the costs of arbitrage. Moreover, if I assume that transaction costs such as tariffs and transportation expenses are zero, the three types become quite similar, because all forms include a gray marketer, who buys in a low price country and imports into a high price one.

2.3 Conditions for gray markets

2.3.1 Price difference

It is a prevailing opinion that price differences among various countries are the major factor for the existence of gray markets (Lee et al., 2000). These differences might arouse because a monopoly manufacturer sets different prices in order to skim the varying consumer's willingness to pay. In theory, a monopolist would try to set an individual price for every single consumer, yet he cannot supply each consumer individually, thus consumer groups or segments are built. A typical price discrimination is the geographical separation of markets (Braouezec, 2012). Assmus and Wiese state, "the price in each country is a reflection of local price elasticity" (Assmus and Wiese, 1995, p. 33).

Price setting differs among different countries because of variations in consumer's purchasing power, competition, and exchange rates (Assmus and Wiese, 1995). Fluctuating exchange rates can either create a price gap or influence an existing price discrepancy between two countries (Duhan and Sheffet, 1988). For example, exploiting the strong USD in the early 1980s, gray marketers bought Duracell batteries in Belgium and imported them into the US at a discount compared to local authorized distributors (Baldo, 1985). In the late eighties, the US dollar devaluated compared to other major currencies and the US became a supply source for gray marketers (Assmus and Wiese, 1995).

2.3.2 Availability

Another important condition is the international availability of a gray market product. First of all, unauthorized retailers need a source of supply in order to get active as gray marketers. Global markets offer plenty international standardized products (Duhan and

Sheffet, 1988) and this standardization creates various opportunities to source and diffuse gray market goods internationally.

For example, Dasu et al. (2012) hold the view that authorized distributors are sometimes eager to sell to gray marketers or get active on the gray market themselves due to demand uncertainty and excess inventory. Because of limited or strongly fluctuating product demand, authorized distributors could have excess inventory, which cannot be sold through authorized channels. Dasu et al. (2012) also state that approximately 25% of the primary inventory cannot be sold in particular when the goods are seasonal products or have a short life cycle. Global product standardization and access inventory result in a significant source of supply for gray marketers.

2.3.3 Low costs of arbitrage

Typically, gray markets are eased by low costs of arbitrage. Transportation costs, taxes, tariffs and payments to align products to the local requirements are seen as costs of arbitrage. The necessary modifications of an imported automobile in order to register it in the domestic country or translating the usage instructions for pharmaceuticals are examples for physical adjustments and are also referred to as conversion costs. They increase the costs to substitute an authorized good with a gray market one (Assmus and Wiese, 1995).

Within the NAFTA, for example, neither duties nor tariffs are asked and the geographical concentration of the members also reduces transportation costs (Berman, 2004). The European Union has even lower regulations on trade within member states. Moreover, the Transatlantic Trade and Investment Partnership, a potential free trade agreement between USA and EU, could further lower the existing trade barriers such as abolishing tariffs across all sectors (European Commission, 2013). In addition, this trade agreement could reduce conversion costs by aligning international standards and approval procedures, e.g. the approval of a car's safety requirements (European Commission, 2013).

Furthermore, the World Wide Web has dramatically decreased search and information costs. Both online search bots, which compare prices within seconds, and online trading communities, that offer excess inventory, minimize these transaction costs (Berman 2004).

2.3.4 Low legal barriers

Another point that facilitates gray marketing is the existence of low legal barriers. As mentioned in the definition, “gray” refers to the ambiguous ruling on gray market goods. The gray market product is genuine and thus lawful, yet the channel of distribution is not authorized by the manufacturer. Therefore, for instance, American manufacturers try to hinder gray market imports into the US by means of trademark rights (Clarke and Owens, 2000).

In 1989, the historic case *Weil Ceramics & Glass versus Dash* showed that a foreign company could import a trademark good even when an American company owns the valid US trademark. In this case, the US based company had no right to ban the import. The reason for this exception was the fact that the foreign company indirectly owned the American trademark owner and thus court stated trademark right was not to apply. Based on this case and a few others, American companies cannot bar import any longer, if there is any affiliate or common control relationship with the importing company (Clarke and Owens, 2000).

Another example is the case *Levi’s jeans versus the British supermarket chain Tesco*. Levi Strauss wanted to prohibit Tesco from selling gray market Levi’s jeans. However, the European Court of Justice decided that Levis Straus could not bar the sale because Tesco sourced the jeans within the European Community. The decision would have been different, if the jeans were acquired from outside the EU (Berman, 2004).

Moreover, there are countries, which are far more liberal regarding gray market goods. Australia, New Zealand, and Singapore have deregulated rulings on gray markets (Richardson, 2002). Malueg and Schwartz (1994) go even so far to state that generally global policies facilitate gray market activities.

International differences in legislation and many exceptions within countries show the ambiguous court decisions on gray markets, which in turn lower the legal barriers.

2.3.5 Brand product

Despite the fact that price differences are seen as the main reason for gray markets, Low and McCrohan (1988) as well as Lee et al. (2000) claim that gray markets also exist between countries with similar prices. They mention that gray marketers have an incentive to “free-ride” the value added to the product provided by the local authorized distributors. Value-added services include for instance “advertising, display, servicing, inventory maintenance, and other marketing investments” (Lowe and McCrohan, 1988,

p. 46). If the distributor's costs of value added exceed the cost of arbitrage, then the gray marketer will have an incentive to import the product and exploit the provided value-added services (Lowe and McCrohan, 1988).

Researchers also list other product characteristics that are connected to a gray market good. Those products are described as well-known brand products with high-perceived status providing high channel gross margins (Lowe and McCrohan, 1988).

Furthermore, gray market products are not industry specific because they occur in various sectors such as pharmaceuticals, automobiles, electronics, and apparel (Anita et al., 2004; Bart, 2008; Autrey and Bova, 2012;). Additionally, Anita et al. (2004) state that gray market goods can be massive or light products as well as tangible or intangible goods. For instance, gray marketer even sold Caterpillar tractors and other heavy construction equipment (Assmus and Wiese, 1995; Anita et al., 2004).

In conclusion, several conditions that facilitate gray markets can be determined by the use of five perspectives. These are international availability, price differences, low costs of arbitrage, low legal barriers, and product characteristics. This means, gray market goods neither show specific physical product characteristics, nor are limited to one single industry. Still, these goods tend to have a well-established brand name and benefit from a certain degree of value-added service. Gray market goods are easily sourced because of authorized retailers with excess inventory. Due to restricted legal options to hinder gray markets, price differences provide a significant incentive for gray marketers, unless they are not absorbed by higher costs of arbitrage. Price gaps could be created by manufacturers' segmentation strategy and influenced by exchange rates.

2.4 Threats and opportunities for gray market participants

Typically, a gray market transaction contains three kinds of players. A manufacturer who sells his products to authorized retailers. These retailers, in turn, can either operate on the gray market themselves or distribute to a third-party agent (Chen and Maskus, 2005). Thus, two types of gray marketers can supply a gray market customer.

According to Anita et al. (2004), gray markets can bear significant threats to manufacturers and authorized retailers.

Due to the effects of cannibalizing sales and undermining price segmentation, gray market goods can substantially decrease the profit of the manufacturer and his

authorized distributor. Duhan and Sheffet (1988) state that three factors are essential to implement a price segmentation strategy successfully. First, price elasticities must differ significantly between the chosen countries. Second, the selected markets must have a demand curve with a declining slope, otherwise the manufacturer cannot set different prices. Third, these markets must have a means of separating the two countries from each other. Meeting these three factors, manufacturers can increase their profits by the means of price discrimination. Yet all three types of gray markets hinder to “seal” these markets and often provide the high-priced country the same product at a discount (Deal, 1951; Thompson, 1981). Gray market goods substitute the higher priced products offered by authorized retailers and thus cannibalize sales. Replacing these high-priced goods means a loss in the manufacturer’s and the authorized retailers’ profits.

One additional negative consequence of gray markets is the dilution of exclusivity. Many brand owner transfer exclusive rights to only a few authorized distributors. Yet gray marketers dilute these rights by increasing the availability through additional channels. The result is a wide product availability that heavily erodes the trademark image (Anita et al., 2004).

Another potential threat is that authorized distributors may stop providing value-added services. If authorized retailers feel their manufacturer ignores the violations of their exclusive rights, these retailers could stop investing in services such as salesperson training or presale service and start to “free-ride” like the gray marketers. The resulting savings can be used to reduce the product price and compete with gray marketers. This free-riding strategy could be an ill answer, because it can harm the differentiation of the high-status brand and thus weaken the brand’s competitive advantage (Anita et al., 2004).

Besides, the manufacturer’s or brand owner’s legal liability and reputation is at risk. Due to gray markets, a manufacturer loses the control over his product distribution and cannot back it up properly. For instance, gray market pharmaceuticals are sometimes distributed past or close to their expiration date. Another example was Motorola’s problem with malfunctioning two-way radios that were developed for Asia and imported via gray marketers to America. Motorola replaced all radios, but already suffered from loss of reputation (Anita et al., 2004).

Apart from authorized retailers and manufacturers, consumers are jeopardized by the possibility that gray market goods might not provide a warranty or other service

agreements. This reduces the value of the product and offsets the potential price savings (Lowe and McCrohan, 1988). Further, gray market goods can cause compatibility issues with other products (Duhan and Sheffet, 1988).

In contrast to the mentioned threats, Ahmadi and Yang (2000) point out that gray market activity can also raise a manufacturer's profit. Even though they confirm that gray market goods partially cannibalize existing demand, these products may also generate additional demand by the means of a third new segment of consumers. The first segment contains consumers, which are not attracted by the lower gray market good because they prefer warranty and services to the price savings. The second segment partially substitutes the high-priced product with the cheaper gray market good, because these consumers are more price-sensitive and place less value on services. However, gray market products also generate a third segment by persuading customers, which were not willing to pay the high price in the first place. Ahmadi and Yang (2000) claim that consumers see gray marketers independent from manufacturers. As a result the discounted gray market product is less likely to confuse consumers regarding the brand image than a low price product from authorized distributor would do. Consequently, if profits from the new arising segment are higher than the cannibalizing effect of the switching segment, a manufacturer could increase his profits. Anita et al. (2004) suggest other situations in which a manufacturer can profit from gray market activity. For instance, IBM used gray markets in order to circumvent China's import regulations, meaning instead of engaging in high investments with local partners, IBM just overlooked the gray market imports into China on purpose. Another example is the producers of brand name PCs in India. A great part of Indian manufacturers only focused on supplying high-end retailers and ignored the possibility to increase their sales volume in the large Indian gray market. Therefore they could not capitalize on economies of scale and suffered from this competitive disadvantage. In other words, gray markets can be used to overcome restrictions on imports and can offer a competitive advantage through economies of scale (Anita et al., 2004).

Apart from manufacturers, Dasu et al. (2012) mention that authorized distributors can also benefit from gray market activity. In a changing economic environment, there is a high uncertainty in demand. As a consequence, authorized dealers can face either inventory excess or shortage. In a case where an authorized retailer overestimated demand and cannot sell additional inventory through authorized channels, gray markets

provide a valuable option, which can lead to sustainable increase in profit. This potential profit depends on factors such as the unauthorized and authorized market volume, profit margins, service level requirements, penalties and inventory costs. Supposing the required service level is high in the authorized market, the available unsold inventory grows. Thus, higher quantities can be diverted to gray markets. In brief, an authorized retailer can significantly lower his or her inventory risk and gain additional profit by selling goods via unauthorized channels (Dasu et al., 2012).

Additional to authorized retailers and manufacturers, there are also third party agents, which can capitalize on gray markets. Lim et al. (2001) hold the view that gray marketing could also be a possible market entry strategy for start-ups. Despite financial restraints and limited access to human capital, entrepreneurs could penetrate a well-established market by the use of a free-riding strategy. Lim et al. (2001) assume that authorized retailers can source at considerably lower costs than the gray marketer, because of their higher purchasing volume. However, saving huge amounts of value-added service investments, these entrepreneurial gray marketers can compete with established authorized dealers even though their sourcing costs might be higher.

Low and McCrohan (1988) mention two important benefits for consumers. First of all, gray market goods are generally sold at a discount and thus providing consumers with a significant saving opportunity.

Secondly, gray market channels increase the availability of the brand product. Therefore, consumers can buy these products either at exclusive authorized stores or via typical gray market channels such as outlets.

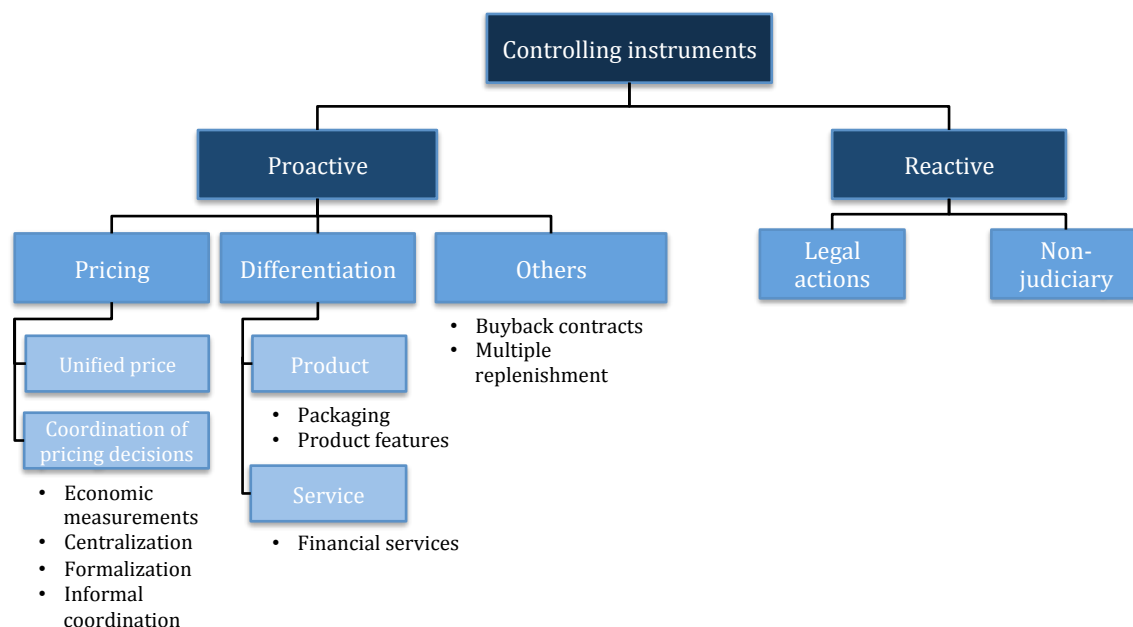
To sum up, the benefits of gray market goods show that manufacturers may not only be victims. Due to additional demand, economies of scale and an opportunity to circumvent import restrictions, a manufacturer has an incentive to use gray markets. Yet gray market activity can erode brand equity, reduce profits and weaken the manufacturer's competitive advantage. Concerning the distribution of gray market goods, either authorized retailer or third-party agents, who acquire the products from authorized retailer, can benefit from gray market activity. Consumers may face a trade-off between a price saving and limited value-added services. Consequently, a manufacturer must control gray market activity in order to limit the downside risk and capitalize on the advantages.

3 Controlling gray market distribution

3.1 Introducing different approaches of gray market control

In gray market literature, researchers present many controlling instruments to steer gray markets. Figure 2 gives an overview of some of the most important measurements. Typically, two sorts of instruments are separated: proactive and reactive (Assmus and Wiese, 1995; Prince and Davies, 2000; Berman, 2004; Anita et al., 2004). Proactive instruments prevent or control gray market activity before it occurs (ex ante), whereas reactive ones cope with gray markets after their appearance (ex post) (Myers and Griffith, 1999; Berman, 2004).

Figure 2: Controlling instruments



3.1.1 Proactive instruments

On the left side of Figure 2, pricing instruments are presented. The most obvious option to counter gray markets is the uniform pricing strategy (Anita et al., 2004). This one-price-for-all policy dissolves price differences due to the manufacturer's price segmentation. For example, LVMH (Luis Vuitton Moët Hennessey) sets an identical price across all countries for its TAG Heuer and Christian Dior watches (Berman, 2004).

