An Empirical Investigation of Online Gray Markets

Kexin Zhao[1]

Email: kzhao2@uncc.edu

Department of Business Information Systems and Operations Management

University of North Carolina at Charlotte

9201 University City Blvd, Charlotte, NC 28223

Phone: 704-687-7637

Xia Zhao

Email: x_zhao3@uncg.edu

Department of Information Systems and Supply Chain Management

University of North Carolina at Greensboro

PO Box 26170, Bryan 479, Greensboro, NC 27402

Phone: 336-256-8588

Jing Deng

Email: jing.deng@uncg.edu

Department of Computer Science

University of North Carolina at Greensboro

167 Petty Building, Greensboro, NC 27402

Phone: 336-256-1112

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1 Corresponding author

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Abstract

A gray market is an unauthorized distribution channel of genuine branded products. Worldwide gray markets compete with authorized distribution channels of branded products and pose significant challenges to brand owners on the management of global supply chains. Therefore, it is important for brand owners to understand sellers' and buyers' behavior in gray markets in order to better address this threat. In recent years, online gray markets, a rapidly growing form of gray marketing, have seen significant growth and provide us an unprecedented opportunity to empirically investigate this phenomenon. In this study, we tracked the number of online gray market sellers and transactions on the largest Internet retail website in China for a 34-week period. We focus on two channel control strategies that brand owners can proactively adopt to manage online gray market incidents: controlling product availability and pricing. The results show that less expensive styles are offered by a larger number of gray market sellers and have more transactions. While product availability is positively associated with the number of online gray market sellers, its impact on online gray market transaction quantities is insignificant. This study provides important implications on managing global supply chains that are relevant for researchers and practitioners alike.

Key words: Online gray markets, unauthorized channels, luxury goods, product availability, pricing

INTRODUCTION

Customers purchasing multiple units of the same Coach handbag style may be questioned or banned from making future transactions at a particular retail store (Sherman et al. 2011). The reason is that Coach, like many luxury brands, has a policy on quantity limits that restricts the number of similar items that an individual customer may purchase. It is odd that retailers envision the need for such a policy of limiting purchases of designer handbags because a single consumer would rarely want to buy multiple units of the same handbag style. This policy is actually devised by brand owners as a means to control gray market incidents (Wilson 2008).

Gray markets refer to "the sale of genuine trademarked products through distribution channels unauthorized by the manufacturer or brand owner" (Antia et al. 2006, pp. 92). In this study, we investigate the case of designer handbags having official prices in the origin country that are lower than prices in the export country. Specifically, gray market sellers buy handbags at the retail price from the origin countries such as the US and then resell them in Asia via e-commerce websites to make a handsome profit. One example of this phenomenon has been seen on Taobao.com, China's equivalent of Amazon, where the top two guests on the VIP list of LV's Galeries Lafayette location regularly resell LV handbags (Wilson 2008). Gray market incidents are not limited to designer handbags; they thrive in a wide variety of product categories, ranging from lumber, electronic components, broadcast signals, IPOs, automobiles, heavy construction equipment, watches, cosmetics, health and beauty aids to prescription drugs (Antia et al. 2004). In fact, worldwide gray markets were estimated to run over $40 billion in revenue each year (Kotler and Keller 2008).

Advances in information technology have been fueling the growth of online gray markets (Bandyopadhyay 2010). Unlike offline gray marketing, the online form has very low entry barriers—individuals can easily establish online retail stores and reach out to a wide range of consumers to sell gray market products. For example, it is free to start a business on Taobao.com. Online gray markets considered in this paper differ from the traditional offline gray markets in two additional ways. First, sellers in online gray markets are typically individuals who buy the products from authorized retailers at retail prices in the origin country. By contrast, traditional offline gray marketers tend to be wholesalers or retailers who buy the products from manufacturers at wholesale prices. Consequently, there is no contractual relationship between brand owners and online gray marketers. Second, the online gray marketers list the products on an e-commerce website, directly targeting individual consumers in the export countries, whereas the traditional offline gray marketers normally divert or transship products into the export countries and sell those products to local retailers for resale to local consumers[1].

There are two main sources for price gaps across different geographic regions. First, imported products are subject to duties and taxes imposed by the import countries. Second, brand owners strategically set prices according to varying local conditions, such as local competition, customer heterogeneity, and perceived premium brand positioning (Onkvisit and Shaw 1989). For example, in our dataset, the Coach Madison Sophia Satchel handbag was sold at $298 in the US in 2011. Taking account of an import duty rate of 10% and a value-added tax rate of 17%[2], the same handbag would have been priced at $383.5. However, its official Chinese price was around $603 (3800 CNY) during the same time period, based on the exchange rate between US and

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[1] We would like to thank one anonymous reviewer for the insightful comments on the differences between the traditional offline gray market and the online gray market.

[2] The duty and taxes rates were obtained from www.dutycalculator.com.

China. The price difference of $219.5 is higher than the average handling and international shipping costs that Coach would incur for a handbag, reflecting that Coach intentionally differentiates the prices across different geographical regions. This example suggests that there is still room for online gray marketers to arbitrage these products.

Online gray market incidents may negatively impact brand owners in both the original country and export country. First, in the origin country, branded products often have limited supply and regular legitimate customers may have difficulty in acquiring the products from the authorized channels because of the competition from gray marketers. Second, in the export country, online gray market products could cannibalize the market of authorized channels. Brand owners, however, cannot apply standard sanctions to online gray marketers due to the lack of contractual relationships between these two parties. As a result, the rising of online gray markets may lead to a financial loss to the authorized distributors and subsequently damage brand owners' relationship with their authorized distributors. Therefore, it is critical for brand owners to closely monitor and control online gray market activities (Antia et al. 2004).

Despite the rising practical relevance of online gray marketing, related academic research is quite limited (Antia et al 2006). Our research aims to expand the understanding of online gray market behavior. Prior studies suggest that gray market incidents are most likely to occur under two conditions. First, the product has a prominent brand name (Bucklin 1993); and second, the price gap is large between two geographic regions (Onkvisit and Shaw 1989). Luxury handbags satisfy both conditions, making them an excellent choice for our study. We developed a web crawler to automatically track the number of gray market sellers and transactions on the largest Internet retail website in China for a 34-week period. To the best of our knowledge, our paper is among

4

the first to collect online gray market data on a large scale and to empirically examine market dynamics.

Prior literature largely considers the price gap as the primary cause of gray market incidents. However, in addition to pricing decisions, brand owners could also control product availability by strategically selecting products sourced to the export country. Although a key proactive strategy that brand owners could adopt, the approach of controlling product availability has been under-studied. For instance, it is unclear whether or how online gray market buyers and sellers would react to the product availability decision made by brand owners. Moreover, for products not available in the export country via the authorized channel, the price gap is non-existent. Without explicit price arbitrage opportunities, what are the drivers of online gray market activities for those products? To answer these questions, we explore two strategies available to brand owners, pricing and controlling product availability, and their joint impact on online gray markets.

Our analyses reveal some interesting empirical findings. We find that product availability only affects the market entry decisions of online gray market sellers but not buyers. Specifically, product availability is positively associated with the number of online gray market sellers, but its impact on online gray market transaction quantities is insignificant. We then separate the data into two subsamples, one for products available via authorized channels in the export country and one for unavailable products. For products available in the export country, our results confirm the arbitrage theory in prior literature (Antia et al 2006; Ahmadi and Yang 2000): sellers make their online gray market entry decision based on the arbitrage potential suggested by the price gap. However, for products unavailable in the export country, price gaps no longer exist

and official prices in the origin country become an important reference in sellers' online gray market entry decisions. Online gray market sellers are more likely to offer less expensive products among those of the same brand. Interestingly, neither price gaps nor official prices in the origin country directly affect transaction quantities in the online gray market. Nevertheless, the results show a positive reinforcement effect between the supply and demand sides of the online gray market. That is, more online gray market sellers in the previous period lead to more online gray market transaction quantities in the current period, and vice versa. Our findings suggest that brand owners can control the online gray market sellers to some extent but have very limited direct control over the online gray market transaction quantities. However, they can indirectly impact online gray market transaction quantities by influencing those sellers.

The remaining of the paper is organized as follows. In the next section, we review the related literature and identify potential research gaps. The hypotheses section develops theoretical arguments for hypotheses proposed in our model. The research context and data section describes our research background, data source, and data collection procedures, followed by our findings in the analysis and results section. Lastly, we conclude the implications of this study for theory and practice, its limitations, and avenues for future research.

