COUNTERFEITERS: FOES OR FRIENDS? – Sales Impacts of Counterfeiting*

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Abstract

This paper combines a natural policy experiment and randomized lab experiments to estimate the differential impacts of counterfeiting on the sales and purchase intent of branded products of various quality levels. I collect new product-line level panel data from Chinese shoe companies from 1993-2004. Exploiting the discontinuity of government enforcement efforts for the footwear sector in 1995 and the differences in authentic companies' relationships with the government, I identify heterogeneous effects of counterfeit entry on sales of authentic products of three quality levels. In particular, counterfeits have both advertising effects for the brand and substitution effects for authentic products. The advertising effect dominates substitution effect for high-end authentic product sales, and the substitution effect outweighs advertising effect for low-end product sales. I build a theoretical model with multi-product producers to generalize such impacts due to counterfeits. The aforementioned heterogeneous effects of counterfeits on branded products are also discovered in lab experiments where the presence of counterfeits is randomly assigned to a subsample of respondents. Responses allude to the fact that counterfeits can increase brand awareness and affinity, as well as substitute for lower-end shoes.

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Key words: Counterfeit, Intellectual Property Rights, China, Instrumental Variables, Marketing Experiments, Sales and quality, Shoes.

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1 Introduction

Upholding the protection of intellectual property rights (IPR) has been moved to the top of the trade agenda since the early nineties, and remains controversial (Lanjouw and Cockburn, 2000; McCalman, 2001). Advocates believe in the stimulating effects IPR has had on innovation, which would fuel faster economic growth. Such stimulating effects are shown to be very limited in practice, with inconclusive results from country case studies (Scherer and Weisburst, 1995; Kortum and Lerner, 1998; Sakakibara and Branstetter, 1999) and a generalizable conditional importance of patent effects only in countries of higher development and education levels (Qian, 2007). The TRIPs negotiations were largely motivated by the desire to reduce trade in counterfeit goods, which affects many industries and can have large influences on what a brand means to consumers.

Counterfeiting stays at the center of the current trade disputes. The year 2007 alone witnessed a G-8 summit recommending stronger enforcement of IPRs, the initiation of a WTO dispute against China's IPR enforcement regime, and the launch of inter-governmental negotiations towards an Anti-Counterfeiting Trade Agreement (ACTA). Although curbing counterfeiting through tightening intellectual property protection has been a common practice worldwide to foster brand values, only a few studied the impacts of counterfeits (Grossman and Shapiro, 1998,1999; Qian 2008). The sales responses remain a mystery partly due to lack of data. This paper leverages the same natural policy experiment for the Chinese field data as in Qian (2008). However, I am able to significantly extend the brand-level panel data in Qian (2008) to product-line details within each brand and to obtain product-line level sales data for the first time. As a result, I am able to go beyond the general impacts of counterfeits on authentic manufacturer norms (Qian 2008) and study the sales impacts. The current paper offers careful empirical identifications of the heterogeneous effects of counterfeits on sales of authentic products at different quality tiers. I further explore the mechanisms of counterfeit effects based on theories and randomized lab experiments.

The natural experiment was created by the Chinese government's emergent reallocation of IP enforcement resources away from monitoring footwear and fashion products to other sectors. This policy was implemented in response to a series of food poisoning and gas explosion accidents in the early nineties. Counterfeiters massively entered the Chinese footwear industry shortly after the policy shift, infringing on brands of both multinational corporations and Chinese enterprises. I am able to directly analyze short-term and long-term sales impacts of counterfeiting. I do so through a unique panel dataset with detailed financial information over a recent 12-year period for 31 branded shoe companies (including domestic brands and multinational brands operating in China) and their counterfeiters, whenever present, in China.[1] These financial data are supplemented by the Chinese Industrial Census database, eBay-in-China dataset, product catalog information, and interviews. The natural experiment and panel structure at the product-line level enable systematic analyses of the heterogeneous sales impacts of counterfeiting. In addition, I conducted controlled lab experiments to further test the causal effects of the exposure to counterfeits on consumers' purchase intent of authentic products at the three representative quality tiers. These experiments well complement the field studies by providing micro-foundations of the overall sales impacts based on individual purchase intent and motivations.