A more complex variation is the coordination of pricing decisions. Assmus and Wiese (1995) identify four sorts of coordination methods. The first one is related to a manufacturer who uses economic measurements such as rationing, implementing a price range or transfer pricing. Rationing means that a manufacturer determines the amount of products that is allocated to each country or region. Knowing approximately

the amount of gray market goods, a manufacturer supplies a potential diverting country only with a limited source of supply and, thus, he minimizes the quantities of gray market goods. As a result of this restricted quantity, the local country manager sets higher prices and therefore reduces the price gap and simultaneously the attractiveness of the former low price country (Assmus and Wiese, 1995).

Simon and Kucher (1992) present another model that identifies a price range for each country. Using a multinational transfer pricing model, Autrey and Bova (2012) show that raising transfer prices of a low price country could improve manufacturer's profits if he is threatened by gray market activity. A retailer in the low price country has now a higher cost base and must rethink his profit function, which leads to a higher retail price. Consequently, the price gap narrows again.

Another kind of coordination is centralization. Pricing is a decentralized decision in many industries and companies. However, decentralized pricing decisions can only be optimal for a manufacturer if one country's decision has no influence on another one's. Due to gray markets, this independence is not granted any more. Hence, a manufacturer withdraws pricing decision from local country manager and transfers it to a regional or global level. As a result, a regional manager incorporates gray market activities within his region (Assmus and Wiese, 1995).

Formalization is another form of coordination mechanism. This means that the price setting process is described thoroughly for each country. For example, a manufacturer defines each country as "lead" or "nonlead" country. The top countries with the highest sales and profits are considered as the lead countries. Nonlead countries have to set prices according to the lead country in a certain proportion in order to minimize or forestall gray markets (Assmus and Wiese, 1995).

Informal coordination specifies a manufacturer's corporate values and enhances those through an incentive system. For instance, a group of local country managers sits together before each product launch and discusses openly various price setting strategies and the consequences on gray markets. All managers agreed on those corporate values and try to find a solution because they will be rewarded for doing so (Assmus and Wiese, 1995).

Further measurements to prevent gray markets are product and service differentiation. On the one hand, a manufacturer can differentiate the product across various countries through a minor change in packaging. For example, packaging size can differ among

nations or a manufacturer can include country specific product instructions instead of a global English manual. On the other hand, a manufacturer can vary the product features such as product ingredients of consumable products or different standards of power supply. Consequently, a consumer of gray market goods might either have to face conversion costs or cannot substitute the authorized good at all (Assmus and Wiese, 1995; Ahmadi and Yang, 2000; Berman, 2004).

One example for a marginal physical product difference is Canon. They simply use different names or model numbers across countries. Hence, consumers can easily identify gray market products and actively decide not to buy those (Berman, 2004).

Furthermore, a manufacturer can differentiate the offered services. That means he should offer services that gray marketers cannot free ride or imitate easily. For instance, Caterpillar offered a completely new way of financing their tractors (Anita et al., 2004). Gray marketers have probably not the financial resources to provide a financing plan at all. Besides, a manufacturer can communicate that he is only providing value-added services to authorized products in order to decrease the perceived value of gray market goods upfront (Ahmadi and Yang, 2000).

Concerning other instruments, a manufacturer can, for example, actively design his contractual agreements with his authorized distributors. First, a manufacturer can offer to buy back inventory that exceeded the demand. Second, multiple replenishments can be provided by contract. That means a retailer can order new products after having additional information from the first sales of a season. Consequently, a retailer has less risk to overestimate demand and can match inventory and demand more precisely. These agreements lessen a retailer's inventory risk without the use of gray markets. As a result, the available amount for gray marketers is reduced (Dasu et al., 2012).

To summarize, uniform and coordinating pricing as well as product and service differentiation are proactive instruments, which prevent or control gray market activity from the beginning. Of course, there are many other additional instruments apart from contractual agreements with distributors, yet this section should just offer samples to steer gray markets and different perspectives without providing a complete portfolio.

3.1.2 Reactive instruments

Regarding legal actions, a manufacturer and owner of a trademark, patent or copyright can demand injunctions, seizure of gray market goods, and compensation for damages (Duhan and Sheffet, 1988; Clarke and Owens, 2000).

The basic purposes of trademarks are to indicate the product's origin and quality (Duhan and Sheffet, 1988) as well as to give the trademark owner the exclusive right to distribute the good (Clarke and Owens, 2000). US courts derived three important theories from trademark rights in dealing with gray market products: universality, exhaustion, and territoriality (Wilson, 1985).

Under the principle of universality, the single function of a trademark is the indication of origin (Duhan and Sheffet, 1988). Consequently, gray marketing is entirely legal, because the trademark is lawfully affixed on a genuine good in one country and shows the product's origin wherever it goes (Clarke and Owens, 2000).

Territoriality means that a trademark is only effective in countries where it is registered. Derived from this, trademark rights differ internationally, because every country might have its own separate legal definition of a trademark and different rulings on seizure of goods, injunctions and damages (Clarke and Owens, 2000). Thus, a manufacturer or a local trademark holder can only ban a gray market good based on domestic law, if he has a registered trademark in that country.

Moreover, the theory of exhaustion implies two alternatives in dealing with gray market goods. In the first case, a trademark owner loses all rights with the first initial sale of his product to the buyer (e.g. channel member or licensee). The buyer now owns the right to distribute the product. In the second case, the domestic trademark owner invests significantly in the building of goodwill other than the product's existing brand image. For example, goodwill increasing investments could be local marketing and other value-added services. Therefore, the foreign trademark differs from the domestic one because it only contains the brand image and not the additional goodwill. In this case, gray market goods can be legally restricted (Clarke and Owens, 2000).

These basic theories are implemented in the United States via the Tariff Act, the Lanham Act and the Copyright Act. For instance, due to the Tariff Act, US trademark holders can generally bar the foreign import of gray market goods based on the Tariff Act, if the product has the same trademark as the domestic owner holds (Clarke and Owens, 2000).

According to the Lanham Act, a trademark holder can bar gray market goods, if the imported product is physically different compared to the domestic product. In one case, the ingredients of the foreign market chocolate differed in some percentages from the American product. The gray market good was declared to be confusing to domestic consumers and therefore a violation of the Lanham Act. (Clarke and Owens, 2000)

Finally, a trademark holder used the Copyright Act to prohibit gray market goods that could not be bared by the Tariff Act or Lanham Act (Clarke and Owens, 2000).

European trademark owners have similar principles regarding territoriality and exhaustion. European citizen or companies can either register a trademark in every single country or register a European trademark (Community Trade Mark) that is valid in all European member states with identical rulings on seizure of goods, injunctions and damages. Regarding the theory of exhaustion, a European trademark owner relinquishes all rights after the first sale to a channel member or licensee in the European Union. Patent law and trademark rights have similar principles of exhaustion (Inta, 2014).

Regarding non-judiciary instruments, a manufacturer has several options by the means of advertising and distribution channel restructuring. First of all, both an authorized retailer and a manufacturer could reduce marketing expenditures in order to reduce costs and set a lower price to compete with a gray marketer (Lee et al., 2000). Alternatively, a manufacturer can launch an advertising campaign to educate his consumers about the drawbacks of buying gray market goods (Berman, 2004).

After gray markets occurred, a manufacturer can restructure his distribution channels. If he can single out an authorized retailer who is active on gray markets, he could cancel a franchise agreement. This sends a significant signal to all offenders. Another possibility is to add further distributors in order to increase controllability and supply the requested demand. At first, a manufacturer could determine only few exclusive authorized retailers in a foreign country, which cannot meet the whole demand. Thus, authorized retailers from the manufacturer's country could parallel import into the foreign country. By adding authorized distributors in the foreign country, a manufacturer could satisfy the demand and stop the gray market activity (Cespedes et al., 1988). Of course, there are many other reactive instruments such as limit or even withdraw an offending authorized retailer's reward system (Anita et al., 2004), however the purpose here is again to give a brief overview and not a complete set of instruments.

In short, a manufacturer can use reactive instruments such as legal actions, advertising and channel restructuring in order to limit gray market activity. In general, trademark laws, copyrights and patents can assist in injunctions, seizure of gray market goods, and compensation. Through advertising, a manufacturer could educate consumers on the risks of gray market goods. A manufacturer could also punish offending retailers by withdrawing rewards or even terminate the franchise agreement.

3.2 Evaluating and selecting proper instruments to control gray market activities

3.2.1 Analyzing proactive and reactive instruments

In this chapter, the previously introduced instruments are evaluated by analyzing advantages, drawbacks, and requirements.

In my opinion, pricing methods offer the advantage that a manufacturer can still benefit from the positive effect of standardized products as well as capitalize on a global consistent marketing strategy regarding product positioning.

Yet a major disadvantage of a one-price-for-all policy is the missed opportunity of price discrimination (Cespedes et al., 1988). That means the uniform price may be too high in some countries, therefore losing customers who are not willing to pay this price, and too low in other countries, thus not skimming the available consumer surplus.

Besides, it might not be easy to hold a fixed price across countries because of exchange rate effects. For example, the regular price of a Luis Vuitton Handbag in Germany is about 680 EUR (Louis Vuitton, 2013a). In America, the same handbag costs 940 USD (Louis Vuitton, 2013b), which is 680.8 EUR at a rate of 1.38 USD/EUR (Bloomberg, 2013). Therefore, if the Euro appreciates against the USD, the handbag in US should become more expensive in order to hold the same price. Yet, handbags are seasonal goods and within a season exchange rate fluctuations may be minor. As a result, one-price-for-all policy may be only applicable, if the good is seasonable otherwise exchange rate fluctuations may demand several price adjustments.

Moreover, a uniform price could hinder the access to new markets such as emerging markets, because these consumers cannot afford the uniform price. Finally, this strategy could not completely erase gray markets, because the opportunity to exploit value-added services still exists (Cespedes et al., 1988).

The advantages of coordinating price decisions are not just the usage of a standardized product and a global marketing strategy, price coordination can also benefit from price discrimination.

Regarding the various types of price coordination, some of them are more appropriate under certain circumstances than others. Economic measures may be regulated by local legislation. For instance, some domestic tax laws impose regulations on transfer prices such as a mandatory arm's length price (Autrey and Bova, 2012). Yet there are different ways to interpret such an arm's length price. Additionally, using a transfer price, a multinational firm can decentralize national decisions and thus has a reduced demand for central information. Besides, in a more decentralized setting, the country managers feel more committed to fulfill their country targets (Assmus and Wiese, 1995).

A global centralized pricing decision can only be successfully implemented if the central decision maker has complete information over all countries. Even if it can be assumed that a manager has all necessary information, it is still demoralizing for country managers to withdraw their former authorities. Further, a central manager must monitor all country specific price developments (Assmus and Wiese, 1995).

Through formalization, nonlead country managers may also be frustrated because they are strongly limited in setting prices. This could be even worse, if a country manager's incentive system is based on certain sales targets that he cannot influence any longer (Assmus and Wiese, 1995).

Assmus and Wiese (1995) state that the right choice depends on the environmental complexity and the local resources. In a highly complex surrounding and high local resource, a decentralized transfer price or informal coordination are promising. In contrast, a central approach and strong formalization are helpful if the various markets are fairly similar and competition is limited, resulting in an overall simpler setting.

In my opinion, using product or service differentiation strategy to combat gray markets, a manufacturer has to face two major drawbacks. First, due to physical product changes according to country specifications, a manufacturer may have an increased number of standards and consequently may not fully capitalize on economies of scale. Second, a higher number of products may also raise the advertising costs, because a manufacturer cannot use it for all standards. Both consequences can increase a manufacturer's costs significantly. Besides, there is a chance that country specifications may increase gray

markets, because a customer may prefer the product from a foreign country (Myers and Griffith, 1999).

However, minor changes may be sufficient as long as the product conversion costs exceed the price gap between the considered countries. Thus, a manufacturer can close the price gap and still benefit from product standardization.

Further, product differentiation can support legal actions, because a manufacturer can better argue that the gray market good differs from the authorized good and thus consumers are more likely being confused (Clarke and Owens, 2000).

Considering other instruments such as buyback contracts and multiple replenishments, it is more difficult for a manufacturer to schedule his global demand and supply. Besides, the risk of uncertainty is shifted to the manufacturer who has to buy back excess inventory. So, in my opinion, these options may be a considerable strategy against gray markets, yet they shift the problem of demand uncertainty from the distributors to the manufacturer.

Concerning reactive instruments, Anita et al. (2006) claim that in order to successfully implement an enforcement such as legal actions, withdrawing benefits from retailers, or the termination of a franchise agreement, a manufacturer should apply three principles: sensing, speed, and severity.

First of all, a manufacturer must be able to identify gray market activity. Of course, these monitoring instruments are quite expensive. With the increasing ability to detect gray market activity, it is more likely that a gray marketer gets punished.

Secondly, enforcement must have a certain degree of severity. Determining a franchise agreement, withholding rewards or legal actions such as compensation of damages impose a significant threat on the authorized retailer, who gets active on the gray markets. Executing these punishments, can jeopardize his professional existence and in turn lead to potential loss for the manufacturer by losing an authorized retailer (Anita et al., 2006).

Finally, it is also important that the time between the detection of a gray market activity and its punishment is not too long, otherwise cause and effect are not connected anymore. In addition, fast reactive instruments decrease the time in which a gray marketer can benefit from his actions and reduces the time in which the gray marketer can adapt his strategy to get round the punishment (Anita et al., 2006).

Consequently, the three principles alone have no impact on gray market activity. Only a combination of high detection rate, severe enforcement and a short time between detection and reactive actions can offer protection against gray markets (Anita et al., 2006).

Moreover, due to many legal exceptions, the success of legal actions is not certain. For instance, if the gray marketer is in a certain business relation with the domestic trademark owner (e.g. affiliated or subject to common control or ownership), the gray market activity cannot be prohibited because the Tariff Act is limited (Clarke and Owens, 2000). Besides, a new US regulation implied that if the gray market good is labeled with a sign saying that material differences to the authorized products exists, it is allowable to import it even with material differences. That restricts the use of the Lanham Act significantly (Berman, 2004). In Addition, even the Copyright Act was limited by the landmark case *L'Anza Research International v. Quality King Distributors* in 1988. In this case, the US court even provided suggestions for non-legal action in order to contain gray market activities (Clark and Owens, 2000).

Besides, by making extensive use of trademark rights and patent law, brand owners jeopardize themselves to infringe European or international competition laws. For example, the German car manufacturer BMW received a severe fine from the Swiss competition Commission, because BMW barred parallel imports of their vehicles into Switzerland. The Swiss Commission could not find any economic reasons to justify BMW's vertical restraints, which actively limited the competition in Switzerland. Thus, the case was declared unlawful based partially on EU competition law, even though Switzerland is not part of the European Union (Bovet, 2013).

Regarding other non-legal actions, reducing advertising efforts could result in a weaker positioning of brand image and thus it could also reduce the overall market demand (Lee et al., 2000). The consequences of educating consumers on gray market goods can be to confuse consumers about the quality of the brand itself (Prince and Davies, 2000).

I claim that channel restructuring measurements can have different effects. On the one side, giving up diverting retailers does not only stop gray market activities, a manufacturer also loses the authorized market. On the other side, increasing the existing amount of authorized retailer in order to match the demand could simultaneously erode the exclusive image of the product.

3.2.2 Suggestion of instruments

The previous analysis shows that brand owner cannot entirely rely on reactive actions because these instruments have demanding requirements, which makes them difficult to implement. Legal exceptions and the uncertain effects of changing advertising, make it hard to determine the outcome of reactive instruments. Due to the uncertain success of legal actions, I assume that generally proactive instruments are preferred to reactive ones. Further, it seems reasonable that a manager should always try to control the distribution of his products. A simple reaction on the occurrence of gray markets might not be enough, because the company already suffers from the negative consequences. In addition, Chapter 2.4 shows that in some cases manufacturer, retailer and consumer can even benefit from gray markets. Consequently, I suggest to control gray markets from the beginning and to evaluate whether it makes sense to accept a certain degree of gray market activity or not. If the projected amount of gray market goods or the arising consequence is not in accordance to the forecasted expectations, a manufacturer can still mitigate the gray market activity by means of reactive instruments. As a result, the proactive instruments should be considered as a first choice and therefore this thesis focuses on these instruments.