RELATED LITERATURE AND RESEARCH GAPS

This study relates to one stream of literature that analytically examines the impact of gray markets on brand owners' profits (e.g., Ahmadi and Yang 2000; Ahmadi et al. 2010; Autrey and Bova 2012). It considers several factors that affect the profit allocation between brand owners and gray marketers, including the number of parallel importers (Ahmadi and Yang 2000),

transaction costs (Xiao et al. 2011), demand uncertainty and excessive inventory (Ahmadi et al. 2010), the nature of market competition (Autrey and Bova 2012), and consumer price elasticity (Iravani et al. 2011). Ahmadi and Yang (2000) find that gray markets may increase brand owners' profits because brand owners can leverage gray markets to differentiate the branded products and can exercise price discrimination. Ganslandt and Maskus (2004), Bucklin (1993) and Coughlan and Soberman (1998) have also investigated the gray market issues using the lens of price discrimination and have examined how brand owners may exploit these opportunities. Ahmadi et al. (2010) show that the existence of the gray market may benefit or harm brand owners—the gray market creates additional demand for brand owners but also brings potential costs and risks. These papers use analytic models to investigate brand owners' and gray market sellers' strategic decisions. Our study empirically explores factors affecting the degree of online gray market activities. Findings from our research can be utilized to refine theoretical models. For example, the price gap is considered the only primary cause of the existence of gray market sellers (Ahmadi and Yang, 2000, Onkvisit and Shaw 1989). However, our research suggests that product availability should also be considered when analyzing gray market sellers' decisions.

Another stream of literature has used survey data to examine the drivers and deterrents of gray market incidents (Antia et al. 2006; Myers 1999). Antia et al. (2006) examine the relationship between the manufacturer's enforcement behavior and gray market activities. They consider a broader notion of enforcement that comprises severity, certainty, and speed. Myers (1999) surveys export managers of manufacturing firms and investigates organizational-level, control-level and market-level factors that drive gray market activities. He identifies several factors, such as decision right allocation, product standardization, channel integration and channel controls, all

of which impact gray market activities. While prior literature relies on managers' perception to measure the degree of gray market incidents, our study uses more objective measures, such as the number of gray market sellers and transactions from a large e-commerce website, to quantify online gray market activities.

Consumer behavior in gray markets has been under-studied in the prior literature. Studies suggest that channel authorization affects consumers' attitude towards gray market goods (Huang et al. 2004; Lee 2006). For instance, most consumers are cautious of risks associated with unauthorized channels. Therefore, interventions could be introduced to control gray market incidents from a demand perspective. While prior studies focus on consumers' perceptions or purchases intention, we track consumers' online gray market transaction records to examine their actual buying decisions. Prior literature has shown that consumers perceive gray markets to be associated with lower prices and higher risks (Cespedes et al. 1988; Duhan and Sheffet 1988). In our study, in addition to the price construct, we examine whether product availability affects consumer purchase behavior. We expect that product availability in the local authorized channel can reduce risks that consumers perceive in the online gray market, as we explain in detail later in the following hypotheses section.

HYPOTHESES

This study focuses on identifying key factors that affect the degree of online gray market activities for a branded product. The dependent variables concern the degree of online gray market activities. In the case of luxury handbags, a selling incident occurs when a seller lists a handbag for sale on the e-commerce website and a buying incident involves a successful

transaction in which a buyer purchases one or more listed handbags. Therefore, we use the number of sellers and transaction quantities for a handbag style to represent the degree of online gray market activities on the supply and demand sides, respectively. By investigating both selling and buying activities, we can better understand market dynamics and the supply and demand interactions.

Prior literature has identified many drivers of gray markets, and we briefly categorize them into market environment (e.g., diversity and volatility), consumer characteristics (e.g., price elasticity, heterogeneity, and attitudes towards gray markets), and organizational decisions (e.g., enforcement, pricing, product offering) (Antia et al. 2006; Iravani et al. 2011; Myers 1999). Because data collection is very time-consuming in this study, we have chosen to focus on one brand of handbag. Since the market environment and consumer segments are similar within the same brand, this study focuses on the impact of organizational decisions. Brand owners can make organizational decisions at either the brand level or the style level (Jaworski et al. 1993). At the brand level, they can use enforcement to deter gray marketing (Antia et al. 2006) or control their distribution channels (Myers 1999). At the style level, they can control product availability and prices. Our dataset containing hundreds of luxury handbag styles offered by the same brand owner enables us to examine organizational decisions at the style level. Specifically, we investigate the impact that product availability in the export country and pricing decisions have on online gray market activities. We also control a variety of compounding factors such as product popularity, product features such as size, color, and release time, and reaction effects between online gray market buyers and sellers.

Product Availability

When entering a new geographic market, brand owners need to strategically decide whether or not to make a product available in its official retail channel. We observe that a product available in the origin country may not be offered in the export country. Differentiation of product availability is a proactive strategy that brand owners may use to combat gray market goods (Berman 2004). Product availability in the local authorized channel influences competition between the online gray market and the authorized channel. It also affects online gray marketers' free riding opportunities on brand owners' marketing efforts. Therefore, we expect that this type of product differentiation strategy would impact online gray market activities.

Based on product availability, there are two different types of gray marketing. In one type of gray marketing, the styles are not offered in the official distribution channels in the export country but are available to consumers in the gray market. In the other type of gray marketing, the styles are available in both the official distribution channels in the export country and in the gray market. The first type of gray marketing could meet buyers' demand unfulfilled by brand owners' official channels, as well as offer buyers a sense of exclusivity since others cannot get those styles locally. At the same time, online gray market sellers who offer unavailable styles do not face direct competition from the brand's authorized channels. However, consumers may be concerned about the quality and authenticity of gray market products and consider gray market purchasing as risky behavior (Lee 2006; Chen 2007). They may be reluctant to buy products not carried and supported by brand owners in their own country. In the second type of gray

marketing, price gaps exist between the official channels in two geographic regions and there are price arbitrage opportunities[3].

Product availability also offers online gray marketers free riding opportunities, since they can benefit from marketing efforts that brand owners and authorized distributors invest in to promote styles available in the export country (Antia et al. 2006). When a brand owner offers a style in the export country, it often promotes it using various approaches, such as TV advertising, online marketing campaigns, and in-store displays. These efforts are vulnerable to appropriation by online gray market sellers (Anderson and Weitz 1986). For instance, a style's market visibility and desirability may increase if the brand owner showcases it in its retail stores' shop windows or displays it on the homepage of the company websites in the export country. Online gray market sellers can benefit from the improved market recognition at no cost. They can also free ride on pre-sale and other services, such as product demonstration and education, provided by brand owners (Knoll 1986). In addition, brand owners' market research on understanding of consumer preferences in different geographic regions may also benefit online gray market sellers, since products offered by brand owners in the export country potentially face higher demand. Online gray market sellers can free ride these research, marketing, and service efforts associated with product availability and capitalize on the demand they create. Such free-riding potential is non-existent for styles not offered in the export country (Antia et al. 2006).

Product availability in the authorized channel may also benefit gray market buyers for several reasons. First, consumers have the opportunity to closely inspect available styles before purchasing them from an online gray market. For instance, if consumers want to buy a particular

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[3] We would like to thank one anonymous reviewer for the insightful comments on the different types of gray marketing caused by product availability.

handbag style, they can go to an authorized retailer store to take a look, try it on, and consult the sales representative. Consumers can also find detailed descriptions and specifications of the style in their native language on the brand owner's website targeting the consumers in the export country. These benefits are obviously non-existent if the style is not available in the export country. Second, availability in authorized channels may help increase products' value perceived by consumers. Consumers may gain higher conspicuousness value if a style is offered by brand owners in their own country. Availability via authorized channels leads to increased market recognition (Wiedmann et al. 2007), thus consumers can more effectively signal their economic power or social status by publicly carrying these styles (Han et al. 2010). Therefore, we hypothesize:

H1a: A product's availability in the authorized channels is positively associated with the number of its online gray market sellers in the export country.

H1b: A product's availability in the authorized channels is positively associated with its online gray market transaction quantity in the export country.

Pricing Decisions

Based on product availability, there are two groups of online gray market products in the export country: products that are available in the authorized channel and those that are not. For products in different groups, online gray market sellers and buyers face different types of prices when making their market entry decisions. We first discuss the impact of the official prices in the origin country, which is common to both groups. Then we discuss the role of the price gap, which is applicable only to products available in the export country's official channels.