A number of insights emerge from this study. Counterfeit entry exhibits both negative substitution and positive advertising effects on authentic sales. The net-effect is positive for high-end authentic products and negative for low-end authentic products, even within the same brand. The positive effect on high-end authentic products mainly comes from increased brand awareness and affinity due to the presence of counterfeits. Brands with less government protection seek to differentiate their products by moving up the quality ladder. Over time, these branded companies shift toward the higher-end product lines and shrink their low-end

[1]The Chinese leather and sports shoes sector concentrates most of the brands, as compared to the other parts of the footwear industry, and accounts for approximately 6 billion USD annual sales. Some Chinese brands, such as Li-ning or Anta, occupy Chinese market share close to that of Nike's.

product line. Such heterogeneous sales impacts are directly linked to the corresponding impacts of being exposed to counterfeits on consumer's purchase intent for products of the three quality tiers. The experiment responses also suggest the double-edged effects of counterfeits in increasing brand awareness and substituting for the low-quality product.

Prior literature on counterfeits remains inconclusive. Darby and Karni (1973) presents a theoretical framework to explore the reasons for and determinants of using fraud information as means of attracting customers. They suggest using branding and client relationship as tools in monitoring qualities. Enlightening as it is, their paper does not discuss what happens when brands are counterfeited. A stream of literature on online piracy has vigorously debated about the effect of file-sharing on original music sales in recent years, and Liebowitz (2006a,b) provide excellent surveys. Several empirical studies seem to point to a negative effect of piracy and file-sharing (Givon et. al. 1995, Hui and Png 2003, Liebowitz 2006,2008, and Hong 2008). Yet Oberholzer-Gee and Strumpf (2007) conclude the opposite based on an uniquely matched dataset of music downloads and purchases. Rob and Waldfogel (2006) conduct surveys on undergrad students. Although they find that the average drop in album purchases due to downloading was \$0.2, consumer surplus has increased due to the lower prices. On the theory side, Shapiro and Varian (1999) argue that file-sharing is a form of free samples and, as such, it may actually stimulate sales. Conner and Rumelt (1991) propose potential positive effects of piracy on the original software demand when consumer utility is a function of the size of the user base. They, however, point out that such network effects are likely to be rather specific to software sector. Nevertheless, positive effects of counterfeits on authentic sales seem to exist in other sectors. Richardson (2009) surveys a sample of consumers, and find that they purchased more branded purses when the brand is counterfeited. The prior literature fails to provide generalizable guidance on the sale effects of counterfeits and the underlying economic mechanisms. This study collects detailed sales data at the product-line level for each of the 31 branded companies and their counterfeits in the

original sample in Qian (2008). These new data enable rich analyses on the sales impacts of counterfeits at the product-line level.

The primary contribution of the paper is empirical, namely gathering data to probe into the sales impacts of counterfeits, identifying a natural experiment and suitable instruments for various levels of counterfeit entry for different branded products, and conducting lab experiments to test causal effects and mechanisms underlying the sales impacts. There is a dearth of empirical studies of counterfeits or underground economics in general: the illicit nature of counterfeit implies "under the table" and difficult to measure. Since China faces serious counterfeit problems, the Chinese footwear sector has a strong incentive to investigate the effects of entry by counterfeiters. I conducted interviews and surveys of Chinese shoe companies and gathered external data to analyze empirically the sales effects of counterfeits. I obtained annual data for these companies' prices and production costs at the product-line level, financial statements, and marketing strategies from 1993-2004.[2] These data corroborate trends in the Chinese Industrial Census database and the eBay dataset. I gathered data on the detailed characteristics of each type of shoe for each brand from the annual product catalogs. I also gathered the prices, costs, quantities, and several dimensions of product characteristics of counterfeits from each authentic company's "brand protection" office, and cross-validated these data with the Quality and Technology Supervision Bureau. While the data are not exempt from limitations, they nonetheless represent a substantial improvement on previously available information.

A key difficulty in empirically measuring entry effects on authentic sales is that entry is often endogenous to these outcomes. This endogeneity problem is especially serious for counterfeit entry, because the higher the authentic producer's sales, the more likely counterfeiters will enter to copy the brand. Under such circumstances, counterfeit entry will be

[2]I collected and analyzed city-level data as well. I found that the authentic prices do not vary a lot across regions. They differ by approximately 1 USD, which accounts for the transportation costs approximately. There is lack of variation in counterfeit entry across regions. However, city-level IV estimations are still conducted as robustness checks.

positively correlated with authentic sales, even if entry is not the underlying cause. My natural experiment and IV strategy allow me to identify occasions in which counterfeiters of a brand are more likely to enter for exogenous reasons that are not related to the brand holder's sales prospects – "randomized" entry decisions – to infer entry impacts.