Using a one-price-for-all policy, a manufacturer neglects positive consequences of price discrimination and hinders himself to enter into emerging markets. The more demanding and promising method is to coordinate prices. The four sorts of price coordination should be selected due to a company's environment. In other words, a company's complexity and local resources are crucial to select an appropriate method.

In order to cover these different environmental settings, I choose models based on a centralized and decentralized decision. In Ahmadi and Yang's model, a manufacturer combines centralization and formalization by centrally coordinating the retail prices in two countries. In contrast, in Autrey and Bova's model, a manufacturer delegates the retail pricing decision and sets instead a transfer price. Additionally, both models consider a differentiation factor between the authorized and gray market product.

To sum up, proactive instruments offer more gray market control than reactive instruments. Autrey and Bova's transfer pricing model (2012) and Ahmadi and Yang's (2000) model show two different perspectives on price coordination and, moreover, even a sort of differentiation is partially integrated in these models.

4 Presenting two methods of price coordination

In the next two chapters, Autrey and Bova's transfer pricing model and Ahmadi and Yang's retail pricing model are presented separately in more detail. By explaining one model at a time, this course of analysis will facilitate the understanding of each model and avoid any confusion between the models. In order to compare these models, variables and indices are partially renamed to ease the comparison in Chapter 4. Additionally, both models are presented in a case without competition, meaning both the manufacturer and the authorized retailer are facing a monopolistic market situation.

4.1 A transfer pricing model

4.1.1 Basic intuition and contribution

In this model, Autrey and Bova (2012) show how a multinational firm can steer the occurrence of gray markets by varying the transfer price to its subsidiary. The subsidiary in the foreign country sells additional products to a gray marketer which in turn reimports the products to the multinational's domestic country.

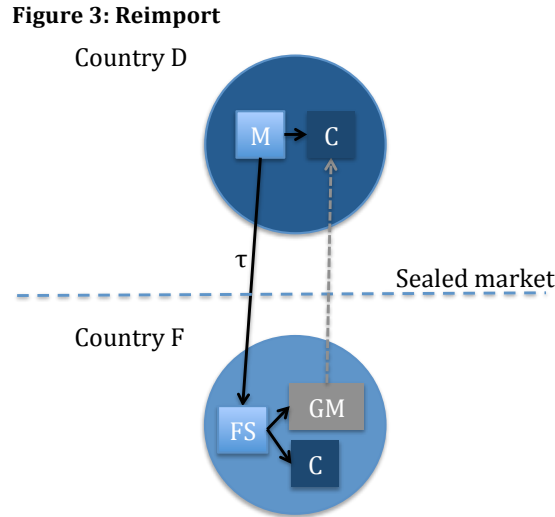
The basic intuition of the steering instrument is that if the multinational firm raises the transfer price, it simultaneously increases the sourcing costs for the gray marketer. This results in a less competitive gray market importer in the domestic country and consequently in fewer gray market products.

The model's main contribution is that in a sealed market setting, meaning the multinational firm can supply each country without fearing any type of gray markets, the transfer price is equal to the product's marginal costs. However, if a gray marketer exists, the new result is that the transfer price is strictly higher than the marginal costs.

But the most important finding of this model is that multinational firms cannot just effectively use transfer pricing to steer gray markets, they can also use gray markets to increase the total multinational firm's profit. This result supports the observations mentioned in Chapter 1.4. This chapter states that multinationals are not solemnly victims but they can also profit from gray markets. In order to better understand this, the further analysis presents the model in more details.

4.1.2 Reimport

Autrey and Bova's model is implemented in a reimport context and it is divided into two configurations: sealed and gray market setting. Figure 3 (based on Autrey and Bova, 2012) shows the two settings.



Basically, a manufacturer or a multinational's parent company (denoted as M) is located in country D (as domestic) and also sells its product to the consumers in the domestic and foreign market (denoted as F). The multinational firm produces and sells only one kind of product. Additional to the domestic market, the multinational firm also sells its product in a foreign second market in F via a foreign subsidiary (denoted as FS). The multinational firm charges the subsidiary a transfer price τ per product. Taking this transfer price into account, the subsidiary sells the product to the consumers in the foreign market F .

In the first model configuration, the sealed market setting, the domestic and foreign markets are separated from each other and there is no opportunity to divert the product from country F to D . The model is based on a linear market demand which is given by $p_0^D = \alpha_D - q_0^D$ for the domestic market and by $p_0^F = \alpha_F - q_0^F$ for the foreign market. The index 0 stands for the multinational domestic parent in D and for the foreign subsidiary in F . Additionally, this index separates it from the next model. p_0^D and p_0^F are the retail prices in the respective domestic and foreign markets, whereas q_0^D and q_0^F are the product quantities sold by the domestic parent and foreign subsidiary. In order to create a high-priced domestic country and a low-priced foreign country, Audrey and Bova set a domestic market size α_D , which is strictly higher than the foreign market size α_F . This is the benchmark case in order to identify the changes that come with the gray marketer.

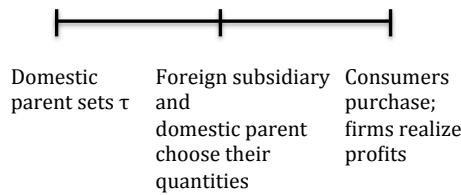
In the second model configuration, the gray market setting, the foreign subsidiary sells its product additionally to the gray marketer who in turn reimports the product into the domestic market. Here the gray marketer competes with the multinational's parent firm for the domestic demand. Therefore, the new function for the domestic demand has also a new gray market element $P_0^{GD} = \alpha_D - q_0^{GD} - \gamma q_g^{GD}$, where the superscript G stands for the gray market setting and γ is the rate of differentiation. The demand function for the foreign market contains the same elements as in the sealed market setting, yet the variables are influenced by the gray market, therefore Autrey and Bova also add the superscript G $p_0^{GF} = \alpha_F - q_0^{GF}$.

4.1.3 Decision process

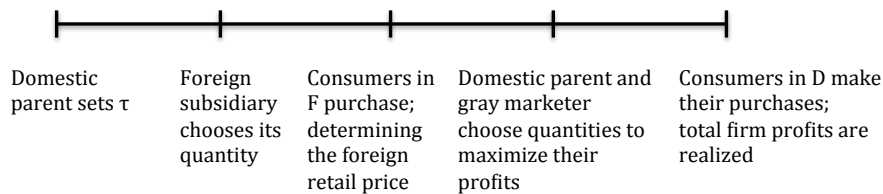
In order to show each party's individual decisions, Autrey and Bova choose a game theoretical model that is suitable for such a dynamic decision process. The decision process, see Figure 4, is adapted for both model configurations and is solved in both settings backwards.

Figure 4: Decision sequence in Autrey and Bova

Sealed market setting



Gray market setting



In a sealed market setting, both the multinational firm and the foreign subsidiary set simultaneously their quantities in order to maximize their profits in the respective markets. Yet the foreign subsidiary's equilibrium quantity q_0^F depends on the transfer price τ . Then, the multinational firm maximizes its total profit including the domestic and foreign profits with its optimal quantities over the transfer price. At the last stage, the consumers conduct their purchases in the two markets and the firms realize their profits.

In a gray market setting, both the domestic parent and the gray marketer choose their optimal quantities in order to maximize their profits in the first stage.

In the second stage, the foreign subsidiary determines its optimal quantity. Based on these quantities, which still depend on τ , the multinational firm again maximizes its total company profits by using τ .

4.1.4 Profit functions

In order to facilitate traceability, Autrey and Bova set the marginal costs of each product to 0. Additionally, they assume that there are no corporate tax rate differences between the two countries. Further, all quantities are assumed to be strictly positive and all prices including the transfer price are weakly positive.

As mentioned earlier, I assume that both the domestic parent and foreign subsidiary are monopolistic players. Consequently, the following equations are already adapted to my assumption. This will ease the comparison to the retail price model.

In a sealed market setting, the foreign subsidiary and the domestic parent set their quantities in order to maximize their individual profits π_0^F and π_0^D . The multinational firm will anticipate the profit maximization of the subsidiary. Thus, Autrey and Bova begin retrogradly with the subsidiary's profit function:

$$\max_{q_0^F} \pi_0^F = q_0^F [\alpha_F - q_0^F] - \tau q_0^F \quad (1)$$

The subsidiary's profit function π_0^F contains a revenue and a cost part. The revenue part is a multiplication of the quantity and the foreign price function, whereas the cost part simply includes the transfer price and the foreign quantity. Setting the first-order condition equal to zero, they obtain the foreign subsidiary's quantity depending on the transfer price:

$$q_0^F = \frac{\alpha_F - \tau}{2} \quad (2)$$

The domestic parent also sets its profit maximizing quantities according to its domestic profit function:

$$\max_{q_0^D} \pi_0^D = q_0^D [\alpha_D - q_0^D] + \tau q_0^F \quad (3)$$

Due to the assumption that marginal costs are zero, the domestic parent's profit function shows no cost part. However, additional to the revenue calculated by price times quantity, the domestic parent can add the income obtained by the revenue resulting from the transfer price. Again, using the first-order condition, they obtain the optimal quantity:

$$q_0^{D*} = \frac{\alpha_D}{2} \quad (4)$$

In the next step, the multinational firm maximizes its total firm profit, including the domestic parents profit and the foreign subsidiary's profit, over τ :

$$\max_{\tau} \Pi = \pi_0^F(\tau) + \pi_0^D(\tau) \quad (5)$$

Solving the first-order condition, the total profit function yields an optimal transfer price $\tau = 0$, which equals the assumed marginal costs. Using this transfer price, the model shows an equilibrium foreign subsidiary's quantity of $q_0^{F*} = \frac{\alpha_F}{2}$. Plugging those equilibrium quantities in the price functions, the model yields $p_0^{F*} = \frac{\alpha_F}{2}$ and $p_0^{D*} = \frac{\alpha_D}{2}$. This results in an equilibrium total profit $\Pi = \pi_0^{F*} + \pi_0^{D*} = \frac{\alpha_F^2}{4} + \frac{\alpha_D^2}{4}$.

Due to the assumption that $\alpha_D > \alpha_F$, it also follows that $q_0^{D*} > q_0^{F*}$ and $p_0^{D*} > p_0^{F*}$ in a monopolistic case. Thus, the domestic country D becomes the high-priced country compared to F.

In a gray market setting, Autrey and Bova (2012) add the superscript G in order to differentiate this gray market setting from the previous sealed market case. A gray marketer g purchases the product from the foreign subsidiary at the price $p_0^{GF} = \alpha_F - q_0^{GF}$. As mentioned earlier, he sells the product to the domestic customers resulting in a new domestic demand function $P_0^{GD} = \alpha_D - q_0^{GD} - \gamma q_g^{GD}$. The degree of difference between the domestic product and the foreign product is expressed by γ , with $\gamma \in (0,1]$. When γ is equal to 1, the foreign product is a perfect substitute for the domestic market, and when γ is close to 0, the reimported product is a completely different product.

In the first stage of the gray market setting, the domestic parent again chooses its optimal quantity to maximize the domestic profit function:

$$\max_{q_0^{GD}} \pi_0^{GD} = q_0^{GD} [\alpha_D - q_0^{GD} - \gamma q_g^{GD}] + \tau^G (q_0^{GF} + q_g^{GD}) \quad (6)$$

Due to the gray market setting, the profit function is extended in two ways. The demand function and the additional transfer pricing revenues now include the gray market quantity γq_g^{GD} and q_g^{GD} , respectively.

Simultaneously, the gray marketer choses its optimal quantity according to his profit function:

$$\max_{q_g^{GD}} \pi_g^{GD} = q_g^{GD} [\alpha_D - q_g^{GD} - \gamma q_0^{GD}] - p_0^{GF} q_g^{GD} \quad (7)$$

The gray marketer's profit function also contains a revenue term, which includes the gray market quantity and the domestic price. The gray marketer's sourcing price p_0^{GF} and his quantity determines his cost part.

Solving the first-order condition of both profit functions (6) and (7) jointly, the model yields the domestic parent's and gray marketer's quantities depending on the foreign market price:

$$\begin{aligned} q_{i=0}^{GD}(p_0^{GF}) &= \frac{\alpha_D}{2 + \gamma} + \frac{\gamma p_0^{GF}}{(2 - \gamma)(2 + \gamma)} \\ q_g^{GD}(p_0^{GF}) &= \frac{\alpha_D}{2 + \gamma} - \frac{2p_0^{GF}}{(2 - \gamma)(2 + \gamma)} \end{aligned} \quad (8)$$

In the second stage, the foreign subsidiary chooses its optimal quantity to maximize its profits:

$$\max_{q_0^{GF}} \pi_0^{GF} = (q_0^{GF} + q_g^{GD}) p_0^{GF} - \tau^G (q_0^{GF} + q_g^{GD}) \quad (9)$$

Similar to the domestic parent's profit function, the subsidiary's functions is adjusted on the revenue and cost side with the perfectly anticipated gray market quantity. Autrey and Bova assume that the foreign subsidiary cannot price discriminate between the customers in F and the gray marketer, thus demanding the same price p_0^{GF} .

Substituting $p_0^{GF} = \alpha_F - q_0^{GF}$ and q_g^{GD} from (8) into Equation (9), the equilibrium subsidiary's quantity is derived from the first-order condition:

$$q_0^{GF}(\tau^G) = \frac{\alpha_F(A + B - \gamma) - \alpha_D(2 - \gamma) - \tau^G B}{2B} \quad (10)$$

where $A \equiv (2 + \gamma)$, $B \equiv (3 - \gamma)A - \gamma$, and $C \equiv (2 + \gamma)^2 - \gamma^2 + (2 - \gamma)2A$.

Using Equations (8) and (10), the mechanism of the transfer price can easily be identified. If a multinational firm increases its transfer price, it leads to a decrease in foreign market quantity $q_0^{GF}(\tau^G)$ from (10). This, in turn, increases the foreign market retail price $p_0^{GF} = \alpha_F - q_0^{GF}$. The higher foreign market price leads via Equation (8) to increasing sourcing costs for the gray marketer and therefore reduces the gray marketer's equilibrium quantity $q_g^{GD}(p_0^{GF})$.

In the third stage, the authors use $q_0^{GF}(\tau^G)$ from (10) and substitute it into $p_0^{GF} = \alpha_F - q_0^{GF}$. The result is then substituted into the equilibrium quantities from (8). Consequently, Autrey and Bova receive the equilibrium domestic quantity and the foreign quantity as a function of the transfer price. Based on these quantities, the multinational sets the transfer price in order to maximize the total firm's profit:

$$\max_{\tau} \Pi^G = \pi_0^{GF}(\tau^G) + \pi_0^{GD}(\tau^G) \quad (11)$$

Solving the first-order condition yields the optimal gray market transfer price:

$$\tau^G = \frac{(2 - \gamma)\gamma(\alpha_F \gamma A + \alpha_D(2B + \gamma))}{BC} \quad (12)$$

Due to the fact that A, B, and C are strictly higher than 0, the optimal transfer price in a gray market setting τ^G is strictly higher than the marginal costs 0. The maximum possible τ^G is the foreign market price p_0^{GF} . If the multinational firm sets it above this threshold, the foreign subsidiary would realize negative profits and won't purchase the product from the domestic parent at all.

Plugging τ^G into the equilibrium quantities from (8) and (10), the model yields the foreign subsidiary's, domestic parent's and the gray marketer's optimal quantities:

$$q_0^{GF} = \frac{\alpha_F(A + B - \gamma) - \alpha_D(2 - \gamma) - \tau^G B}{2B}$$

$$\begin{aligned}
q_0^{GD} &= \frac{(2 - \gamma)(\alpha_D(2B + \gamma) + \alpha_F \gamma A) + \gamma \tau^G B}{2(2 - \gamma)AB} \\
q_g^{GD} &= \frac{(2 - \gamma)\alpha_D(2B - A + \gamma) - (A - \gamma)(\alpha_F(2 - \gamma)A + \tau^G B)}{2(2 - \gamma)AB}
\end{aligned}
\tag{13}$$

These optimal quantities lead then to the following profits via (6), (7), and (9):

$$\begin{aligned}
\pi_0^{GF} &= (q_0^{GF} + q_g^{GD})^2 \frac{(2 - \gamma)A}{B} \\
\pi_0^{GD} &= (q_0^{GD})^2 + \tau^G \frac{(2 - \gamma)(\alpha_D + \alpha_F A) - \tau^G B}{2(2 - \gamma)A} \\
\pi_g^{GD} &= (q_g^{GD})^2
\end{aligned}
\tag{14}$$

Substituting (14) into (11) leads to the multinational's equilibrium total profit. Further, using the optimal quantities and substituting these into the demand functions, the model yields the optimal prices.