Official Price in the Origin Country

The official prices in the origin country represent online gray market sellers' sourcing costs and also reflect potential risks associated with online gray market activities. Online gray market sellers face risks of unsold products (Padmanabhan and Png 1997). Even though sellers can return the products they bought at retail prices back to authorized retailers, there is usually a limited time window. The cost of returning is also elevated once the product has been relocated to another country. Thus, the risk of unsold products is higher when gray market sellers are handling more expensive products. Higher product prices are associated with larger potential losses (Peter and Ryan 1976). Furthermore, higher prices require larger capital investments, which create higher market entry barriers for sellers (Porter 1980). Online gray market sellers are often individuals or small businesses with budget constraint. They may not be able to afford upfront costs of acquiring the more expensive products from the origin country. It is possible that some online gray marketers choose to acquire the product after receiving orders from their customers. However, luxury products, especially more expensive items, are usually in a limited supply due to exclusivity created by brand owners (Brun and Castelli 2013). It is likely that scarcity of the product delays or prevents these gray marketers from acquiring the products. While these sellers may avoid unsold loss, they have to deal with low customer satisfaction because of shipping delay or unfulfilled sales orders.

On the demand side, online gray market consumers face purchasing risks associated with the lack of channel authorization, such as unreliable guarantees, the lack of manufacturer warranty, and the unavailability of after-sale service (Huang et al. 2004; Lee 2006). Such risks increase with a product's price level, which may cause consumers to avoid big-ticket items in online gray markets. Moreover, consumers who can afford more expensive products are more likely to have

lower price sensitivity (Lee 2006). Being less sensitive to prices, these consumers have a stronger preference for authorized channels that allow them to avoid the aforementioned purchasing risks associated with gray markets (Ahmadi and Yang 2000; Xiao et al. 2011). Studies have also shown that the perception of cost saving might decrease as the price level increases. The Weber-Fecher law of psychophysics suggests that increasing the magnitude of the original stimulus leads to less noticeable difference (Grewal and Marmorstein 1994). For instance, a $10 savings on a $20 product may be perceived as more valuable than a $10 savings on a $200 product. So, consumers who can afford more expensive products may not value the potential savings from gray market channels as much as other consumers. Consequently, more expensive products may attract fewer buyers in gray markets.

In addition, the law of demand suggests that the quantity demanded increases as the price of a product decreases (Hicks 1956). This is especially true for luxury products. The average annual income of a Chinese family was about $2,100 in 2012, when data were collected for our study (Wong 2013). Within the same brand, lower priced luxury handbag styles would be more appealing and affordable to many Chinese consumers. By the same token, online gray market sellers are more likely to source lower priced styles due to their larger potential market demand.

Therefore, we propose the following hypotheses.

H2a: A product's price level in the origin country is negatively associated with the number of its online gray market sellers in the export country.

H2b: A product's price level in the origin country is negatively associated with its online gray market transaction quantity in the export country.

Price Gap

For products available in the export country, there are price gaps between the origin and export countries. A price gap is the difference between a product's official price (i.e., the price in the authorized channels) in the origin country and that in the export country. The existence of price gaps can be attributed to many factors, such as luxury taxes, tariffs, or divergent local markets. Larger price gaps may lead to more earnings for the sellers and more savings for buyers, and consequently increase the number of gray market incidents.

Sellers enter gray markets to take advantage of the arbitrage opportunity arising from a product's price gap (Ahmadi and Yang 2000). Online gray market sellers acquire products from the authorized channels in the origin country. In the export country, they have to mark their prices lower than authorized distributors to lure customers from authorized channels to the online gray market. Prior analytical research confirms that the gray market price and gray market seller's profit depend on prices in both the origin and export countries (Ahmadi and Yang 2000). A larger price gap gives gray market sellers more flexibility to price the product and may result in a higher profit margin. For a product with a larger price gap, online gray market sellers expect to gain more and therefore are more likely to enter the market.

On the demand side, consumers are also more likely to buy gray market goods if the price gap between the origin and export countries is large (Xiao et al. 2011). The higher price gaps allow the sellers to offer larger price discounts to consumers. So, these higher savings associated with larger price gaps may motivate consumers to enter online gray markets. We therefore hypothesize that:

H3a: A product's price gap between two countries is positively associated with the number of its online gray market sellers in the export country.

H3b: A product's price gap between two countries is positively associated with its online gray market transaction quantity in the export country.

In addition to channel control variables, we observe two additional market-level factors that could potentially affect the degree of online gray market activities. We next discuss the impact of these factors on the number of online gray market sellers and on transaction quantities.

Product Popularity: Gray markets may exist only if there is real market demand for branded products in the export countries (Antia et al. 2006). Product popularity is an indicator of market awareness and interest (Tucker and Zhang 2011). We expect that popular products are attractive to both online gray market sellers and buyers. For sellers, it is more likely that they will successfully sell popular products due to a large consumer base. In addition, authorized distribution channels may be unable to meet demand for popular products in the export countries, leading to a larger number of consumers being diverted to gray market channels (Antia et al. 2006). On the other hand, consumers are more likely to acquire popular products, since product popularity can serve as a quality signal (Szymanski et al. 1993) that helps mitigate uncertainty that consumers have when they choose products (Howard and Sheth 1969). In addition, consumption of popular luxury products has social implications to consumers (Wiedmann et al. 2007; Dion and Arnould 2011). Handbags are conspicuous products carrying conspicuous value because their usage is publicly visible (Zhou and Wong 2008). Asian consumers often prefer popular products because such products have higher market awareness that helps improve the dream value of the products (Phau and Prendergast 2000).

Interplay of Gray Market Sellers and Consumers: Online gray markets have high information transparency due to enhanced accessibility and availability of online market information (Lynch and Ariely 2000). As a result, sellers and buyers can better observe and react to one another's activities. On the supply side, online gray market sellers estimate market demand to optimize their sourcing and pricing decisions based on their observation (Iravani et al. 2011). If sales of a product are observed to be high in the previous time period, existing sellers are more likely to keep offering them and new sellers may want to enter the market to capitalize the current trend. On the demand side, online gray market buyers' decisions are affected by the sellers' behavior in two ways. First, a product's market visibility may increase if there are more sellers offering it. A product listed by 200 sellers will have a better chance to be viewed by buyers than the one listed by only two sellers. Such market visibility is likely to drive future purchase. Second, online sellers are heterogeneous in terms of their listing prices, reputation scores, and service (Ghose 2009). If a product is provided by more sellers, a buyer has a better chance to identify a potential seller that matches her preferences. Thus we expect that online gray market sellers and buyers could reinforce each other's presence.

RESEARCH CONTEXT AND DATA

Research Context

We focus on luxury handbags because they "are the engine that drives luxury brands today" (Thomas 2008, pp. 168). In addition, price disparity for luxury handbags between the origin countries and the Chinese market is large and the premium branding attracts a lot of potential buyers. To test our hypotheses, we selected one of the most popular luxury brands among Asian consumers, Coach (Han 2005; Lee et al. 2003). A quick search for Coach on Baidu, China's

equivalent of Google, yielded eight million hits, which is far above that of Coach's direct competitors such as Kate Spade and Michael Kors (Jannarone 2012). More importantly, Coach is selling fewer handbag styles in China than in US, which allows us to examine the impact of product availability on online gray market sellers and buyers' choices. In our dataset, only 23.1% out of 394 handbag styles are available in official channels in China. By contrast, some brands, such as LV, offer the same product selection in different locations (Fung et al. 2012). As a result, we cannot observe any variation of product availability between the origin and export countries, making this brand unsuitable as the focus of our research.

The online gray marketers considered in this study are largely operated as micro businesses with limited cash flow. Many of the businesses are mom and pop operations where the owner purchases the handbags at online shops, retail stores, outlet stores and/or department stores abroad as a regular consumer (Swanson 2014). They post the handbags for sales on Chinese online marketplaces, directly targeting consumers in China. More organized businesses also exist−−−some sellers may have multiple partners located abroad to purchase the handbags for them. The sellers or their partners may purchase only one or several handbags in a transaction to avoid being sanctioned. They often scour multiple stores online or offline to acquire handbags because a specific store has limited stock. On Chinese online marketplaces, some gray marketers offer free shipping but others charge shipping fees ranging from 100 CNY to several hundred CNY depending on the shipping speed.