The rest of the paper is organized as follows: Section 2 describes the field data, followed by empirical analyses and results in Section 3; Section 4 provides theoretical foundations for the findings; Section 5 documents the lab experimental design and results; Section 6 concludes and draws out policy implications. Figures and tables are included in the Appendix.

2 Field Data

2.1 Data Design

The ideal experiment that would test the sales impacts of counterfeits would randomly assign counterfeit entry for a set of brands in a large pool. Meanwhile other brands would be kept immune from counterfeiting. The exogeneity of counterfeit entry, however, may not hold in reality because entry is more likely to occur if the original producer has a larger sales, easier-to-copy quality, or a looser trademark management team. These unobserved time-variant firm characteristics are not captured by the fixed effects, resulting in correlation between counterfeit entry and the error term. Simple OLS without accounting for this entry endogeneity will lead to biased effect estimates.[3]

Given these concerns, I locate appropriate instruments that would identify the effects

[3]The omitted variable bias potentially enters OLS in two directions: an upward bias due to brand effects, which correlate positively with the sales outcome and counterfeit entry; and a downward bias due to internal management effects, which are positively correlated with the sales outcome but negatively correlated with the brand's counterfeit entry. In particular, a brand with good internal management may effectively ward off counterfeits as well as maintain high sales. In fact, when simply regressing log sale quantities on the fake entry dummy and a year trend, the entry coefficient is very large (=0.68). While the company fixed effects help control for the omitted brand effects, they do not control for the time-variant management effects. The resulting OLS entry coefficient is, therefore, biased downward, as compared to the IV estimates.

of the counterfeit entry variable. Following Qian (2008), the IV strategy relies on a natural experiment in the Chinese IPR enforcement change and its differential impacts on different brands. The remainder of this section explains the necessary details for completeness.

The advantage of studying the Chinese shoe industry primarily comes from the natural experiment, which stems from an enforcement change around the year 1995, due to external shocks exogenous to the shoe sector. In China, copyright and trademark laws were restored after 1976. In 1985, the Chinese government established the Quality and Technology Supervision Bureau (QTSB),[4] with a branch in each city and joint forces nationwide, to supervise product quality and outlaw counterfeit localities. Due to a series of accidents arising from low-quality or counterfeit agricultural products and gas tanks, the Chinese government issued notifications around 1995 to enhance quality supervision and combat counterfeits in seven main sectors prone to hazardous materials.[5] The majority of the Bureau workforce and funding went into these sectors, leaving loopholes for counterfeits to enter the footwear industry. For instance, in the early 1990s, approximately 10-12% of the Bureau's resources were devoted to the footwear sector; this number, however, fell to 2% after 1995 (QTSB yearbooks). As the data show, authentic companies experienced significant counterfeit entry after this loosening of governmental monitoring and enforcement, with the highest level of entry occurring in 1996.

As expressed in interviews, authentic shoe producers were surprised at the massive entry of counterfeits[6] but soon reacted. The branded companies that had been infringed upon set up their own "brand-protection" offices to compensate for the lack of government

[4]It was recently renamed the "Administration of Quality Supervision, Inspection and Quarantine." The Bureau enlarged its personnel and funding in 1991 in a joint effort with legislation to protect IPR and monitor product quality.

[5]These sectors included: pharmaceuticals; agricultural products (including fertilizers, pesticides, and other materials or instruments); fiber and cotton (particularly bacteria-infected or bleached counterfeits); food; tobacco; alcohol; and gas. Notification No. 52 of late 1994 highlighted fiber and cotton quality supervision, and Notification No. 10 of early 1996 highlighted gas and other major hazardous products.

[6]These are illegal products that infringe upon others' brands that they do not own.

monitoring. The company fixed-effects regression of the log of company enforcement investments on a legislation dummy is positive and significant at the 5% level (coefficient=3.2).