In Chapter 5, using the exogenous variable, I analyze the gray market impact on quantity and profit function in more detail and explain how a multinational firm can prevent gray markets to occur.

4.2 A retail pricing model

4.2.1 Basic intuition and contribution

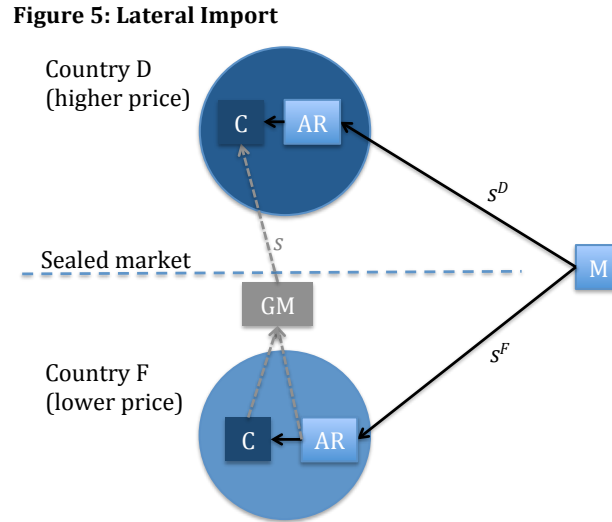
In Ahmadi and Yang's (2000) model, the multinational firm centrally coordinates the retail prices for each country in order to steer gray markets. In this model, a manufacturer or multinational company sells its product in two countries and price discriminates its retail price according to the individual market condition in each country. Ahmadi and Yang show that in a gray market setting the company has also to take the price gap between the two countries into account when it sets its retail prices. A significantly large gap can be an incentive for gray markets to purchase the product in the low-priced country and sell the product at a discount to the consumers in the high-priced one. This undermines the multinational's capability to price discriminate.

But Ahmadi and Yang also point out that the gray marketer creates another channel for the authorized product and furthermore it seems that he introduces a differently perceived product version. Consequently, they describe the impact of gray market products on the high-priced country in three segments. First, they assume that the group with the highest willingness to pay will stay with the authorized goods from the local retailer, because these customers place more value on service and warrants. The second segment consists of those existing consumers who have a lower willingness to pay. Ahmadi and Yang assume that these segment members will switch to the new gray market product, because it is offered at a discount. Due to the lower price of the gray market product, a new, third customer segment will arise that did not consider the authorized product at first.

Therefore, Ahmadi and Yang's main findings regarding the gray markets impact on the manufacturer's profit are subject to his situation. Creating another channel for the authorized products, gray markets should increase manufacturer's sales. However, whether his profit increases or not depend on the two effects. On the one hand, the gray marketer undermines the possibility to price discriminate and cannibalizes existing sales in the high-priced country. On the other hand, he adds a new product version and creates a new consumer segment. Thus, a manufacturer must outweigh the different aspects of the trade-off and decide based on his market conditions whether to allow or prevent gray markets. Based on this estimation, he coordinates his retail prices accordingly.

4.2.2 Lateral import

Ahmadi and Yang's model is based on a common marketing setting with one manufacturer, two markets, two authorized retailer and one product. Due to the centralized price setting of the manufacturer, the authorized retailers (denoted as AR) are neglected in their model. Figure 5 (based on Ahmadi and Yang, 2000) illustrates the model's environment.



Regarding the three types of gray markets mentioned in Chapter 2.2, Ahmadi and Yang cope with the lateral import issue. A manufacturer sells his product in a low-priced country F and a high-priced country D via authorized retailers. If the price gap between F and D is large enough, an unauthorized retailer has an incentive to source the product either from an authorized retailer or from consumers in country F and sell it to consumers in D. Regarding the market size α , Ahmadi and Yang assume that both countries offer the same market size $\alpha_D = \alpha_F = \alpha$. Besides, the model is based on a linear downward sloping demand curve $p^{F,D} = b^{F,D}(\alpha - q^{F,D})$ for the authorized demand in countries D and F, respectively. The demand coefficient b is based on the national income level and the foreign exchange rate of the respective country. The higher the demand coefficient b , the less price sensitive are the consumers in this country, meaning they are willing to pay more for the same product. In order to determine country D as a high-priced country, b^D is set strictly higher than b^F . Moreover, transportation costs occur for the manufacturer supplying country F and D in the amount of s^F and s^D as well as for the gray marketer in the amount of s . A gray marketer has to pay s to transport the products from F to D.

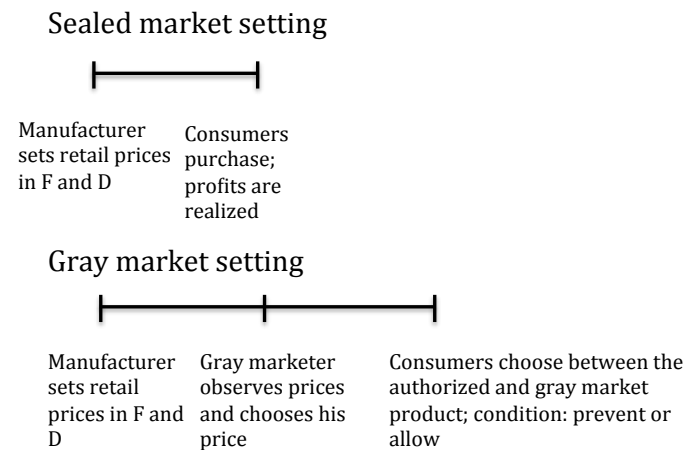
In a sealed market, the manufacturer can choose the retail prices accordingly to each individual market demand function. Yet in a gray market setting, the gray marketer undermines this price discrimination by importing products into D.

4.2.3 Decision process

In the sealed market setting, first, the manufacturer sets separately the retail prices in D and F according to the country's demand function. Then, consumers make their purchases.

In contrast, a game theoretical model is used to describe the decision process in the gray market setting. Figure 6 shows both settings. The gray market setting is depicted in a three-stage Stackelberg pricing game that is used to capture the participants' individual pricing decisions.

Figure 6: Decision sequence in Ahmadi and Yang



In the first stage, the manufacturer sets retail prices in both countries in order to maximize total profits. He already includes the potential impact of a gray marketer.

Second, the gray marketer chooses the retail price for his gray market product according to the manufacturer's p^F and p^D .

Last, the consumers in country 2 decide whether they purchase the gray market product or the authorized product. As mentioned earlier the decision varies between the two existing and the newly arising segments. Now the model yields the condition whether it is favorable to prevent or allow the gray market for the manufacturer. The model is solved by backward induction, meaning the manufacturer anticipates the critical condition and sets retail prices in order to prevent or allow gray markets. Whereas a large price gap between the two countries incentivizes or allows a gray market, a minor price gap prevents it.

4.2.4 Profit functions

In this model, Ahmadi and Yang define the manufacturer as a monopolistic price setter due to a high brand image and the high market power that comes along with such a highly perceived brand value. Therefore, in a sealed market setting, the profit function depends solely on the manufacturer's retail prices. In order to ease the comparison to the transfer pricing model, I adapt Ahmadi and Yang's model by assuming variable production costs of 0. Without a gray marketer, the manufacturer's total profit is the sum of the profits realized in Country F and D:

$$\max_{p^F, p^D} \Pi = \left(\alpha - \frac{p^F}{b^F} \right) (p^F - s^F) + \left(\alpha - \frac{p^D}{b^D} \right) (p^D - s^D) \quad (15)$$

Each country profit contains a quantity part, which is derived from the downward sloping demand curve mentioned in 4.2.2, and a contribution margin part, which is the country specific retail price less the respective transportation costs.

Solving the first order condition for p^F and p^D yields the optimal retail prices in a sealed market setting:

$$\begin{aligned} p^{F*} &= \frac{b^F \alpha + s^F}{2} \\ p^{D*} &= \frac{b^D \alpha + s^D}{2} \end{aligned} \quad (16)$$

By substituting these optimal prices into the demand curve, I obtain the optimal product quantities for F and D:

$$\begin{aligned} q^{F*} &= \frac{b^F \alpha - s^F}{2b^F} \\ q^{D*} &= \frac{b^D \alpha - s^D}{2b^D} \end{aligned} \quad (17)$$

Substituting optimal prices and quantities from (16) and (17) into Equation (15), I obtain the optimal total profit:

$$\Pi^* = b^F \left(\frac{b^F \alpha - s^F}{2b^F} \right)^2 + b^D \left(\frac{b^D \alpha - s^D}{2b^D} \right)^2 \quad (18)$$

In the gray market setting, the manufacturer has to take the gray marketer's decision into account. In order to distinguish the new manufacturer's objective function and the pricing and quantity decisions, I add the superscript G for the gray market setting. In the first stage, the manufacturer's new total profit function is:

$$\begin{aligned} \max_{p^{GF}, p^{GD}} \Pi^G &= (q^{GF} + q_g^{GD})(p^{GF} - s^F) + (q^{GD} - \gamma q_g^{GD})(p^{GD} - s^D) \\ \text{where } q_g^{GD} &= \max \left\{ \frac{\gamma p^{GD} - p_g^{GD}}{\gamma(1-\gamma)b^D}, 0 \right\}. \end{aligned} \quad (19)$$

Compared to the pervious case, the manufacturer's profit function changes in two ways. On the one hand, the quantity sold in country F includes the authorized retail sales q^{GF} in F and the gray market quantity q_g^{GD} , that is sourced in F and sold in D. On the other hand, the quantity sold in D is the demand for authorized retailer goods q^{GD} less the gray market quantity.

Besides, Ahmadi and Yang determine γ as a valuation discount factor for the gray market goods, with γ being between 0 and 1. Due to the lack of service or warrants, the gray market goods have not exactly the same perceived value in country D as the authorized goods. The more the gray market good differs from the authorized product, the closer γ is to 0. The derivation of the gray market quantity is explained in detail in the next chapter.

In the second stage, the gray marketer chooses his retail price for the gray market product. He observes the retail prices in F and D and chooses his price to maximize his profit function:

$$\max_{p_g^{GD}} \pi_g = \max \left\{ (p_g^{GD} - p^{GF} - s) \frac{\gamma p^{GD} - p_g^{GD}}{\gamma(1-\gamma)b^D}, 0 \right\} \quad (20)$$

If the gray marketer can achieve any positive profits, his profit function will include his contribution margin and his gray market quantity q_g^{GD} , otherwise the gray marketer will not import any products and thus will not realize any profits.

As mentioned earlier, the consumers in D and F choose between the gray market product and the authorized products in the third stage. Then, the model yields the condition for allowing or preventing the gray market.

In the first stage, the manufacturer anticipates the gray marketer's profit function as well as the critical condition and includes them in his decision. Thus, the model is solved

by backward induction, meaning first identifying the critical decision and solving the second stage problem and afterwards plugging in these results into the manufacturer's objective function.

Ahmadi and Yang determine the condition for allowing the gray market as the following:

$$\mu_1 b^D \alpha - \mu_2 (s^F - \gamma s^D) - \mu_3 s > 0$$

where $\mu_1 = 2\gamma(1 - \gamma)(\gamma b^D - b^F)$, $\mu_2 = b^F + \gamma(2 - \gamma)b^D$, and $\mu_3 = b^F + \gamma(4 - 3\gamma)b^D$ (21)

If the condition is fulfilled, the manufacturer is recommended to allow gray markets to occur. In this case, I add the index A (denoted for allow) in order to distinguish the chosen prices and the resulting quantities and profits. The manufacturer sets the retail prices in D and F to maximize his profits:

$$p_A^{GF*} = \frac{(3\gamma - \gamma^2)b^F b^D \alpha - b^F s}{2\mu_2} + \frac{s^F}{2}$$

$$p_A^{GD*} = \frac{[(1 + \gamma)b^F + 2\gamma(1 - \gamma)b^D]b^D \alpha + \gamma b^D s}{2\mu_2} + \frac{s^D}{2}$$
(22)

These prices are chosen in such way that a considerable price gap between the two countries arise. Now it is economically attractive for a gray marketer to source from F and import into D, because the following condition is considered in the retail prices:

$$\gamma p_A^{GD*} > p_g^{GD} > p_A^{GF*} + s$$
(23)

The price of the gray market product covers the purchasing costs and the transportation costs. Moreover, the retail price in D for authorized goods is higher than the gray market price even including the valuation discount.

Consequently, the gray marketer observes these retail prices and set his price in D to maximize his profits:

$$p_g^{GD*} = \frac{p_A^{GF*} + s + \gamma p_A^{GD*}}{2} = \frac{(3\gamma - \gamma^2)b^F b^D \alpha - b^F s}{4\mu_2} + \frac{s^F}{4} + \frac{s}{2} + \gamma \left[\frac{[(1 + \gamma)b^F + 2\gamma(1 - \gamma)b^D]b^D \alpha + \gamma b^D s}{4\mu_2} + \frac{s^D}{4} \right]$$
(24)

Substituting these retail prices in the respective demand curves, the model yields the optimal quantities in F and D:

$$\begin{aligned}
q_A^{GF*} &= \alpha - \frac{p_A^{GF*}}{b^F} = \alpha - \frac{(3\gamma - \gamma^2)b^F b^D \alpha - b^F s}{2\mu_2 b^F} + \frac{s^F}{2b^F} \\
q_A^{GD*} &= \alpha - \frac{p_A^{GD*}}{b^D} = \alpha - \frac{[(1 + \gamma)b^F + 2\gamma(1 - \gamma)b^D]b^D \alpha + \gamma b^D s}{2\mu_2 b^D} + \frac{s^D}{2b^D} \\
q_g^{GD*} &= \frac{\mu_1 b^D \alpha - \mu_2 (s^F - \gamma s^D) - \mu_3 s}{4\gamma(1 - \gamma)b^D \mu_2}
\end{aligned}
\tag{25}$$

Using the optimal prices and quantities from (22), (24), and (25) and replacing them into the following, I obtain the manufacturer's and gray marketer's optimal total profits:

$$\begin{aligned}
\Pi_A^G &= q_A^{GF*}(p_A^{GF*} - s^F) + q_A^{GD*}(p_A^{GD*} - s^D) \\
\pi_g^* &= (p_g^{GD*} - p^{GF*} - s) \frac{\gamma[p^{GD*}] - p_g^{GD*}}{\gamma(1 - \gamma)b^D}
\end{aligned}
\tag{26}$$

In contrast, Ahmadi and Yang's model suggests preventing gray markets, if the condition in Equation (21) is not fulfilled. I add the index B to describe the manufacturer's decision to prevent gray markets. In this case, a manufacturer should set the respective retail prices as:

$$\begin{aligned}
p_B^{GF*} &= \frac{\gamma(1 + \gamma)b^F b^D \alpha + \gamma^2 b^D s^F + \gamma b^F s^D - 2b^F s}{2(b^F + \gamma^2 b^D)} \\
p_B^{GD*} &= \frac{(1 + \gamma)b^F b^D \alpha + \gamma b^D s^F + b^F s^D + 2\gamma b^D s}{2(b^F + \gamma^2 b^D)}
\end{aligned}
\tag{27}$$

Given these authorized retail prices, Equation (23) is not fulfilled and yields the following result:

$$\gamma p_B^{GD*} = p_B^{GF*} + s
\tag{28}$$

The equation shows that the sourcing costs plus transportation costs are equal to the maximum possible price in D for gray market products. As the consequence of this smaller price gap, the gray marketer cannot realize any profits and consequently he is not active on the market.

The manufacturer's quantities and profit are realized as:

$$\begin{aligned}
 q_B^{GF*} &= \alpha - \frac{p_B^{GF*}}{b^F} \\
 q_B^{GD*} &= \alpha - \frac{p_B^{GD*}}{b^D} \\
 \Pi_B^{G*} &= q_B^{GF*}(p_B^{GF*} - s^F) + q_B^{GD*}(p_B^{GD*} - s^D)
 \end{aligned} \tag{29}$$

Equations (23) and (28) show how a manufacturer can steer gray markets by coordinating retail prices. If the condition (21) is fulfilled, the model recommends allowing gray markets. Thus, a considerable price gap is incorporated into the two retail prices. Yet, if this condition is not fulfilled, the model recommends preventing gray markets. A manufacturer then raises the authorized retail price in country F and reduces the price in country D. Consequently, he narrows the price gap and a potential gray marketer cannot realize any profits.