It is worth noting that language is not the only barrier that prohibits consumers in China from purchasing handbags from the official US Coach website. Another important reason is that the US site does not offer shipping options to China at all. Other than gray markets, consumers in

China have to visit the authorized Coach's brick and mortar retail stores or authorized online stores including the official China Coach website to purchase Coach handbags[4]. The official online and offline stores price the Coach handbags the same but significantly higher than the authorized US retailers. As a result, even though the products that the online gray marketers acquire have been marked up to the US retail prices, there is still a large enough gap for arbitrage opportunities.

We collected data from Taobao Marketplace (formerly Taobao), the Chinese equivalent of Amazon. As the largest Internet retail and trading website in China, it provides small businesses and individuals with a platform to run online retail stores and post their products for sale[5]. The product categories listed on Taobao Marketplace range from fashions, grocery items, electronics, and jewelry, to books. The overwhelming majority of the listings offer brand new merchandise at a fixed price, and auctions only account for a very small percentage of the sales. Taobao Marketplace was serving more than 800 million product listings and more than 500 million registered users as of June 2012. The annual transaction volume on Taobao Marketplace reached 208 billion CNY in 2009, accounting for approximately 80% of China's e-commerce market.[6]

Data Collection

We test our hypotheses using data collected from the authorized Coach online distribution channels in U.S. and China and the online gray market in China. From the official Coach websites (www.coach.com and www.china.coach.com), we collected handbag information

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[4] http://www.coach.com/counterfeit-education.html

[5] By contrast, brand owners or authorized distributors sell branded products on Tmall.com, another independent company associated with Alibaba group.

[6] http://news.alibaba.com/specials/aboutalibaba/aligroup/index.html

including the style number, US official price, Chinese official price, size, material (leather/no leather) and whether the item was a new arrival or not. The data collection was initially conducted in April 2011 and then repeated in September 2011 to incorporate new product releases for the Fall/Winter collection.

To collect online gray market data, we developed a web crawler, which fed the Coach style numbers obtained from the US official website into Linux shell scripts to search for all matching items that were listed on Taobao.com. For each listing, we collected information such as listing prices, seller location, counts of listing page being added to wish-lists, transaction history, etc. Data collection was automatically performed once per week from May 30th, 2011 to January 23rd, 2012, for a total of approximately 34 weeks.

The main tools used in the information retrieval process included perl, wget, python, as well as other standard tools such as grep, sed, wc, etc. The main web page retrieval engine was the urllib2 library for python, which was capable of loading dynamic data such as the number that a listing page was added to users' wish-lists. The use of URLLIB2 library also ensured us to retrieve webpage readable source files that had been encoded with both GBK and UTF-8 for Chinese characters.

Variables

SELLER and *TQ:* We measure the degree of online gray market activities for a handbag style using the number of sellers, denoted as *SELLER*, and transaction quantity, denoted as *TQ*, in a week. SELLER and TQ are our dependent variables. In the prior literature, due to the difficulty in observing gray market activities, the degree of gray market activities was measured based on subjective perception, either as the likelihood that gray market incidents occurred during the

previous two years (Antia et al. 2006), or as whether gray market incidents posed a significant problem to the exporters (Myers 1999). Our study differs from the previous research by using objective measures based on direct observations of online gray market activities. On Taobao Marketplace, sellers create a webpage with a unique listing ID for each handbag style that they sell. Therefore, for each style, the number of listings approximates the number of sellers. Taobao Marketplace also publishes the transaction records for each listing page in the past 30 days, including the buyer's nickname, the transaction price, the number of handbags transacted, the transaction date, and a brief handbag description. The weekly transaction quantity for a handbag style is calculated by totaling the transaction quantity of all listings of this style within a week.

AVAILABILITY: The variable *AVAILABILITY* indicates whether a handbag style was available in the authorized channels in China at the time of data collection. It is a dichotomous variable where 1 represents that the handbag was available and 0 otherwise.

PRICE: There are three types of prices for a handbag style—the official price in US (the origin country), the official price in China (the export country) if this style is available, and the gray market price if this style is available in the gray market. The variable PRICE denotes the first type of prices, i.e., a handbag style's official US price. Due to the channel coordination strategy used by firms in their global supply chains, prices in the origin country and those in export countries are correlated.

PRICEGAP and *GAPRATIO*: *PRICEGAP* is the difference between a handbag style's official prices in the origin versus in the export countries. In this study, it is the price differential between a Coach handbag's official price in US and official price in China, i.e., PRICEGAP= official price in China-PRICE. A product's price gap is highly correlated with its price level in the origin

21

country as a result of global management strategies of a multinational firm (Zou and Cavusgil 2002). To ensure price consistency across multiple distribution channels, a multinational firm often jointly prices and coordinates its products in different geographic markets. Therefore, more expensive products have larger *absolute* price gaps. In our data, the Pearson Correlation coefficient between PRICE and PRICEGAP is 0.95 and the VIF value between these two variables is above 10. To address the multicollinearity concern, we define a new variable to represent a product's price gap, *GAPRATIO*, which is calculated as the ratio of PRICEGAP to PRICE (i.e., *GAPRATIO= PRICEGAP/PRICE*, or GAPRATIO= (official price in China-official price in US)/official price in US). This variable assesses the *relative* price difference between two geographic channels by normalizing its price in the origin country. Since the VIF value between GAPRATIO and PRICE is 6.22, we include both variables in the analysis (Hair et al. 2009).

POPULARITY: Due to the lack of product-level weekly sales data from the authorized channels, we used an alternative measure for product popularity, a handbag style's wish-list count. A registered Taobao user can add a listing to her wish-list, so that she can easily keep track of the product that she is interested in. We expect that more popular product styles have higher wish-list counts since they are attractive to more potential buyers. For each style, we normalize its wish-list count by averaging the number of a handbag style being added to wish-lists by sellers, and use it as a proxy for POPULARITY.

LSELLER and *LTQ*: Since it takes time for sellers or buyers to observe the market, process information, and adjust their behavior accordingly, we use lagged terms to capture the reaction effects. Using lagged variables to model reaction effects has been documented in prior literature;

one example is the Arms Race model (Richardson 1960). Specifically, the lagged transaction quantity (*LTQ*) is an explanatory variable to estimate the number of sellers, and the lagged number of sellers (LSELLER) is an explanatory variable to estimate transaction quantity.

Control variables: To control product features, we include the variables *SIZE*, *MATERIAL*, *NEW* and *AGE*. The handbag styles are categorized on the official websites as small, medium, large and extra-large at the time of data collection. We therefore code a nominal variable, *SIZE,* with 1 for small, 2 for medium, 3 for large and 4 for extra-large. To control handbag material, we use a dichotomous variable, *MATERIAL,* where 1 represents leather and 0 otherwise. New arrivals may draw additional interest from consumers as well as online gray market sellers but may not be readily available to the online gray market sellers. Therefore, we use a dichotomous variable, *NEW*, which equals to 1 if the handbag is a newly released product and 0 otherwise. A handbag style released earlier may accumulate a larger number of sellers and lead to a higher transaction quantity. In this study, we control a handbag style's age, denoted as *AGE*, by calculating the total number of weeks elapsed since the handbag style's data was first collected. We also include a trend variable, *WEEK*, ranging from 1 to 34 to control the time effect.

Descriptive Statistics

The data consists of the Coach handbag's style information, online gray market listings and transaction records from May 30th, 2011 to January 23rd, 2012. The unit of analysis is handbag style and the temporal unit in this analysis is "week".

Our analysis only includes overseas online gray market sellers, who are not located in Mainland China. On Taobao Marketplace, the sellers who purchase products for other consumers who are

located in a different geographic region are often referred to as DaiGou. Those sellers can easily

access authentic products at lower prices in the origin country, and their location information

helps to alleviate customers' potential concern regarding counterfeit products. Table 1 provides

the descriptive statistics for our data and Tables 2 provides the correlation matrixes. We also

remove the sellers whose listing prices in the online gray market were 30% lower than the

official prices in US to further control for potential counterfeit goods. In our robustness tests, we

estimate our models using the complete dataset as well as the dataset with sellers whose prices

were no more than 10% below the official prices in US.