5 Comparing the two approaches

First of all, I contrast the models with each other in terms of the basic situations, model configurations, and assumptions to clarify whether the frameworks are similar enough. Afterwards, I analyze how and when the manufacturer blocks gray markets and then describe the gray marketer's impact on sales volume and profit in detail.

5.1 Types of gray markets

At a first glance, the presented models seem to cover two different sorts of gray markets. On the one side, Autry and Bova try to solve a reimport issue including a domestic country and a foreign country. The manufacturer's head office is in the domestic country and sells his authorized goods to both countries. On the other side, Ahmadi and Yang present a model that covers lateral import. Here, the manufacturer imports into two countries without having a seat in one of the considered countries.

Nonetheless, the similarities are obvious. In both models, one manufacturer sells one kind of product in two countries: a high-priced and a low-priced one. The differences resulting from the manufacturer's seat are taxation and transportation costs. In both models, the authors assume similar taxation, so the transportation costs remain as a difference.

Assmus and Wiese (1995) provide a first attempt to unify the models by assuming transportation costs equal to 0. Although Autrey and Bova's model already incorporate this assumption, it would take away a lot of the other model's findings. Transportation costs play an important role in the decision whether the gray market occurrence should be allowed or prevented. Tariffs, shipping costs and other transportation costs reduce gray marketer's profits and as a result manufacturers can incorporate a larger price gap without having to fear gray market extension.

Another attempt is to adapt the transportation costs in Ahmadi and Yang's model so they could also show a reimport situation. If I assume that the manufacturer is also seated in country D, the gray marketers and the manufacturer's transportation costs would be equal, meaning $s^F = s$. Now the transportation costs s^D would simply be shipping costs within country D. As a consequence, s^D would most likely be lower than s^F (and s), due to the lack of tariffs within a country and maybe even lower shipping costs. Hence my assumption changes Ahmadi and Yang's findings and as an additional aspect it is analyzed in Chapter 5.4.

5.2 Model configurations and assumptions

Both models incorporate the observation that consumers may perceive gray market products in a different way than the authorized ones. Whereas Autrey and Bova call it substitution effect and Ahmad and Yang determine it as valuation discount factor, both models describe the same aspect. Additionally, both models incorporate this factor with a similar range from 0 to 1. This means that gray market goods are judged inferior in value compared to the authorized ones. However, there is contradictory, anecdotal evidence in the car industry, that due to specific car configurations such as color and optional equipment, gray market goods were even preferred (Autrey and Bova, 2012). This would lead to a differentiation variable, which would be larger 1. Nevertheless these cases are probably the minority, so the models describe still a fair situation.

Besides, there are two differently priced countries in the two analyzed models. Autrey and Bova achieve this difference by setting a strictly higher market size α_D in the domestic country in comparison to the foreign country. Assuming the same quantity is sold in both countries, country D's demand function leads always to a higher price. Yet there are exceptions that turn the domestic high-priced country into the low-priced one even if the market size in D is higher than in F. First, if I assume that the domestic market size is only slightly larger than the foreign market. In this case, a gray marketer has the incentive to enter the market, but with his additional quantity in D, he would lower the domestic retail price below the foreign one. Consequently, the gray marketer would realize a negative profit. Second, assuming a highly competitive market in D the retail price could fall below the foreign market price. But this is not relevant in this comparison.

In contrast, Ahmadi and Yang presume that both countries have the same market size. In their model, they add the variable b to scale the demand. A high b stands for consumers, who are less price-sensitive, meaning that with the same price increase the demand reduction is smaller. Setting b^D strictly higher b^F , they create a high-priced and a low-priced country.

Regarding the market size, basically, both models offer a similar setup, yet with a different approach to incorporate it into the respective model.

The sort of competition is another aspect worth analyzing in more detail. On the one side, Autrey and Bova assume a Cournot competition context, in which a manufacturer

and a gray marketer maximize their profit functions by choosing the optimal quantity. In a duopolistic Cournot competition, if both players have the same marginal costs, the model yields the same optimal quantities for both of them. Yet the gray marketer's marginal costs are always higher than the manufacturer's costs, because the gray marketer has to source the product at the authorized retail price P_0^{GF} which already contains the manufacturer's costs. As a result, in Autrey and Bova's equilibrium, the gray marketer will always offer less products than the manufacturer in the domestic market, which means $q_g^{GD} < q_0^{GD}$. Additionally, due to the model setup, the gray marketer and the manufacturer will always offer their quantities at the same price P_0^{GD} . As mentioned in Chapter 2, most gray market products are offered at a lower price compared to the authorized product. This limits the model's validity for a real world setting.

In Ahmadi and Yang's approach, a Stackelberg pricing game is assumed. The basic price competition model is the Bertrand competition. Here the players compete with each other by simultaneously setting different retail prices. In a typical duopolistic Bertrand competition, two players strategically set their prices for a homogenous good. Due to the identical products, consumers only buy from the player with the lowest price. Thus, each player will undercut the competitor's price and supply the whole demand. This process continues until one player reaches his marginal costs. Assuming both players have identical marginal costs, the optimal prices equal the players' marginal costs.

However, in Ahmadi and Yang's model, the manufacturer and the gray marketer choose different prices in D. I find three causes for this. First, gray market products and authorized goods are not perceived as homogenous goods. Consumers place less value on gray market goods, which is expressed in the model with γ . Secondly, the gray marketer has again different marginal costs due to sourcing expenses and transportation costs. Thirdly, Ahmadi and Yang assume that the manufacturer is the first-mover in the leader-follower game, which gives him a crucial advantage.

Consequently, Ahmad and Yang's model offers a price difference within the same country. This would better match a real world example.

Besides, both models neglect some parts of the profit function's cost side. In the first place, they ignore the player's fixed costs. This is not a significant problem, because all players derive their decisions by solving the first order condition. As a consequence, the fixed costs would drop out anyway. Second, Autrey and Bova set the marginal costs to 0.

In order to facilitate the comparison, I also implement this assumption to the other model. For a gray market case, it seems reasonable to me to emphasize the revenue aspect of each player's profit function including price, quantities and transportation costs. There are two main arguments supporting this perspective. First, these factors are directly connected. Increasing transportation costs raise the price and via the demand function reduce the quantity. In addition, I hold the view that the most important gray market issue is the intra-brand competition compared to the addition of another sales channel. To put it in other words, a manufacturer faces the trade-off between boosting sales in one segment or market and simultaneously cannibalizing sales in another one.

To sum up, both models show similarity in distinguishing the gray market good from the authorized one. Additionally, they incorporate a price difference yet with a different approach. An interesting aspect is the distinctive ways the players maximize their profits and compete with the gray marketer, which leads to diverging price approaches in D.

5.3 Methods and conditions to prevent gray markets

In Autrey and Bova's model, the manufacturer uses the transfer price in order to coordinate the foreign retail price and thus the gray marketer's cost base. So indirectly, the multinational firm can also steer the gray market's quantity. Therefore, when the company chooses the transfer price, it already takes the gray market impact into account.

In most cases, the manufacturer will choose a transfer price that allows a certain degree of gray markets, because he can only completely block the gray marketer by choosing a transfer price, which equals the foreign market size α_F . However, based on a transfer price $\tau = \alpha_F$, the foreign subsidiary would not realize any profits. Thus, fully blocking the gray marketer goes hand in hand with not entering the foreign market at all. This is only a financial improvement in corner solutions, otherwise allowing gray markets to occur seems to be the best decision. Consequently, the analysis of Autrey and Bova's model in the next chapter emphasizes the comparison of sealed market case to the "allowing" gray market case.

The manufacturer in Ahmadi and Yang's model manages the retail prices in order to steer the gray market. Basically, the multinational either narrows the price gap to

prevent a gray market or widens the gap to allow a gray marketer to realize profits and enter the market.

The previously presented condition in (21) states whether it is recommended or not to allow gray markets. An increase in the market size α , the transportation cost s^D , and the factor b^D leads to the tendency to allow gray markets. Given a certain set of parameters, an increase in each of these exogenous factors can change the decision from preventing to allowing. With a raising factor b^D , country D finally becomes more attractive and it gets more expensive to protect it by narrowing the price gap. In other words, now the price gap is larger and the multinational will lose more potential profit by closing it. Besides, with a higher s^D , multinational's authorized distribution channels are getting more expensive compared to supply D via the gray market channel. A rise in α means the price gap widens, while the transportation gap stays constant. Thus, a manufacturer tends to allow gray markets with increasing market size.

In contrast, an increase in the gray marketer's transportation costs s , the multinational's transportation costs s^F , and the factor b^F decrease the profitability of a gray market, because the gray market channel gets more expensive than the authorized one. The valuation discount factor has a diverging impact and will be analyzed in the next chapter in detail.

Comparing both models, I conclude that on the one side the manufacturer uses retail prices to steer gray markets and follows a recommendation based on a condition that varies with the model's environment. But more important is that the latter model allows the gray market to occur in general and prevents it only in exceptional cases. It is important to point out that this prevention is realized by not entering the foreign market at all and not via a high transfer price. I assume that the model could be extended by transportation costs. This could lead to more cases where it is recommended to block the gray market. But this is not the model's focus. In my opinion it is more about how to steer gray markets.

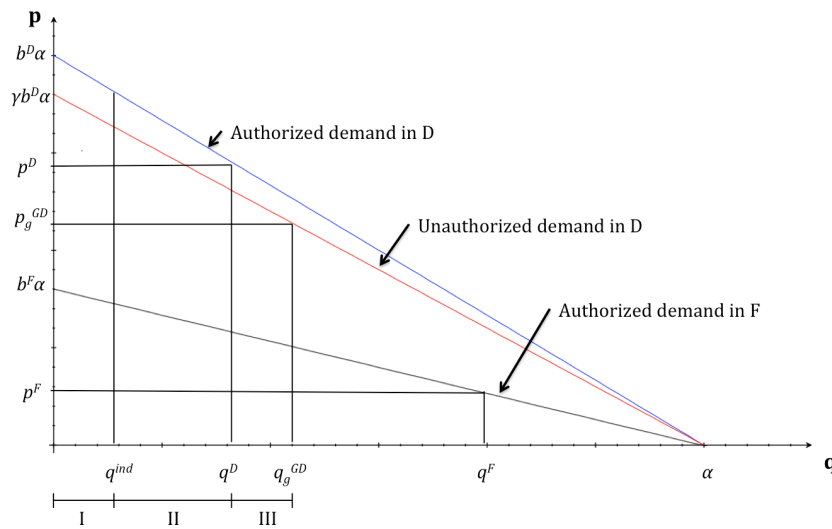
On the other side, Ahmadi and Yang's model yields a specific condition that recommends how a multinational firm should act. However, if it is recommended to prevent the gray market, generally the manufacturer loses potential profits compared to the sealed market case.

5.4 Impact of gray markets

5.4.1 Change of sales volumes

As mentioned earlier, in Ahmadi and Yang's model, the consumers decide in the third stage whether they want to purchase from the gray marketer or from the authorized retailer. The authors identify three segments in country D, which are illustrated in Figure 7 (based on Ahmadi and Yang, 2000). Segment I stands for the consumers that have a high willingness to pay and thus stay with the authorized retailer. Segment II is built up of the customers who will switch to the cheaper gray market product and Segment III comprises consumers who have not thought about the product before and will now buy the gray market version.

Figure 7: Consumer segments



The critical threshold is q^{ind} . Here the consumers are indifferent between the authorized and gray market product. Thus, this threshold separates Segment I from II. Moreover, the gray market quantity is the sum of segment II and III.

Setting the consumer surplus $b^D(\alpha - q^{ind}) - p^{GD}$ for the authorized product equal to the consumer surplus $\gamma b^D(\alpha - q^{ind}) - p_g^{GD}$ for the gray market version, Ahmadi and Yang derive q^{ind} and the gray market quantity as:

$$q^{ind} = \alpha - \frac{p^{GD} - p_g^{GD}}{(1 - \gamma)b^D}$$

$$q_g^{GD} = \frac{\gamma p^{GD} - p_g^{GD}}{\gamma(1 - \gamma)b^D}$$
(30)

Using this gray market quantity and substituting the optimal gray market price $p_g^{GD} = \frac{p_A^{GF} + s + \gamma p_A^{GD}}{2}$ from Equation (24) into the quantity, the model yields the quantity increase in country F:

$$\Delta q^{GF} = q_g^{GD} = \frac{\gamma p_A^{GD} - p_A^{GF} - s}{\gamma(1 - \gamma)b^D} > 0 \quad (31)$$

Given these retail prices in F and D, the result shows that the sales volume in F always increases with the decision to allow gray markets, because the gray marketer purchases in F.

Substituting the optimal gray market price and the boundary q^{ind} into the following:

$$\Delta q^{GD} = q^{ind} - q^D = \alpha - \frac{p_A^{GD} - p_g^{GD}}{(1 - \gamma)b^D} - \left(\alpha - \frac{p_A^{GD}}{b^D} \right) = \frac{p_A^{GF} + s - \gamma p_A^{GD}}{\gamma(1 - \gamma)b^D} = -\gamma q_g^{GD} < 0 \quad (32)$$

This result points out that the authorized quantity in D always decreases with the decision to allow gray markets. Regarding the three segments in D, both findings seem to be straight forward. The existing segment II switches to the gray market product leading to a rise in F and a decrease of authorized goods in D. Even the new third segment in D buys the gray market goods sourced from F.

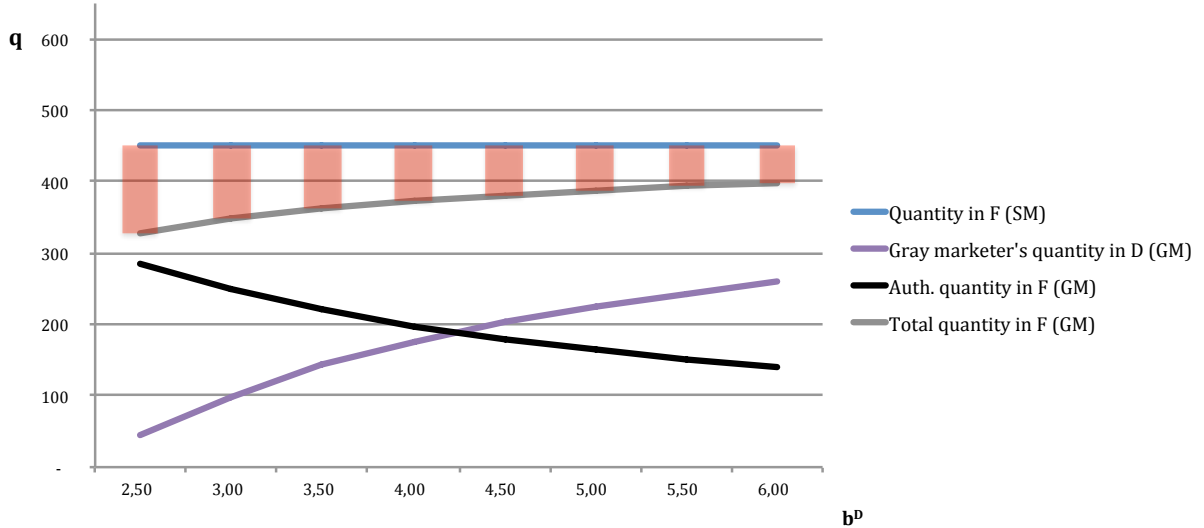
The change of the manufacturer's total sales volume is the sum of (31) and (32), which is:

$$\Delta q^{total} = (1 - \gamma)q_g^{GD} > 0 \quad (33)$$

Consequently, the total manufacturer's quantity always increases with the decision to allow gray markets. This supports the observation in Chapter 2, that a manufacturer uses gray markets to boost their total sales volume. Yet a manufacturer could try to exploit the third segment by himself and implement some kind of price discrimination. As a result, the manufacturer could lose the brand image by introducing a cheap product version. Ahmadi and Yang argue that gray markets offer a great possibility to tap this third market segment, because consumers perceive the gray marketer with a certain distance to the authorized retailer and thus experience the good as a different alternative to the authorized one. This is an important matter for multinational firms which has to be considered in a gray market situation.