Table 1a: Summary Statistics for Styles Available in China

	Observations	Mean	St. Deviation	Min	Max
SELLER	1436	57.06	56.95	3	310
TQ	1436	4.12	11.21	0	121
PRICE (CNY)	1436	2828.71	1453.62	944.39	7777.20
PRICEGAP (CNY)	1436	2441.172	811.11	940.81	4344.80
GAPRATIO	1436	0.92	0.12	0.53	1.24
POPULARITY	1436	7.63	10.97	0	75.73
SIZE	1436	2.11	0.64	1	3
MATERIAL	1436	0.50	0.50	0	1
NEW	1436	0.57	0.50	0	1
AGE	1436	10.64	3.36	2	34

Table 1b: Summary Statistics for Styles Unavailable in China

	Observations	Mean	St. Deviation	Min	Max
SELLER	4961	25.02	24.51	0	209
TQ	4961	0.67	2.60	0	84
PRICE (CNY)	4961	2065.5	1098.44	365.17	9073.40
POPULARITY	4961	3.83	6.36	0	74.91
SIZE	4961	1.81	0.75	1	4
MATERIAL	4961	0.51	0.50	0	1
NEW	4961	0.60	0.49	0	1
AGE	4961	11.48	6.98	2	34

Note: The variables Size, Material and New are product-level variables. The values of these variables
were invariant for a handbag style during the time period of data collection. The values of the

Price (the official price in the origin country) variable changed for a handbag style because of the raise of prices and the fluctuation of exchange rates.

Table 2a: Correlation Matrix for Styles Available in China

		1	2	3	4	5	6	7	8	9	10	11
1.	SELLER	1										
2.	TQ	0.68*	1									
3.	PRICE	-0.22*	-0.15*	1								
4.	PRICEGAP	-0.16*	-0.12*	0.95*	1							
5.	GAPRATIO	0.31*	0.19*	-0.91*	-0.80*	1						
6.	POPULARITY	0.56*	0.51*	-0.30*	-0.32*	0.26*	1					
7.	SIZE	-0.10*	-0.07*	0.61*	0.61*	-0.57*	-0.23*	1				
8.	MATERIAL	0.19*	0.08*	0.48*	0.56*	-0.31*	-0.04	0.22*	1			
9.	NEW	-0.09*	-0.02	0.05*	0.10*	0.03	-0.18*	0.11*	-0.06*	1		
10.	AGE	0.12*	0.05	0.06*	0.08*	0.06*	0.04	0.04	0.14*	-0.12*	1	
11.	WEEK	0.03	-0.02	0.05	0.09*	0.14*	-0.14*	0.13	0.11*	0.48*	0.64*	1

* Denotes significance at the 0.05 level.

Table 2a: Correlation Matrix for Styles Unavailable in China

		1	2	3	4	5	6	7	8	9
1.	SELLER	1								
2.	TQ	0.48*	1							
3.	PRICE	0.02	0.01	1						
4.	POPULARITY	0.38*	0.45*	0.04*	1					
5.	SIZE	0.11*	0.10*	0.57*	-0.01	1				
6.	MATERIAL	0.07*	-0.02*	0.25*	0.03	0.05*	1			
7.	NEW	-0.21*	-0.15*	-0.21*	-0.20*	-0.15*	0.17*	1		
8.	AGE	0.10*	-0.01	0.04*	0.00	0.02	0.02	-0.23*	1	
9.	WEEK	-0.04*	-0.11*	-0.09*	-0.17*	-0.06*	0.18*	0.49*	0.62*	1

* Denotes significance at the 0.05 level.

ANALYSIS AND RESULTS

Model Estimation

In order to estimate factors affecting the degree of online gray market activities, we aggregate the number of sellers and transaction quantity for each handbag style at the week level. The

dependent variables, weekly aggregated number of sellers and transaction quantity, are both nonnegative integers, or count numbers. The distributions of discrete dependent variables place probability mass at nonnegative integer values only, requiring us to apply count regression models to analyze our dataset. In particular, we estimate two different count models: (1) the negative binomial maximum-likelihood count regression model of gray market activities on the supply side, and (2) the zero-inflated count model of gray market activities on the demand side. Both models account for the non-negative, discrete integer distribution of gray market supply and demand activities. We use Stata to estimate the models. To address the potential issue of contemporaneous cross-equation error correlation, we first estimate these two equations separately and then adjust the estimation results into one parameter vector and *simultaneous* (co)variance matrix of the sandwich/robust type using the SUEST command. The Stata SUEST command is an application of the cluster modification of the sandwich estimator proposed by Rogers (1993). It constructs a stacked estimation model in which different models apply to different observations to derive the simultaneous distribution of the estimators.

Poisson regression is often used for count data analysis. However, one of the important properties of Poisson distribution is *equidispersion—the data has equal mean and variance* (Cameron and Trivedi 1999). This imposes significant restrictions on the use of Poisson regression for the count data. A quick examination of our data shows that the number of online gray market sellers has the *overdispersion* issue, i.e., the variances of the dependent variables are larger than the means. The Pearson goodness-of-fit result further confirms that the distribution of our data significantly differs from a Poisson distribution. Therefore, we follow the literature and use a negative binomial maximum-likelihood regression model to investigate the factors

affecting the degree of online gray market activities on the supply side (Hilbe 2011; Wuyts et al. 2004):

$$P(SELLER_{it} \mid X_{it}) = \frac{\Gamma(SELLER_{it} + \alpha^{-1})}{\Gamma(\alpha^{-1})\Gamma(y_{it} + 1)} \left(\frac{\alpha^{-1}}{\alpha^{-1} + \mu_{it}} \right)^{\alpha^{-1}} \left(\frac{\mu_{it}}{\alpha^{-1} + \mu_{it}} \right)^{y_{it}}$$

where

$SELLER_{it}$ represents the number of online gray market sellers of handbag style i in week t;

$\Gamma(.)$ is the gamma integral;

α is the dispersion parameter;

X_{it} represents the independent variable including AVAILABILITY$_{it}$, PRICE$_{it}$, GAPRATIO$_{it}$ (this variable is applicable only in the analysis of products available in both the US and China), POPULARITY$_{it}$, LTQ$_{it}$, NEW$_i$, SIZE$_i$, MATERIAL$_i$, AGE$_{it}$, WEEK$_t$;

$E[SELLER \mid X, \alpha] = \mu$;

$Var[SELLER \mid X, \alpha] = \mu(1 + \alpha\mu)$;

$\mu_{it} = \exp(\boldsymbol{\beta X} + \varepsilon_{it})$.

A close examination of the data indicates that *excessive zeros* exist in weekly transaction quantities. In other words, many handbag styles have zero weekly transaction during the period of data collection. This suggests that a different model has to be used to analyze the transaction quantity equation. We therefore choose a zero-inflated count model to deal with excess zeros (Lambert 1992) while exploring the degree of online gray market activities on the demand side.

In our model, for each observation TQ_{it}, the process that only generates zeros is chosen with probability φ_{it}, and the process that generates positive counts from a negative binomial model ($NB(TQ_{it} \mid X_{it})$) is chosen with probability $1-\varphi_{it}$ (Lambert 1992; Sheu et al. 2004). φ_{it} is the zero-inflated link function and specified as a logistic regression. To explore online gray market dynamics measured by transaction quantity, we estimate the following model:

$$TQ_{it} = \begin{array}{ll} 0 & \text{with } probability \ \varphi_{it} \\ NB(TQ_{it} \mid X_{it}) & \text{with } probability \ 1\text{-}\varphi_{it} \end{array}$$

Where

X_{it} represents the independent variables including AVAILABILITY$_{it}$, PRICE$_{it}$,

GAPRATIO$_{it}$ (this variable is applicable only in the analysis of products available in

both the US and China), POPULARITY$_{it}$, LSELLER$_{it}$, NEW$_i$, SIZE$_i$, MATERIAL$_i$,

AGE$_{it}$, WEEK$_t$

Results

In this section, we discuss our results and summarize the key findings of our analysis. We first examine the impact of product availability on the degree of online gray market activities using the full dataset. In this analysis, GAPRATIO is not included because the price gap does not exist for handbag styles unavailable in authorized channels in China and as a result GAPRATIO is not defined for these styles. Model 1 (Column 2 and 5 in Table 3) shows the estimation results of the model. The coefficient of AVAILABILITY is positive and statistically significant (β=0.547, $p<0.001$) in the equation for the number of sellers, but is insignificant in the equation for transaction quantity. The results indicate that online gray market sellers prefer to offer the handbag styles that are available in the authorized channels in China, but the buyers show no

difference. So H1a is supported but H1b is rejected. The results also show that the coefficient of PRICE is negative and statistically significant in both the equation for the number of sellers (β=-0.000136, $p<0.001$) and for transaction quantity (β=-0.000229, $p<0.05$), suggesting that the *overall* impact of PRICE on the degree of online gray market activities is negative. More sellers offer less expensive luxury handbags in the online gray market, which is consistent with our argument that the cost of acquiring the handbags and risk of not selling or lost sales could be major concerns for online gray market sellers. On the demand side, buyers prefer less expensive handbag styles in the online gray market, as the law of demand suggests (Mas-Colell et al. 1995). In addition, the transaction risk in the online gray market may also discourage buyers from buying more expensive products.