However, the above-mentioned gray market impact is based on constant retail prices. In order to consider the price effect, I determine a reference case with the exogenous parameters $\alpha = 1000$, $s^F = s^D = s = 1$, $b^D = 2$, $b^F = 1$ and $\gamma = 0,9$. I discover that the gray market's impact on sales volume is turned upside down by the price effect on quantity. As an example, Figure 8 illustrates this counter-effect.

Figure 8: Quantity in country F in Ahmadi and Yang



In Figure 8, the quantity in F (SM denoted for sealed market setting) is strictly above the manufacturer's total quantity in F (GM), which includes the authorized quantity in F and the gray marketer's quantity in D. With an increasing demand coefficient b^D , the market in D becomes more financial attractive for the gray marketer. Therefore he raises the sourced quantity in F. Anticipating this potential threat, the manufacturer raises the retail price in F in order to protect the prospering market D. This price increase limits the gray marketer's volume and also reduces the authorized quantity in F. In this case, the price counter-effect is larger than the additional gray market quantity, meaning the total gray market impact on sales volume in F is negative.

This finding contradicts the previous statement that the gray market increases the quantity in F.

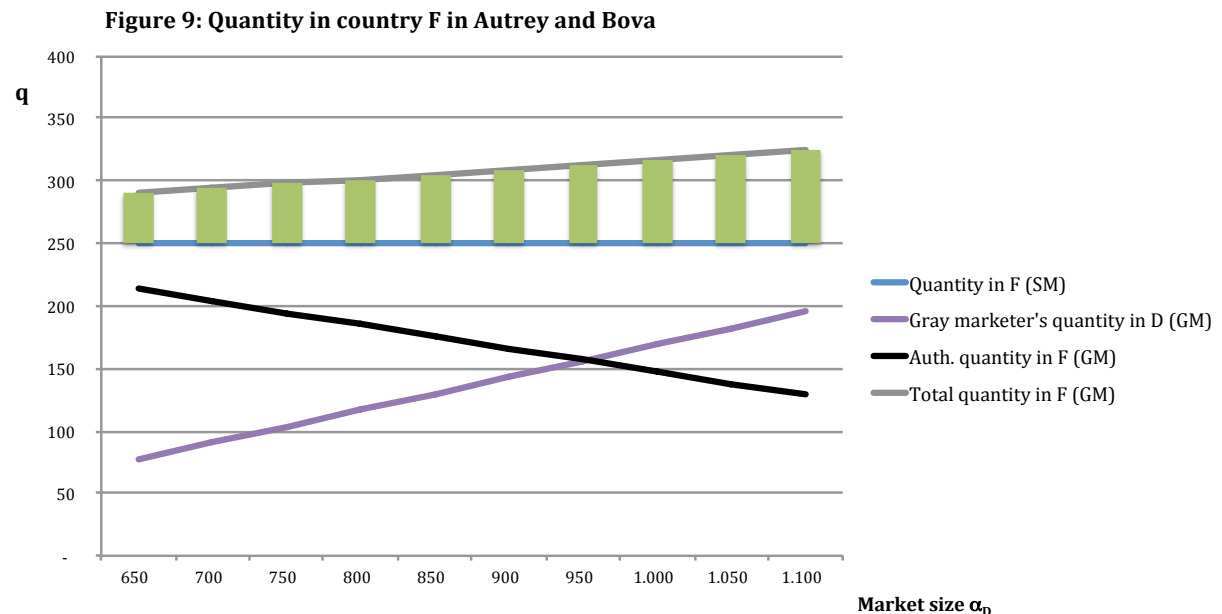
I find a similar counter-effect regarding the quantity in D in a gray market setting. With increasing b^D , the market in D becomes more attractive and here the sealed market quantity in D rises. However, the manufacturer must protect this market and also reduces the retail price in D. As a result, the total authorized quantity in D is above the sealed market quantity. Again, this counter-effect turns the reducing gray market impact on sales volume in D.

Regarding, the manufacturer's global sales volume, I find that this counter-effect is slightly larger than the $(1 - \gamma)q_g^{GD}$ gray market effect turning the gray market's impact on sales volume negative.

Apart from this "allowing" gray market effect, if condition (21) is not fulfilled, the model recommends choosing the retail prices in order to prevent gray markets. In this case, a manufacturer increases the price in F and thus sells a lower quantity in order to prevent gray markets. To narrow the price gap further, he decreases the retail price in D and sells more products here. Due to the different price sensitivity, the quantity increase will be less than the decrease leading to a decrease in manufacturer's total quantity.

In Autrey and Bova's model, comparing the domestic parent's and foreign subsidiary's profit functions in the two market settings, I find the same quantity increase and decrease as mentioned above. Equation (6) shows the manufacturer's quantity decrease by $-\gamma q_g^{GD}$ in D, due to the gray marketer's entry. Additionally, Equation (10) points out the increase of the foreign subsidiary's quantity by q_g^{GD} . Again, the total manufacturer's sales volume increase is $(1 - \gamma)q_g^{GD}$ without considering any price effects.

In this model, the gray market's impact on sales volume is only diminished by the price effect on quantity. Concerning the reference case, I choose the exogenous parameters as $\alpha_D = 1000, \alpha_F = 500$, and $\gamma = 0,7$. As an example, Figure 9 illustrates this diminishing effect.



Beginning with a domestic market size of 650, the total quantity in the foreign country is 290 in the gray market setting (GM) and sums up the authorized foreign quantity and the gray marketer's quantity. Besides, it is above the foreign quantity in a sealed market setting. As mentioned earlier, $q_0^{GF} + q_g^{GD}$ are strictly higher than q_0^F due to the additional gray market quantity. Yet the positive gray market effect is reduced. With increasing domestic market size, the authorized quantity in F decreases. The explanation for this is, that with an increasing α_D , the manufacturer increases the transfer price τ to protect his domestic market. The increasing τ , in turn, leads to a higher retail price in F. Thus, the authorized quantity in F declines with an increasing domestic market size. In contrast, in a sealed market, the domestic market size has no influence on the price in F.

Regarding the domestic quantity, a similar diminishing effect can be found. In general, the authorized quantity in the domestic market is lower in a gray market setting than the quantity in the sealed market case. Due to the additional gray market quantity in D, the retail price in D is lower than in the sealed market case. Therefore, the authorized quantity in a gray market setting is higher than without this price effect. Consequently, the negative impact of $-\gamma q_g^{GD}$ is reduced.

This price effect is not analyzed in more detail, because the examples point out the counter-effect. Moreover, its influence on the quantity is already included in the impact on profits, which will be discussed in the next chapter.

Besides, if I assume that the manufacturer wants to block the gray market products by increasing the transfer price, the model reduces to the sealed market case in D in terms of sales volume.

To sum up, both models assume a similar gray market impact in F and in D. This common influence is the exclusive quantity effect of the gray marketer. Yet the price effect distinguishes the models in the reference case. On the one side, Autrey and Bova's original sales effects are only slightly diminished. On the other side, the price effect turns the quantity upside down in Ahmadi and Yang's model. The explanation for these different impacts is the price effect's extent. Assuming $\alpha = \alpha_D = 1100$ (or 650), Ahmadi and Yang's positive price mark up from sealed to gray market in F is 128 (and 59). In contrast, Autrey and Bova's model yields only a positive price difference in the foreign retail price between sealed and gray market of 70 (and 37). Consequently, the higher surcharge has a stronger impact on the sales volume.

5.4.2 Change of profits

In Ahmadi and Yang's model, the change of profits is described as:

$$\Delta\Pi = p_A^{GF} \Delta q^F + p_A^{GD} \Delta q^D - s^F \Delta q^F - s^D \Delta q^D \quad (34)$$

Substituting (31) and (32) into Equation (34), the change of profit is:

$$\Delta\Pi = q_g^{GD} [(\gamma s^D - s^F) - (\gamma p_A^{GD} - p_A^{GF})] \quad (35)$$

Due to $q_g^{GD} > 0$ in a gray market setting with constant prices, this result shows that the impact of gray markets on the manufacturer's profit is positive if the following is fulfilled:

$$\gamma s^D - s^F > \gamma p_A^{GD} - p_A^{GF} \quad (36)$$

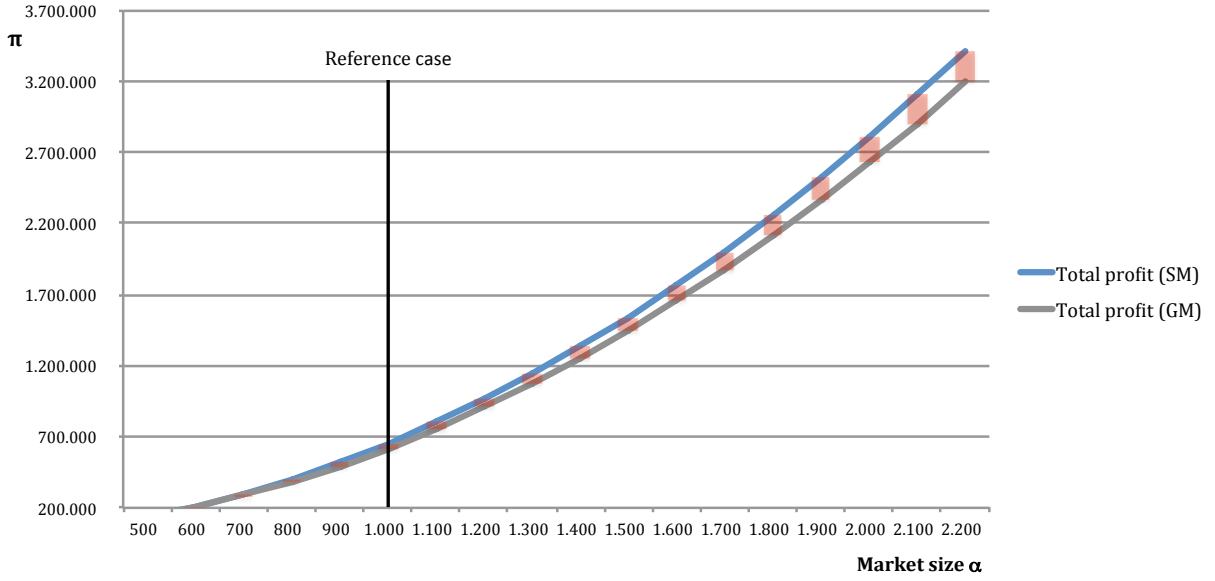
Consequently, the gray markets increase the manufacturer's profit, if the transportation cost gap is larger than the price gap including the valuation discount factor on both sides. Yet the price effect, as mentioned in 5.4.1, is not included here.

In contrast, if the condition (21) recommends preventing gray markets, the change in profit is always negative compared to the sealed market case. This negative change results from the fact, that a manufacturer must deviate the retail prices in a gray market setting from the optimal case in sealed market setting and cannot benefit from the gray market. Thus, the preventing strategy leads always to a profit decrease compared to the benchmark case.

In order to analyze the gray market's impact including all its effects, I consider the previously mentioned reference cases in more detail and vary the different exogenous parameters. Altering a parameter once at a time and comparing the sealed market to the gray market setting, the results lead to more insights on the change of profits. To begin with, I present my findings on Ahmadi and Yang's model. Secondly, I discuss Autrey and Bova's model.

Figure 10 illustrates the total profits in a sealed and gray market setting with varying market size.

Figure 10: Market size and profits in Ahmadi and Yang

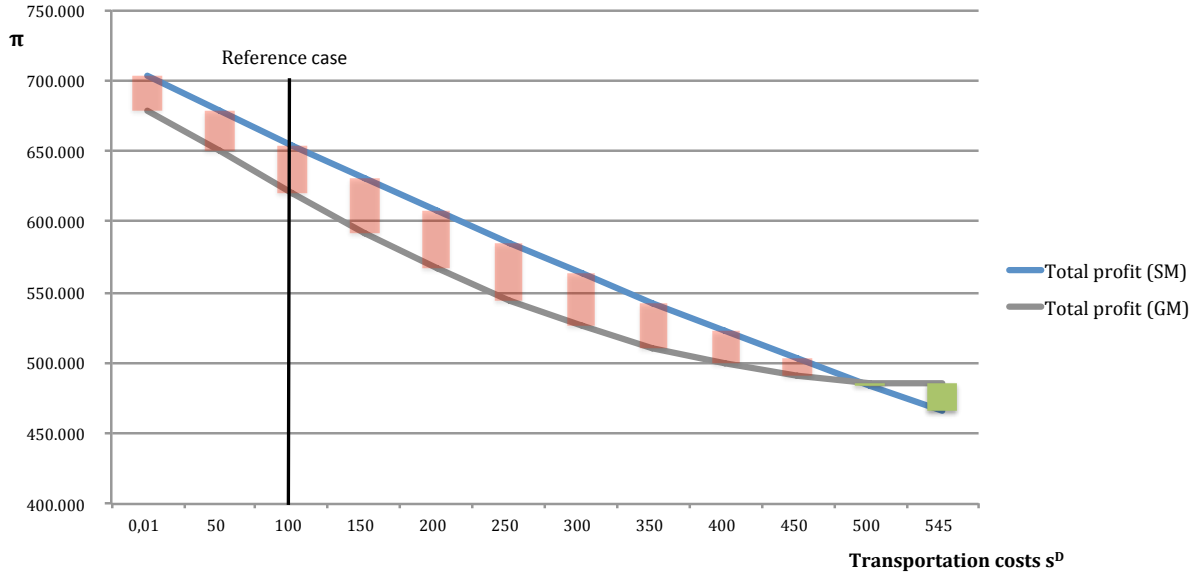


In both settings, with increasing market size, the demand in F and D rises. As a consequence, both retail prices and quantities in F and D increase. Of course, this leads to rising profits in both settings. Due to the condition (21), the manufacturer blocks the gray markets until approximately a market size of 1300, after this threshold he allows gray markets. Nonetheless, the total profit in the sealed market setting is strictly higher than the one in the gray market setting (the negative difference in profits is marked red). My explanation is that the manufacturer can skim the increasing market size more efficiently in a sealed market. The increasing market size, leads to a larger price gap between the two countries due to different scaling factors b^D and b^S . In the first section, the multinational firm has to narrow the price gap to prevent the gray market and loses potential profits. In the second section, the manufacturer allows the gray market, yet he cannot efficiently use the gray market.

The analysis regarding the scaling factors b^D and b^S supports this explanation. An increase in either one of the factors, leads to a profit increase in the sealed and gray market case. However, the gray market profit is strictly lower than the sealed one.

As mentioned earlier in condition (36), if the transportation cost gap is sufficiently large to cover the price gap, a positive gray market impact can be realized. Figure 11 shows the effect of rising transportation costs s^D including price effects.

Figure 11: Transportation costs to D and profits in Ahmadi and Yang



At first, the sealed marketing setting yields a favorable profit, yet this turns at transportation costs of approx. 500 (the positive profit difference is marked green). With increasing transportation costs to supply country D, the profits in both settings fall. At costs of around 500, it is cheaper to supply D via the gray marketer than to use the authorized channel. In a real life setting, D could be a country with very high tariffs that somehow can be circumvented by the gray marketer who imports from F into D.