Since price gaps exist only for handbag styles available in authorized channels in China, we divide our dataset into two subsets, one including only handbag styles available in authorized channels in China and the other including all remaining handbag styles. We can further compare the impact of PRICE on online gray market activities, while the first subset alone allows us to examine the impact of GAPRATIO on the degree of online gray market activities

Table 3 Results of Analyses

	NUMBER OF SELLERS			TRANSACTION QUANTITY		
	(1)	(2)	(3)	(1)	(2)	(3)
AVAILABILITY	0.547*** (0.0799)	---	---	0.174 (0.139)	---	---
PRICE	-0.000136*** (0.0000388)	-0.0000172 (0.0000775)	-0.000127* (0.0000543)	-0.000229* (0.000110)	-0.000206 (0.000160)	-0.000303 (0.000167)
GAPRATIO	---	2.52* (1.00)	---	---	-0.0347 (1.24)	---

POPULARITY	0.0282***	0.0218***	0.0273***	0.0435***	0.0433***	0.0472***
	(0.00560)	(0.00622)	(0.00801)	(0.00569)	(0.0101)	(0.00789)
LTQ	0.0434***	0.0254***	0.128***	---	---	---
	(0.0116)	(0.00548)	(0.0291)			
LSELLER	---	---	---	0.0159***	0.0137***	0.0220***
				(0.00173)	(0.00201)	(0.00363)
SIZE	0.145*	0.189	0.0971	0.303***	0.132	0.209
	(0.0680)	(0.102)	(0.0769)	(0.0932)	(0.143)	(0.133)
MATERIAL	0.200*	0.398**	0.162	-0.282*	-0.218	-0.267
	(0.0857)	(0.129)	(0.0978)	(0.142)	(0.229)	(0.187)
NEW	-0.368**	-0.165	-0.340*	-0.211	-0.0106	-0.223
	(0.117)	(0.130)	(0.158)	(0.154)	(0.263)	(0.164)
AGE	-0.0115	-0.0152	-0.00994	-0.0533***	-0.0613*	-0.0450**
	(0.0100)	(0.0113)	(0.0131)	(0.0143)	(0.0284)	(0.0170)
WEEK	0.0151	-0.00984	0.0130	0.0171	0.277	0.00584
	(0.00856)	(0.00889)	(0.0114)	(0.0119)	(0.0217)	(0.0146)
CONS	2.98***	0.794	3.00***	-0.332	0.144	-0.326
	(0.130)	(1.14)	(0.146)	(0.281)	(1.42)	(0.345)
Inflate_ PRICE				0.0000277	0.00074	-0.000169
				(0.000138)	(0.000535)	(0.000276)
Inflate_ GAPRATIO				---	8.78	---
					(6.90)	
Inflate_ AVAILABILITY				0.0738	---	---
				(0.319)		
Inflate_ POPULARITY				-0.225***	-0.211**	-0.222***
				(0.0313)	(0.0743)	(0.0377)
Inflate _LSELLER				-0.0880***	-0.0786***	-0.0938***
				(0.0108)	(0.0154)	(0.0174)
Inflate _CONS				3.28***	-6.80	3.47***
				(0.380)	(7.74)	(0.609)
N	6397	1436	4961	6397	1436	4961
Maximum Likelihood R^2	0.404	0.550	0.270	0.454	0.590	0.345

Note: (1) Robust standard errors are listed in parentheses.

(2) ***, **, and * denote significance at 0.001, 0.01, and 0.05, respectively.

Model 2 (Column 3 and 6 in Table 3) shows the results of the analysis using the dataset of products available in authorized channels in China. Model 3 (Column 4 and 7 in Table 3) shows the results of the analysis using the dataset of products unavailable in authorized channels in China. The coefficient of PRICE in the equation for the number of sellers is negative and

statistically significant (β=0.000127, p=0.02) for the handbag styles which are unavailable in authorized channels in China (column 4) but is insignificant for the handbag styles which are available in authorized channels in China (column 3). Our findings suggest that the sellers are more concerned about the cost aspect of online gray market selling when price gaps do not exist. As a result, more sellers offer less expensive luxury handbags. But when the sellers can quantify the relative price gaps, the expectation of profit potential dominates risk considerations associated with price tags. On the demand side, the coefficients for PRICE are insignificant both for products available and unavailable in authorized channels in China. Therefore, H2a is partially supported and H2b is rejected.

The coefficient of GAPRATIO in the equation for the number of sellers is positive and statistically significant (β=2.52, p=0.012), indicating that handbags with larger relative price gaps between the authorized channels in the origin and export countries attract more online gray market sellers. This result suggests that the potential profit associated with the arbitrage opportunities is one of the drivers of online gray market selling activities. In the equation for transaction quantity, the coefficient of GAPRATIO is statistically insignificant, which suggests that the potential savings of buying handbags from online gray markets do not play an important role in buyers' decision making. Therefore, H3a is supported and H3b is rejected.

For all models, the coefficients for POPULARITY are positive and statistically significant, indicating that online gray market incidents are more likely to occur for more popular handbag styles. We also find that there is a positive temporal interdependence between the number of sellers and transaction quantity. The coefficients of the lag variables (LSELLER and LTQ) are always positive and statistically significant. An increase in demand in a previous period is

associated with an increase in supply in the current period in the online gray market. Similarly, an increase in supply in a previous period is associated with an increase in demand in the current period. The coefficient of AGE is statistically insignificant in the equation for the number of sellers but is negative and significant in the equation for transaction quantity. The results suggest that the number of online gray market sellers is stable over time, while online gray market purchases are decreasing gradually.

We implemented two sets of robustness tests. First, we used an alternative measure of product popularity. Instead of using wish-list counts, we used the number of times a product listing page has been browsed by consumers to assess its popularity. All results remain qualitatively the same. Second, we tried different price constraints. We first relaxed the constraint to include all overseas sellers, and then we tightened the constraint to only include oversea sellers whose prices were no more than 10% below the official US prices. We found that all results for hypotheses testing qualitatively hold.

DISCUSSION AND CONCLUSION

Our study empirically demonstrates factors affecting a product's online gray market incidents on both the supply and demand sides. This study, using a large sample of field data collected from a Chinese online gray market, helps enhance the understanding of buyers' and sellers' online gray market entry decisions. Our research has important implications for both researchers and practitioners.

Research Implications

Product availability and pricing decisions are two proactive channel control strategies that brand owners could adopt to combat gray market activities. Our findings suggest that these two methods are more effective in controlling the number of online gray market sellers than consumers' purchasing quantities. Limiting the availability of styles in the export countries is useful in deterring online gray market sellers but not buyers. On the supply side, our finding supports the assumption in the prior literature that marketing efforts in authorized channels can be leveraged by gray marketers (Antia et al. 2006). Styles available in the authorized channel are more appealing to online gray marketers because they can free ride on the authorized distributors' presale services and marketing efforts. Those styles are better known to consumers in the export country, since they are offered in brand owners' authorized retail channels and consumers can personally inspect those styles. However, product availability does not necessarily affect buyer behavior. One possible explanation is that for styles unavailable in the export country, market demands are not fulfilled by the authorized retail channels. If consumers want to acquire those styles in the export country, they have to purchase them via online gray markets. Moreover, some buyers may prefer styles unavailable in the local authorized channel, since they value exclusivity associated with such unavailability. Thus, from online gray market buyers' perspective, unfulfilled market demands as well as the exclusivity effect compensate for the lack of free-riding opportunities associated with products unavailable in the export country.

Even though online gray markets differ from other markets in channel authorization, the supply and demand activities in online gray markets still follow the basic law of demand. Overall, we found that there are more buyers and sellers for less expensive styles in the online gray market. However, our analyses suggest that product availability moderates the impacts of official prices

33

in the origin country on online gray market activities. Different types of gray marketing happen depending on product availability. If a style is not available in the export country, the online gray market becomes its key sourcing channel. The official prices in the origin country represent online gray marketers' sourcing costs and affect their market entry decisions. Costs and risks such as large initial investments and high potential losses from unsold products or lost sale costs become a major concern for the sellers when deciding on whether or not to enter online gray markets. Also, online gray marketers expect a potentially larger market demand for less expensive styles. Therefore, we expect that among the styles unavailable in the export country, more online gray marketers exist for less expensive items. For products available in both the origin country and export countries, online gray marketing is a price arbitrage phenomenon. Our study provides empirical evidences of the positive relationship between price gaps and sellers' online gray market entry decisions. The profit potential suggested by price gaps weakens the impact of the sellers' cost concerns. As a result, official prices in the origin country no longer play a significant role.