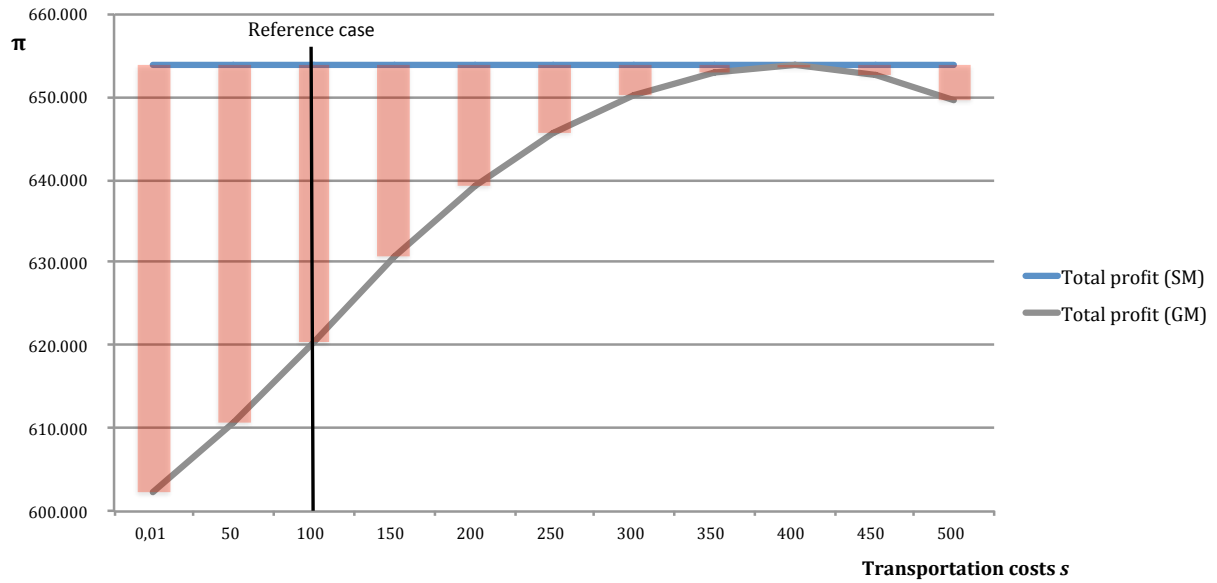
Yet the model misses a logical option. A manufacturer could also ship his authorized products to country F and then transport these further from F to D like the gray marketer does. Consequently, the manufacturer's transportation costs to D would be limited by the sum of the transportation costs to F and the gray marketer's costs, meaning $s^D \leq s^F + s$. With s and s^F being 100, the total profit in a gray market setting could not rise above the sealed market setting.

Even if I would not consider the previous objection, with transportation costs higher than 545, the model reaches parameter limitations in terms of negative profits in D.

Apart from this, I suggest to set the transportation costs as $s^D < s^F = s$ in order to transform Ahmadi and Yang in a reimport situation. As mentioned in 5.1, now the transportation costs s^D would occur within D and would most likely be smaller than the transportation costs to the foreign country F. Assuming this further limitation of s^D , Ahmadi and Yang's model would not show a gray market profit above the sealed market one.

Figure 12 illustrates the gray marketer's transportation costs.

Figure 12: Gray marketer's transportation costs and profits in Ahmadi and Yang

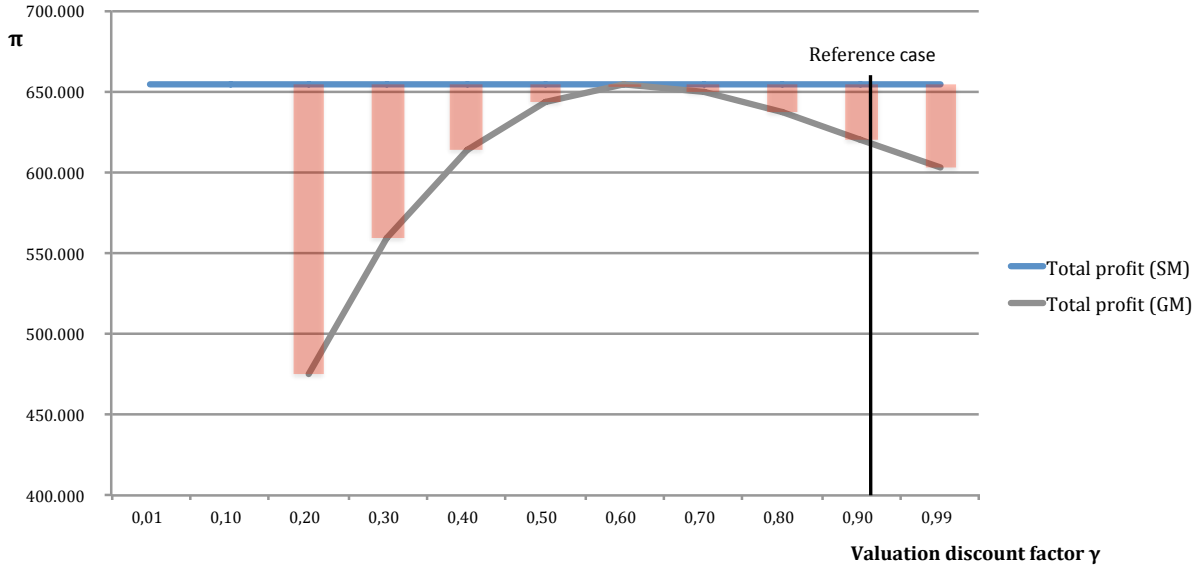


Due to the lack of a gray marketer, the sealed market profit is constant. Besides, the gray market profits are strictly lower than in the alternative case. Using this parameter range, the manufacturer constantly chooses to prevent the gray market. Thus, with a rising gray marketer's transportation costs, the gray marketer's retail price rises and the manufacturer can widen the price gap between the two countries. In other words, it gets cheaper to prevent the occurrence of the gray market. Therefore, the GM profit rises until the transportation costs reach approx. 400. After this point, a further increase reduces the multinational's profit. In my opinion, this reduction seems not logical, because the model still recommends preventing the gray market. A further increase should lead to the same profit as at 400, because the gray marketer has no incentive to enter.

Analyzing the transportation costs s^F does not yield any additional insights. With increasing s^F , both profits fall, while the sealed market case is strictly above the gray market alternative.

Figure 13 points out another interesting finding regarding the valuation discount factor.

Figure 13: Discount factor and profits in Ahmadi and Yang



Again, the profit in the sealed market case is strictly higher than the one in the gray market setting. At a first glance, the GM profit curve has a surprising trend. But the gray market quantity in Equation (31) shows that only a sufficiently large valuation discount factor can lead to a positive gray market quantity, because the receiving price including the discount γp_A^{GD} has to be higher than his costs $p_A^{GF*} + s$. So, with an increasing discount factor, it becomes more likely that a gray marketer gets active. However, it is important to point out that within the previously stated restrictions for the transportation costs s , s^D , and s^F , the sealed market is always favorable compared to the gray market setting.

Along the set of parameters in the reference case, the manufacturer strictly prevents gray markets in Figure 13. Due to the increasing gray market chance, it becomes more expensive to protect the market in D. The manufacturer must raise the retail price p_A^{GD} and reduce the price p_A^{GF} , resulting in a narrowing price gap. Of course, the lower retail price in D raises the authorized quantity in D. The higher price in F, decreases the quantity there. This smaller price gap seems to provide higher profits than a larger price gap, meaning the earlier price gap was not optimal. That is surprising because he should lose potential profits with a narrowing price gap and not gain additional. Consequently, this explanation contradicts the logic of Figure 13. Nonetheless, within the range of parameters in Figure 13, the manufacturer prevents gray markets and thus his profit is lower than the one in the sealed market setting.

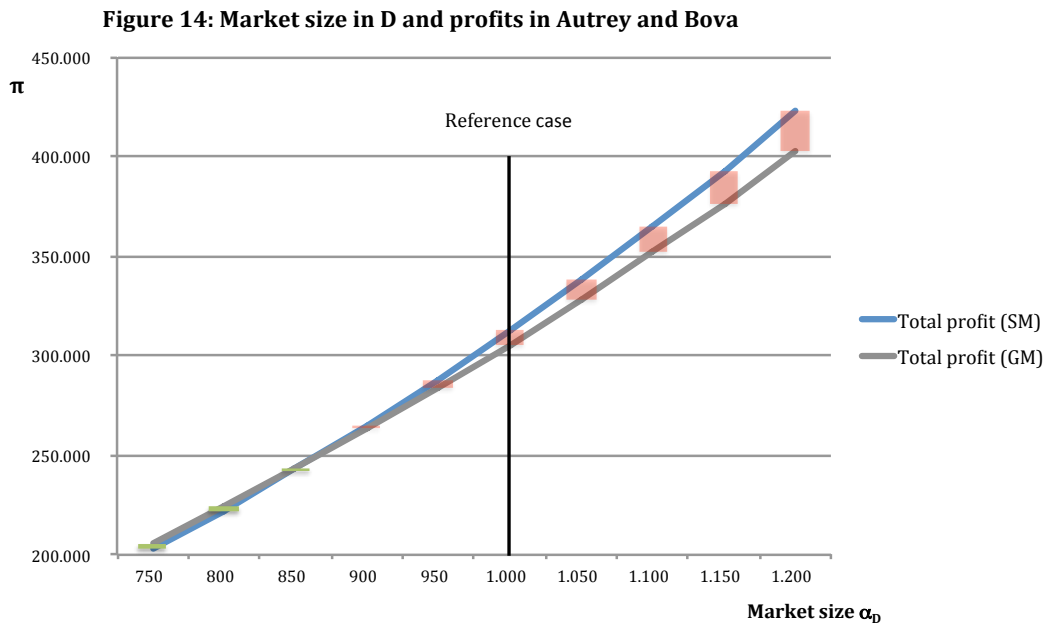
Even if I do not restrict the transportation costs s^D , the profits in the gray market setting could not rise above the sealed market. For example, assuming now $s^D = 400$ and the other parameters are equal to the reference case, an increasing substitution factor

would create a threshold at around $\gamma = 0,54$, where a gray marketer would get active. After this point, a further increasing substitution factor would reduce the manufacturer's total profit, because of higher cannibalization effects in D. In this case, with a very high substitution effect around $\gamma = 0,95$, the profit in D would even be negative, meaning the model reaches another model restriction.

Regarding the gray marketer's impact on the manufacturer's profit, Autrey and Bova find that a multinational firm can increase its profit through a gray market. However, this positive impact cannot be generalized for all model situations.

In order to analyze the manufacturer's profit, I present a reference case and vary the exogenous factors, market size and substitution effect, along a certain range. This range is chosen in such way that it contains the threshold when the profit in the gray market setting is better than in the sealed market. Concerning the reference case, I choose, as previously mentioned, the exogenous parameters $\alpha_D = 1000$, $\alpha_F = 500$, and $\gamma = 0,7$. This configuration describes a situation where the domestic market is twice as large as the foreign market and the gray market goods are not identical with the authorized product.

First of all, I vary the domestic market size α_D , which is illustrated in Figure 14.



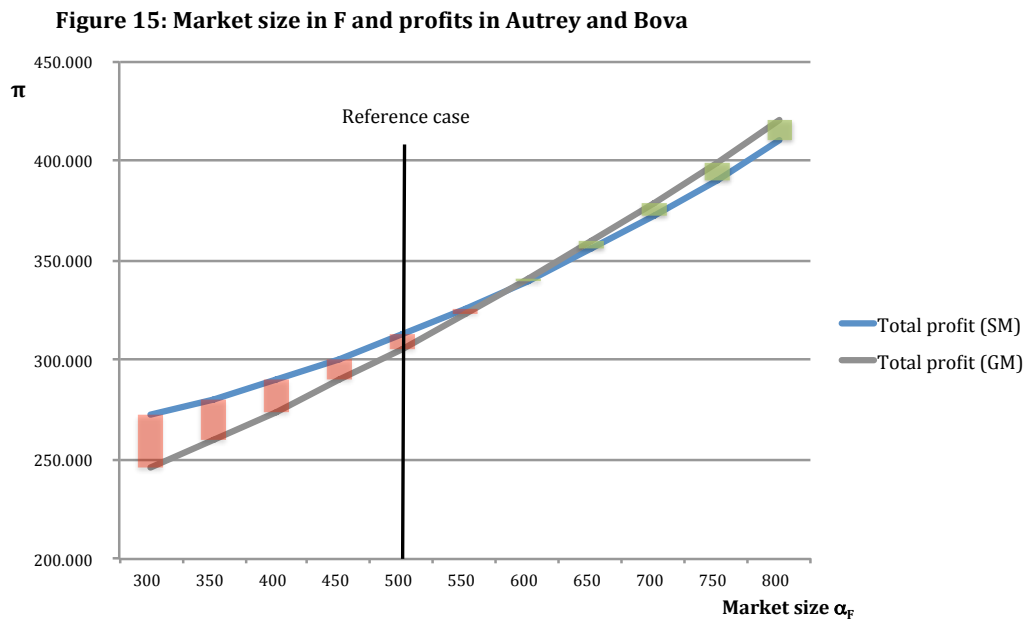
Beginning with a domestic market size of 750, the manufacturer's profit in a sealed market (SM) equals almost the profit in a gray market (GM). However, the latter is slightly above the other. Again, the positive difference in profit is marked green. This

advantage turns at 850. After this threshold, the sealed market profit is strictly higher than the GM profit including the reference case.

With increasing market size, the realizable profit in a SM setting rises faster than the one in the GM setting, thus the positive difference turns negative. This negative difference continuously increases until the domestic market is around 1600 or 3,2 times larger than the foreign market. This represents an upper limit, because after this threshold, the manufacturer would not enter the foreign country. This is an important finding, which also reflects observations in the automotive industry. Manufacturers often do not enter very small emerging markets, because of the price difference their profits are jeopardized by reimport.

The explanation for these findings is that with an increasing domestic market size, the price in D rises compared to F. As a result, the gray market's cannibalization effect increases with a larger price gap. Meaning that the same amount of gray market products leads to a higher loss in D. At the upper limit, the loss in D is higher than the subsidiaries profit in F. In other words, the domestic parents' sealed market profit is higher than the total profit in a gray market setting $\pi_0^D > \pi_0^{GD} + \pi_0^{GF}$, thus a manufacturer would not enter the foreign market at all.

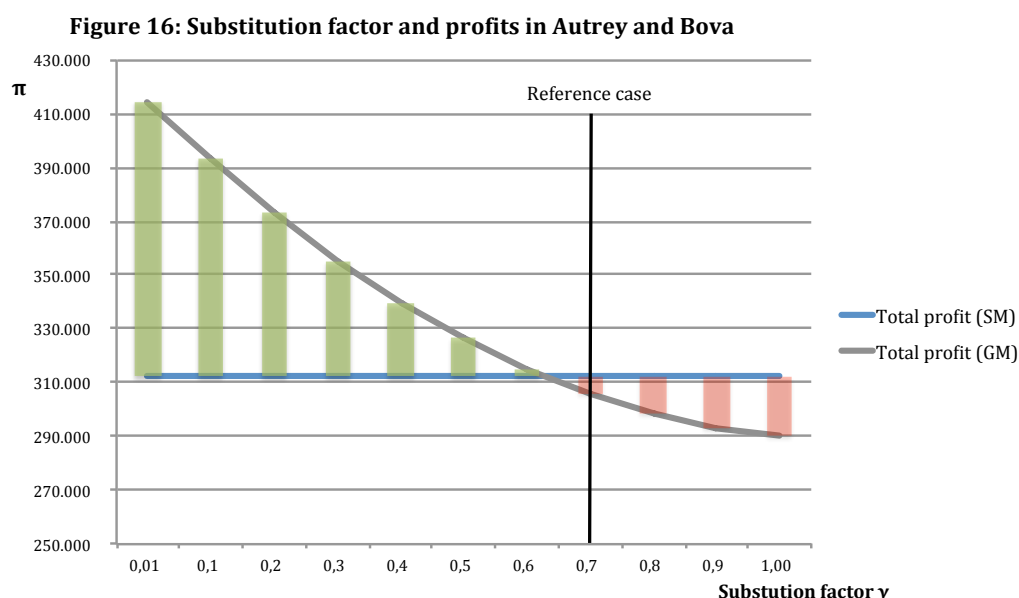
By varying the foreign market size in Figure 15, I find the similar logic as in the previous findings.



Here, I begin with a configuration in which the foreign market is too small to enter. Yet with an increasing foreign market size, the price gap between the foreign and domestic market narrows. The closer both countries are in terms of market size and thus prices, the more economically attractive is the gray market. The threshold, where the multinational's profit is in a gray market setting higher than in the sealed market, is approximately at 590. If the foreign market size gets too close to the domestic market, e.g. at about 850, the gray marketer is not active, because the foreign retail price is higher than the domestic one and thus he cannot realize any profits.

These findings confirm the previous ones. However, analyzing it this way, Figure 16 hints at a new aspect: the time component. At first, it seems not reasonable to enter the small foreign market, because the manufacturer's domestic profit is higher than the combined domestic and foreign profits in a gray market setting. Yet if this foreign market grows over time, from 300 to 800, the multinational can increase his profit compared to the sealed market. Even if it is not economically attractive to enter at first, with increasing size the foreign market gets beneficial and even more with a gray marketer.

In Figure 16, I analyze the substitution factor γ .



Beginning with a substitution factor close to 0, the manufacturer's profit is considerably higher in a gray market setting than in a sealed one. As mentioned in Chapter 2, most gray market products are also brand products and no counterfeits, thus they are not completely different products. With increasing similarity and therefore a raising

substitution factor, the multinational's profit decreases in a gray market setting. With increasing similarity, the cannibalization effect rises and the domestic parents profit decreases stronger.

Resulting from these findings, I can conclude that with a lower substitution factor, the market size difference can increase before a manufacturer will not enter in the foreign market at all. Using $\gamma = 1$, the domestic market can only be 1345 or 2,7 times bigger than the foreign market with 500. Substituting $\gamma = 0,7$, the domestic market can already be 3,2 times larger. Consequently, I can point out that the bigger the difference between the two markets is, the more crucial it becomes to differentiate the gray market good from the authorized product.

To sum up, both models support the finding that a manufacturer may increase his profit through gray markets. Yet only by allowing the gray market, a manufacturer has the opportunity to improve his economic situation. Besides, both models show that if the manufacturer prevents gray market, he always decreases his profit compared to the sealed market setting.

Regarding Autrey and Bova's model, I find that the higher the ratio domestic market to foreign market size is, the less beneficial the gray market is compared to the sealed market. The relationship also holds if it goes in the opposite direction. The closer the two markets are in terms of market size and prices, the less the cannibalization effect is and the more profitable gray markets are. Additionally, it shows that considering a growing foreign market, it could be beneficial to enter into a considerable smaller market. Further, the larger the market size gap is, the higher the degree of product difference should be between the authorized and gray market product.

I find partially similar results in Ahmadi and Yang's model. An increasing market size also leads to a higher disadvantage in the gray market setting, because the price gap between the two countries widens leading to higher cannibalization threat. Different results yield Ahmadi and Yang's model in terms of valuation discount factor, which can improve or lessen the manufacturer's profit. Considering the manufacturer's logical option to use the gray marketer's transportation route, the underlying reference case yields that a sealed market setting is always favorable over the gray market setting. This finding cast doubt on the condition whether a manufacturer should allow or prevent gray markets and on the resulting equilibrium prices.

5.5 Model extensions

As previously mentioned, both models implement strong assumptions such as monopolistic market structures, no tax rate differences or no government regulations. These assumptions are partially added to the basic models in the model extensions. Thus, I briefly go through the extensions' main findings and lastly comment on an aspect worth considering in further gray market models.

One aspect limiting the transfer pricing model is the restricted choice to set transfer prices. In Autrey and Bova's model, the multinational can choose freely, yet, for example in the OECD nations and the US, a multinational company is forced to set an arm's length transfer price. Autrey and Bova determine it as a price that the multinational would demand from an unrelated third party. They find that the resulting transfer price is strictly higher than the unrestricted transfer price in both sealed and gray market setting. Consequently, the mandatory arm's length price decreases the multinational's profit, because it forces him to deviate from his optimal transfer price.

Besides, Autrey and Bova also create a case with different tax rates across the two countries. Assuming a spread in tax rates, a manufacturer can shift profits to the country with the lower tax rate in order to save taxes. The authors find that the occurrence of gray markets is a counterforce that reduces the incentive to shift profits. If the foreign country offers a lower tax rate, a manufacturer could lessen the transfer price under the marginal costs to shift the profits to the foreign country. Yet in a gray market setting, the manufacturer could still choose a transfer price higher than the marginal cost. Otherwise a gray marketer would flood the domestic market with cheap gray market products.

Moreover, the assumptions regarding competition are reconsidered in both models. Autrey and Bova already incorporate in the basic model a potential upstream competition, meaning that the manufacturer can face competition in D. I left this part out in order to ease the comparison between the models. The authors find that with increasing competition in D, the transfer price can be lowered in the gray market setting. Two aspects are responsible for this reduction. First, with a highly competitive market in D, F becomes relatively more attractive. Second, the manufacturer must lessen the retail price in D, which narrows the price difference between the two markets. As a

result, the gray marketer's market power diminishes. In a perfect domestic market, the gray marketer's entrance has no influence on the multinational firm. In my opinion, this finding is correct in Autrey and Bova's quantity competition. Yet the anecdotal evidence mentioned in the second chapter shows that gray market products are usually imported at a discount. Consequently, the gray marketer would further lessen the retail prices.

Ahmadi and Yang extend their model by incorporating a case with multiple gray marketers. They point out that with an increasing amount of gray marketers, the authorized price gap between the countries narrows. Due to the competition among the gray marketers, the gray marketer's retail price is reduced. This will also lessen the retail price in D. In order to protect the domestic market, the manufacturer will increase the retail price in F.

Another interesting aspect is Ahmadi and Yang's extension with non-pricing instruments. This kind of control contains for example monitoring, severe fines, and additional product or service differentiation. The findings are that a manufacturer using these instruments can further widen the price gap. Moreover, the more effective the non-pricing method is, the wider the price gap can be.

By considering the gray market's conditions from 2.3, I find that both models together, including their extensions, cover almost all conditions. The main emphasized condition is the different prices due to market size or price elasticity. But as already mentioned, gray marketers can offer their products at a discount for different reasons. In some cases, gray marketers benefit from a lower cost base, because they free ride the authorized retailer's value-added service. Consequently, it seems reasonable to add a cost advantage in further research, because it would even further shrink the favorable price gap.

To sum up, a mandatory transfer price can limit the gray manufacturer's decision to set a transfer price and thus reduces his gray market potential. Further, a gray marketer can be a force to counteract the incentive to shift profits to the lower tax country F. Besides, both models incorporate some kind of competition. The competition in the transfer pricing model reduces the gray marketer's impact on the domestic parent. In contrast, the increasing number of gray marketers intensifies the gray market impact. Additionally, using non-pricing instruments, the manufacturer can increase his potential price gap. Yet considering a gray marketer's cost advantage would reduce this gap.

6 Conclusions

This thesis sheds light on two price coordination models which purpose is to control and to capitalize on gray markets. Both instruments describe a similar one-manufacturer, two-market and one-product situation. Further, they show that preventing gray markets through closing the price gap or not entering the foreign market at all, is always inferior to the sealed market case. In order to understand the intuition behind the models, I further consider the gray market's influence on quantity and profit.

Regarding the analysis of the gray market influence on sales, I find that both models have a similar way to incorporate the gray market quantity into the manufacturer's profit function. The gray marketer sources his products in F and imports them into D leading to a quantity increase in F and to a quantity decrease in D. However, the price effect on the sales volume plays a different role in those models. Using a reference case, I figure out that the price effect in Autrey and Bova's model has only a diminishing influence on sales. In contrast, in the retail price model, the price effect is stronger and turns the gray market effect upside down resulting in a decreasing quantity in F and an increasing quantity in D.

Scrutinizing the gray market's impact on the manufacturer's profit, I find that with similar market sizes in F and D or a small substitution factor, in Autrey and Bova's model, the gray market setting is favorable over the sealed market. Additionally, I highlight that a manufacturer should consider the time component in his decision whether to enter the market in a foreign country or not. With a growing foreign market, a previously adverse market proportion can turn into a profitable one and even to a more favorable one in a gray market setting. Concerning Ahmadi and Yang's model, high transportation costs to the country D can result in a gray market advantage. However, taking the logical option into account that a manufacturer can substitute the product's transport to D with the transport to F in combination with the gray marketer's transport to D, the multinational company cannot profit from a gray market in the analyzed case. This finding challenges the general condition in Ahmadi and Yang's model when a manufacturer should allow or prevent gray market goods.

Further research should analyze this important condition including the resulting equilibrium retail prices in more detail. Moreover, it seems reasonable to incorporate a gray marketer's cost advantage, because he exploits the product's value-added service

without investing in it. Gray markets provide interesting findings, which might also be transferred to the more general issue on intra-brand competition.

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Appendix

German Abstract

Diese Masterarbeit untersucht wie internationale Unternehmen effektiv Graue Märkte steuern können. Graue Märkte entstehen, wenn ein unautorisierter Händler ein originäres Markenprodukt zu einem niedrigen Preis in einem Land kauft und es dann zu einem höheren Preis in einer anderen Nation wieder verkauft.

Die Motivation dieser Arbeit folgt aus der immensen Bedrohung der Grauen Märkte und ihrer Folgen für Unternehmen aus verschiedensten Industrien. In 2003 hat KPMG bereits den Umsatz in den Grauen Märkten, allein in der IT Industrie, auf USD 40 Milliarden geschätzt und den daraus erfolgenden Gewinnverlust mit USD 5 Milliarden beziffert (KPMG, 2003). Forscher behaupten, dass Graue Märkte die Unternehmensergebnisse, durch beispielsweise die Untergrabung von geografischer Preisdiskriminierung und durch die Verwässerung von Premiummarken, gefährden können (Cespedes et al., 1988; Anita et al., 2004). Jedoch wird von anderen Autoren hervorgehoben, dass Graue Märkte zusätzliche Chancen wie weitere Vertriebskanäle und höhere Umsätze ermöglichen (Autrey and Bova, 2012).

Aufgrund dieser widersprüchlichen Erkenntnisse werden in dieser Masterarbeit zwei Modelle vorgestellt, die analysieren, wie Unternehmen kontrolliert Graue Märkte lenken und Gewinnpotentiale ausnutzen können.

In dem Model nach Ahmadi und Yang (2000) koordiniert ein Hersteller zentral die Verkaufspreise in den beiden betrachteten Ländern, um dadurch bewusst die Preislücke zwischen den Nationen zu schließen oder zu öffnen. Dies wiederum beeinflusst die Gewinnspanne des unautorisierten Verkäufers und seine Entscheidung, ob er aktiv wird oder nicht.

Dagegen lenkt in Autrey und Bova's Modell (2012) der Hersteller mit Hilfe von Verrechnungspreisen die Erscheinung von Grauen Märkten. Durch eine Erhöhung des Verrechnungspreises steigen die Kosten für das Tochterunternehmen, welches dadurch wiederum einen höheren Verkaufspreis im ausländischen Markt setzen muss. Zu diesem erhöhten Marktpreis kauft der unautorisierte Händler seine Produkte ein und importiert diese nun, mit einer für ihn ungünstigeren Ausgangsposition, ins Herstellerland.

In beiden Modellen maximiert der Hersteller seine Gewinnfunktion unter Berücksichtigung von Grauen Märkten. Die Modelle zeigen, dass durch die Entscheidung

Graue Märkte zu verhindern, durch das Schließen der Preislücke oder durch das Nichteintreten in den ausländischen Markt, der Hersteller stets schlechter gestellt wird als in einer Situation ohne unautorisierte Hersteller. Um die Mechanismen der beiden Modelle besser zu verstehen, wird der Einfluss der Grauen Märkte auf die Menge und den Gewinn des Herstellers genauer analysiert.

Betrachtet man zuerst die Verkaufsmenge des Herstellers in den beiden Märkten so zeigt sich, dass beide Modelle einen ähnlichen Mengeneinfluss aus den Grauen Märkten ableiten und diesen auf gleiche Weise in die Gewinnfunktion des Herstellers integrieren. Jedoch sind die Preisänderungen, welche durch die Grauen Märkte ausgelöst werden, in den betrachteten Modellen unterschiedlich stark. Bezogen auf das Modell von Autrey und Bova, verringert der Preiseffekt in dem analysierten Fall den Mengeneffekt in den beiden Ländern jeweils nur leicht. Hingegen dreht der Preiseffekt in Ahmadi und Yangs Modell den Mengeneffekt sogar um.

Eine genauere Analyse der Gewinne ergibt, dass in dem Verrechnungspreismodell mit annähernden Marktgrößen und mit kleiner werdendem Substitutionsfaktor, die Situation mit Grauen Märkten für den Hersteller vorteilhafter ist als ohne. Außerdem lässt sich die Wichtigkeit einer Zeitkomponente herausheben. Es kann gezeigt werden, dass eine zunächst richtige Entscheidung in einen Markt nicht einzutreten, umgedreht wird, falls ein Marktwachstum über die Zeit angenommen werden kann. Mit noch stärkerem, ausländischem Marktwachstum wird durch Graue Märkte sogar ein Vorteil geschaffen, da sich nun die Marktgrößen wieder annähern.

In Ahmadi und Yangs Modell sind Graue Märkte nur dann für den Hersteller von Vorteil, wenn die Transportkosten in das Land D besonders hoch werden. Betrachtet man jedoch die logische Option, dass der Hersteller die Transportkosten nach D umgehen kann, dann sind in dem analysierten Fall Graue Märkte nicht vorteilhaft. Dazu muss der Hersteller das Gut für D zuerst nach F transportieren und dann denselben Transportweg wie der unautorisierte Händler nutzen.

Diese Erkenntnis fordert die Bedingung in Ahmadi und Yangs Modell, nach welcher der Hersteller Graue Märkte erlaubt oder blockiert, heraus.

Deshalb empfiehlt es sich in weiteren Forschungsarbeiten diese entscheidende Bedingung sowie die daraus folgenden Gleichgewichtspreise genauer zu analysieren. Zusätzlich erscheint es sinnvoll, den Kostenvorteil eines unautorisierten Herstellers, der nicht in wertschöpfende Dienstleistungen investiert, zu berücksichtigen.

Curriculum vitae

PROFESSIONAL EXPERIENCE

01/2013 - 08/2013	CMS Reich-Rohrwig Hainz Legal Advisors Part-time job; Assistant to Managing Partner <i>Supporting special projects such as preparing a M&A study, corporate analyses, and market forecasts</i>	Vienna
01/2012 - 12/2012	CMS Reich-Rohrwig Hainz Legal Advisors Part-time job; Business Development Analyst and over a period of three months stand-in of Head of Business Development <i>Preparation of international pitch documents to acquire clients; International coordination, scheduling; Preparation of all international Directory Submissions (Legal rankings); Installing and maintaining a data basis for references</i>	Vienna
03/2011 - 09/2011	BMW South Africa Internship; Production and Plant Control <i>Develop new control systems to track investment targets and currency exchange rate effects; Control project budget and preparation of status reports for senior management meetings; Involvement in the methodological and conceptual further development of existing control processes, and instruments</i>	Rosslyn/ Pretoria
05/2010 - 09/2010	BMW Automotive Bachelor thesis; Production Planning and Controlling <i>„Empirical and theoretical analysis of deviations MTM-based targets in the engine assembly line“. The thesis aimed to develop a Excel based calculation in order to measure and optimize complexity in a flexible engine assembly line with more than 800 engine variations (BMW rating: 1.3)</i>	Munich
01/2009 - 12/2009	BMW Motorcycle Working student; Product and Project Controlling <i>Benchmarking and manufacturing cost analyses; Preparing Excel tools e.g. project calculations based on Net Present Value and ROI as well as contribution margin calculations for optional equipment and various packages</i>	Munich

ACADEMIC EXPERIENCE

03/2012 - 03/2014* (*Expected end)	University of Vienna – Economics and Business Department Master of Science in Business Administration <i>Major fields of study are Managerial Accounting (Controlling) and Innovation & Technology</i> Current average grade: 1.26 (approx. A-)	Vienna
08/2010 - 01/2011	San Diego State University Semester abroad Overall average grade: 1.7 (approx. B+)	San Diego
10/2007 - 01/2011	Ludwigs-Maximilians-University Bachelor of Science in Business Administration <i>Majors Finance and Accounting</i> Overall average grade: 2.1 (approx. B; within the best 25% of the graduated students)	Munich
09/1997 - 07/2006	Albert-Einstein Gymnasium A levels <i>Major subjects: Mathematics, Physics, English, German, and Sports</i> Overall average grade: 1.8 (approx. B+)	Ravensburg

OTHER EXPERIENCE

10/2007 - 09/2009	Companion for a young boy with Down's syndrome	Munich
09/2006 - 09/2007	Gemeinsam Leben Lernen e.V. Mandatory Civil Service <i>Scheduling excursions and supporting teenager with disability</i>	Munich

LANGUAGES, IT-KNOWLEDGE AND INTERESTS

German:	<i>Mother Tongue</i>	Software Expertise:	<i>Excel, PowerPoint, Word, VBA, SAP</i>	Sports:	<i>Soccer, Riding Motorcycle, Fitness</i>
English:	<i>Fluent</i>				
French:	<i>Basics</i>				