However, on the demand side, neither the price gap nor the price level matters for the styles available in the export country. For products unavailable in the export country, online gray market buyers show no difference between big-ticket items and their less expensive counterparts. Our findings suggest that brand owners have limited influence on online gray market buyers. Neither controlling product availability nor pricing decisions can directly affect purchasing behavior in online gray markets. Consumer behavior in online gray markets is more nuanced and deserves further research.

We extend prior research of product popularity to online gray markets and confirm its importance (Tucker and Zhang 2011). A popularity cue may mitigate uncertainty in a channel without brand authorization. It attracts more sellers and buyers and reinforces the dominance of the products. Additional between-group analyses (e.g., the available styles subsample vs. the unavailable styles subsample) indicate that the positive effect of product popularity is even stronger if a style is unavailable in the export country. Popularity helps online gray market sellers to learn buyers' preferences and estimate the market demand, especially when a style is not available via brand owners' authorized channels. At the same time, buyers may get more prestige from a popular style if it is unavailable locally to others. This study also reveals interesting interactions between the supply and demand sides of online gray markets. Similar to other online channels, online gray markets offer higher information transparency to participants. Thus, it is possible for sellers and buyers to observe and react to each other's behavior, and our analysis validates the temporal interdependency between them. In the online gray market, one side's existence reinforces the other side's market entry.

Online gray markets are an increasingly important phenomenon due to the prevalence of e-commerce. Our research sheds light on the dynamics of this unauthorized distribution channel that competes with a brand owner's authorized retail networks. However, it is important to revisit the main differences between online gray markets examined in this paper and traditional offline gray markets and discuss the generalizability of our findings. In online gray markets, sellers are usually individuals or small businesses. They have limited financial resources and incur very high costs to handle unsold inventories. As a result, the more expensive items draw fewer online gray market sellers. Such a negative relationship between the official prices in the origin country and the number of online gray market sellers may not necessarily hold in traditional offline gray

markets. In traditional offline gray market, enterprises that are orchestrating the gray market import are more resourceful and organized and as a result, they can better handle risks associated with big-ticket items. In addition, our study finds that the impacts of product availability and pricing differ between sellers and buyers in online gray markets. Such difference may not necessarily exist in offline gray markets, since offline gray market sellers may have better market analytics capabilities to understand consumer behavior in the market.

Managerial Implications

In the global economy, firms need to proactively manage their global supply chains, including unauthorized channels. Gray market incidents often have a negative impact on brand owners' revenue, brand image, consumer perceptions, and relationships with authorized retailers. It is important for brand owners to properly monitor and manage gray market activities.

Industry experts summarize brand protection strategies against gray market diversion as a five-step process: assess, design, protect, monitor, and enforce (Kodak 2010). Our study illustrates how to assess the dynamics of online gray market activities and examine the impact of channel control strategies based on comprehensive empirical analyses. Brand owners can combine data collected from the Internet and from their own supply chains to estimate the impact of online gray market incidents on their revenue, allowing them to evaluate alternative approaches to managing online gray market activities (Iravani et al. 2011). Such a data-driven approach could enable brand owners to design more effective supply chain management and customer retention strategies.

Since sellers and buyers reinforce each other's existence, brand owners should combat online gray markets from both supply and demand perspectives (Berman 2004). However, our study

suggests that channel control strategies are only influential on the supply side. So, brand owners should focus on controlling the supply side of the online gray market, which will indirectly reduce transaction quantities. In particular, differentiating product offerings in different regions can discourage online gray market sellers, due to the lack of free-riding benefits from brand owners' regional marketing spending. However, carrying entirely different products in different markets could be costly and potentially lead to inconsistent brand images across markets. Our results suggest that brand owners can focus on applying product differentiation to low-end (less expensive) products, since high-end products are less vulnerable to online gray market threats.

Another possible approach to limiting the number of products diverted to the online gray market is quantity control. Since there is no contractual relationship between brand owners and online gray marketers, the standard sanctions such as terminating the dealers who are involved in gray marketing are no longer applicable. A commensurate tactic could be to create a "cannot purchase" list and refuse to sell to these "pretend" consumers in the official retail stores. Quantity control is an effort in this regard.[7] Luxury brands, such as LV and Coach, limit the number of identical or similar items that may be purchased by an individual (Sherman 2011). However, publicly enforcing such policy may cause controversy or even damage customer relationships (Sherman 2011). Our results suggest that overseas online gray market sellers prefer popular low-end handbags. Brand owners may enforce the quantity control policy on popular but less expensive products only and claim the shortage due to a high market demand.

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[7] We would like to thank one anonymous reviewer for comments on the quantity control policy.

Future Research

There are some limitations of our study that could be the basis of future research. As the first step to empirically investigate online gray market dynamics, this study focuses only on a single product category: luxury handbags. In addition, due to the time-consuming and computationally-expensive nature of data collection, only one brand was analyzed. Our research is exploratory and additional research efforts are needed to establish empirical generalizations for the emerging online gray marketing topics (Kamakura et al. 2014). In addition, our analyses were based on style-level aggregation. Future research can explore gray market activities at the individual level and examine how seller-level characteristics affect the likelihood of online gray market transactions. Furthermore, more analyses would become feasible if additional data from the authorized channel were accessible. For instance, we could examine the interaction between the authorized channel and the online gray market. We could also use the sales of a style in the authorized channel to better measure popularity of the style. In the current study, we examine how buyers and sellers react to product availability decisions made by brand owners. Future study could explore how brand owners strategically make their product availability decisions. In addition, data collection over a longer time period might enable us to investigate whether and how brand owners' decisions are affected by gray market activities.

REFERENCES

Ahmadi, R., and Yang, R. 2000. "Parallel Imports: Challenges from Unauthorized Distribution Channels," *Marketing Science* (19:3), pp. 279-294.

Ahmadi, R., Carr, S.M., and Dasu, S. 2010. "Gray Markets, Demand Uncertainty, and Excess Inventory," Marshall Research Paper Series Working Paper No. FBE 11-10.

Anderson, E., and Weitz, B.A. 1986. "Make-or-Buy Decisions: Vertical Integration and Marketing Productivity," *Sloan Management Review* 27, Spring, pp, 3-19.

Antia, K.D., Bergen, M., and Dutta, S. 2004. "Competing with Gray Markets," *Sloan Management Review,* pp. 63-69.

Antia, K.D., Bergen, M., Dutta, S., and Fisher, R.J. 2006. "How Does Enforcement Deter Gray Market Incidence?" *Journal of Marketing* (70:1), pp. 92-106.

Autrey, R. and Bova, F. 2012. "Gray Markets and Multinational Transfer Pricing," *The Accounting Review* (87:2), pp. 393-421.

Bandyopadhyay, S. 2010. "The Internet and Gray Marketing," *International Business & Economics Research Journal* (9:6), pp. 95-101.

Berman, B. 2004. "Strategies to Combat the Sale of Gray Market Goods," *Business Horizons* (47:4), pp. 51-60.

Brun, A. and Castelli, C. 2013. "The Nature of Luxury: A Consumer Perspective," *International Journal of Retail & Distribution Management*, (41:11/12), 823-847.

Bucklin, L.P. 1993. "Modeling the International Gray Market for Public Policy Decisions," *International Journal of Research in Marketing* (10:4), pp. 387-405.

Cameron, C.A., and Trivedi, P.K. 2007. "Essentials of Count Data Regression," in *A Companion to Theoretical Econometrics*, B.H. Baltagi (ed.), Malden: Blackwell Publishing Ltd.

Cespedes, F.V., Corey, E.R., and Rangan, V.K. 1988. "Gray Markets: Causes and Cures," *Harvard Business Review* 66(4), pp. 75-83.

Chen, H. 2007. "Gray Marketing and Its Impacts on Brand Equity," *Journal of Product & Brand Management* 16(4), pp. 247-256.

Coughlan, A.T. and Soberman, D.A. 1998. "When Is the Best Ship a Leaky One? Segmentation, Competition and Gray Markets", *INSEAD Working Paper*, 98/09/MKT.

Dion, D. and Arnould, E. 2011. "Retail Luxury Strategy: Assembling Charisma through Art and Magic," *Journal of Retailing* (87:4), pp. 502-520.

Duhan, D.F. and Sheffet, M.J. 1988. "Gray Markets and the Legal Status of Parallel Importation," *Journal of Marketing* (52:3), pp. 75-83.

Fung, J., MacAusland, C., and Mazza, G. C. 2012. "Louis Vuitton and the Traveling Chinese Consumer," *Knowledge @ Wharton*.

Ganslandt, M. and Maskus, K.E. 2004. "Parallel Imports and the Pricing of Pharmaceutical Products: Evidence from the European Union," *Journal of Health Economics* (23:5), pp. 1035-1057.

Ghose, A. 2009. "Internet Exchanges for Used Goods: An Empirical Analysis of Trade Patterns and Adverse Selection," *MIS Quarterly*, (33:2), pp. 263-291.

Grewal, D., and Marmorstein, H. 1994. "Market Price Variation, Perceived Price Variation, and Consumers' Price Search Decisions for Durable Goods," *Journal of Consumer Research* (21:3), pp. 453-460.

Hair, J.F., Black, W.C., Babin, B.J., and Anderson, R.E. 2009. *Multivariate Data Analysis*. NJ: Pearson Prentice Hall.

Han, H.T. 2005. "Taiwanese Consumers' Perceptions of Luxury Handbags: The Country-of-Origin Effect," Dissertation, Lynn University.

Han, Y.L., Nunes, J.C., and Dreze, X. 2010. "Signaling Status with Luxury Goods: The Role of Brand Prominence," *Journal of Marketing* (74), pp. 15-30.

Hilbe, J.M. 2011. *Negative Binomial Regression*, NJ: Cambridge University Press.

Hicks, J.R. 1956. *A Revision of Demand Theory*. Oxford: Clarendon Press.

Howard, J.A., and Sheth, J.N. 1969. *The Theory of Buyer Behavior*. New York, NY: Wiley.

Huang, J.H., Lee, B.C.Y., and Ho, S.H. 2004. "Consumer Attitude towards Gray Market Goods,"
International Marketing Review (21:6), pp. 598-614.

Iravani F., Mamani, H., and Ahmadi, R. 2011. "Coping with Gray Markets: The Impact of
Market Conditions and Product Characteristics," working paper,
(http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1952003)

Jannarone, J. 2012. "Coach's Shares Should Remain in Fashion," *Wall Street Journal*. January
(http://online.wsj.com/article/SB10001424052970203750404577173371712048172.html).

Jaworski, B.J., Stathakopoulos, V., and Krishnan, H.S. 1993. "Control combinations in
marketing: conceptual framework and empirical evidence," *Journal of Marketing* (57:1),
January, pp. 57-69.

Kamakura, W., Kopalle, P.K., and Lehmann, D.R. 2014. "Empirical Generalizations in
Retailing," *Journal of Retailing* (90:2), pp. 121-124.

Kotler, P., and Keller, K. L. 2008. *Marketing Management* (13th ed), Upper Saddle River, NJ:
Prentice Hall.

Kodak, 2010. "Brand Protection Strategies: Defending Against Gary Market Diversion,"
Executive White Paper,
(http://graphics.kodak.com/KodakGCG/uploadedFiles/Products/Security_and_Authentication
/K-162_GrayMkt_WhtPpr_0610_lo.pdf).

Knoll, M. S. 1986. "Gray-Market Imports: Causes, Consequences and Responses," *Laws &
Policy in International Business* (18), pp. 145-216.

Lambert, D. 1992. "Zero-inflated Poisson Regression with Application to Defects in Manufacturing," *Technometrics* (34), pp. 1-14.

Lee, B.C.Y. 2006. "Consumer Perceived Importance of Channel Authorization: A Post Hoc Segmentation Approach to Dealing with Gray Markets," *Australasian Marketing Journal*, (14:1), pp. 10-22.

Lee, J., Harp, S.S., Horridge, P.E., and Russ, R.R. 2003. "Targeting Multicultural Purchase and Consumption Segments in the Leather Handbag Markets: Product Development and Merchandising Implications," *Family and Consumer Science Research Journal* (31:3), pp. 297-330.

Lynch, J.G., and Ariely, D. 2000. "Wine Online: Search Costs Affect Competition on Price, Quality, and Distribution," *Marketing Science* (19:1), pp. 83-103.

Mas-Colell, A., Whinston, M.D. and Green, J.R. 1995. *Microeconomic Theory*. Oxford University Press.

Myers, M.B. 1999. "Incidents of Gray Market Activity among U.S. Exported: Occurrences, Characteristics, and Consequences," *Journal of International Business Studies* (30:1), pp. 105-126.

Onkvisit, S., and Shaw, J.J. 1989. *International Marketing: Analysis and Strategy*, Columbus, OH, NJ: Merrill Publishing Company.

Padmanabhan, V., and Png, I.P.L. 1997. "Manufacturer's Returns Policies and Retail Competition," *Marketing Science* (16:1), pp. 81-94.

Peter, J.P., and Ryan, M.J. 1976, "An Investigation of Perceived Risk at the Brand Level," *Journal of Marketing Research* (13), pp. 184-188.

Phau, I., and Prendergast, G. 2000. "Consuming Luxury Brands: The Relevance of the 'Rarity Principle'," *The Journal of Brand Management* (8:2), pp. 122-138.

Porter, M.E. 1980. *Competitive Strategy: Techniques for Analyzing Industries and Competitors*, New York, NJ: The Free Press.

Richardson, L. 1960. *Arms and Insecurity*, Pittsburgh, NJ: Boxwood Press.

Rogers, W.H. 1993. "Comparison of nbreg and glm for negative binomial," *Stata Technical Bulletin* (16:7), pp. 7.

Sherman, E. 2011. "Coach's PR Disaster: Waging War against Legit Online Consumers," *CBS News*, February (http://www.cbsnews.com/8301-505124_162-43448511/coachs-pr-disaster-waging-war-against-legit-online-customers-update/).

Sheu, M.L., Hu, T.W., Keeler, T.E., Ong, M., and Sung, H.Y. 2004. "The Effect of a Major Cigarette Price Change on Smoking Behavior in California: A Zero-Inflated Negative Binomial Model," *Health Economics* (13:8), pp. 781-791.

Swanson, A. 2014. "China's Growing Gray Market for All That's Foreign," *Foreign Policy*, August (http://foreignpolicy.com/2014/08/20/chinas-growing-gray-market-for-all-thats-foreign/)

Szymanski, D.M., Bharadwaj, S.G., and Varadarajan, P.R. 1993. "An Analysis of the Market Share-Profitability Relationship," *Journal of Marketing* (57), July, pp. 1-18.

Thomas, D. 2008. *Deluxe: How Luxury Lost Its Luster*. New York, NJ: The Penguin Press.

Tucker, C., and Zhang, J.J. 2011. "How Does Popularity Information Affect Choices? A Field Experiment," *Management Science* (57:5), pp. 828-842.

Wiedmann, K.P., Hennigs, N., and Siebels, A. 2007. "Measuring Consumers' Luxury Value Perception: A Cross-Cultural Framework," *Academy of Marketing Science,* (7), pp.1-21.

Wilson, E. 2008. "Retailers Limit Purchases of Designer Handbags," *The New York Times*,

    January (http://www.nytimes.com/2008/01/10/fashion/10CAPS.html?pagewanted=all).

Wong, E. 2013. "Survey in China Shows a Wide Gap in Income," *The New York Times*, July

    (http://www.nytimes.com/2013/07/20/world/asia/survey-in-china-shows-wide-income-

    gap.html?_r=0)

Wuyts, S., Dutta, S., and Stremersch, S. 2004. "Portfolios of Interfirm Agreements in

    Technology-Intensive Markets: Consequences for Innovation and Profitability," *Journal of*

    Marketing (68:2), pp. 88-100.

Xiao, Y., Palekar, U., and Liu, Y.C. 2011. "Shades of Gray-The Impact of Gray Markets on

    Authorized Distribution Channels," *Quantitative Marketing and Economics* (9), pp. 155-178.

Zhou, L., and Wong, A. 2008. "Exploring the Influence of Product Conspicuousness and Social

    Compliance on Purchasing Motives of Young Chinese Consumers for Foreign Brands,"

    Journal of Consumer Behavior (7), pp. 470-483.

Zou, S.M., and Cavusgil, S.T. 2002. "The GMS: A Broad Conceptualization of Global

    Marketing Strategy and Its Effect on Firm Performance," *Journal of Marketing* (66:4), pp.

    40-56.