In light of the enforcement changes that are shown to have instigated massive counterfeit entries, the ideal experiment would translate into randomly loosening IPR enforcements for a group of brands in China at a certain time, while leaving the IPR enforcements of the other brands unchanged. Although the government enforcement change mainly presents itself with time variations, I am able to bring in brand-level variations by measuring the relationship between each sampled authentic producer and the government. Pertinent details will be discussed in the following paragraphs, but the bottom line is straightforward: After the enforcement-legislation change, the monitoring of counterfeits became decentralized, resulting in company-level supervision, carried out primarily through authentic manufacturers' own initiatives to protect their own brands. However, the authentic companies still had to rely on the government to outlaw the counterfeit localities once discovered by their own enforcement employees because only the government had such authority. Therefore, companies that had a poor relationship with the government received less attention and experienced more counterfeits. I thus exploit the interaction between the enforcement-legislation change and a proxy for the relationship between an authentic company and the government to identify entry impacts.

Before the enforcement change, the QTSB conducted regular inspections of shoe markets and factories. They confiscated and shut down counterfeit localities on the spot. The monitoring mechanism was, therefore, quite uniform across different brands. After the enforcement change, however, companies that had a good relationship with the government received faster responses when they reported counterfeit cases. All else being equal, this type of phenomenon reduced the incentives of counterfeiters to infringe upon these brands.[7] Brand-level variation in relationships with the government (the QTSB in particular) is there-

[7]Chinese news agencies broadcast counterfeit-confiscation news and consequently counterfeiters are likely to know which brands are harder to infringe upon.

fore helpful for exploring the variation in counterfeit entries for different brands after the policy shift and, in turn, its effects on different authentic sales. The challenge is to obtain a proxy for such a relationship. Previous literature on political connectedness largely measures country-level corruptions. Fisman (2001) pioneered such company-level measurement by linking the response of the share returns of firms traded on the Jakarta stock exchange to a string of rumors about the adverse state of President Suharto's health.However, it is hard to identify a political figure similar to Suharto in the Chinese context that I am examining. The shareholders or directors of the sampled shoe companies also did not participate in electoral votes, a scenario used in Khwaja and Mian (2005) to document the political connectedness of firms in Pakistan. The World Bank World Business Environment Survey (WBES) measures political connectedness with managers' impressions on how fast things get done in dealing with governments (Batra, *et al.* 2003). The only other alternative I found is a recent paper by Mobarak and Purbasari (2006), who propose that whether an Indonesian company acquired import licenses reflects its political connectedness. In the event that the political-connectedness element might play a role in the Chinese import-licensing system, I gather data for the sampled companies (See Appendix A). I also collect data on CEO's biography and political connectedness for each company. However, I only use them in supplemental analyses because they do not reflect a company's relationship with the government agency of interest, i.e., the agency that is in charge of IPR enforcements and that influences counterfeit entry and quantities. I seek a relationship proxy that is most relevant in explaining brand-level variation in counterfeiting and least influential with respect to authentic sales, except when it affects counterfeiting. Based on these criteria, the number of days it took a branded company to obtain ISO certificates nationwide is the most appropriate proxy.

Since the late 1980s, all registered companies in China have been *mandated* to meet the standards set by the International Standards Organization (ISO).[8] For the shoe industry,

[8]This differs from the U.S., where companies adopt ISO standards voluntarily.

the ISO sets standards for the basic equipment a company uses and the basic treatments pertaining to the environment and labor. The QTSB is in charge of ISO certification. For some companies, one month was sufficient to obtain the ISO certificate, but for others, the application date and grant date were more than 300 days apart. Of the companies that spent a long time fulfilling the ISO requirements, some were small, and others medium or large.

Through close readings of documents and multiple interviews with companies and the QTSB, I am able to confirm that the standards were rather basic and the differences in application times were largely due to bureaucracy. Notably, the standard for companies to be registered as legal enterprises surpassed the basic quality standard specified by the ISO. The companies also had to pass internal qualifications as outlined by the ISO before submitting their applications to the QTSB (QTSB 2000). Thus, the variation in application time is largely due to relationships and not product quality or other company factors. Each registered branch of a branded company needed to apply for an ISO certificate at its local QTSB office.[9] I use the number of work days it took each branded company to obtain ISO certificates, averaged across all the relevant cities where that company had production or management branches, as a proxy for the company's relationship with the government in the national market. This is a more objective relationship proxy than managers' impressions recorded in World Bank surveys (Batra *et al.* 2003).

The sampled shoe companies had to comply with two sets of ISO standards, one established in 1994 and the other in 2000. I obtain each company's application and grant dates for an ISO certificate corresponding to each set of standards and calculate the number of workdays between each pair of application and grant dates. I then constructed a variable that equals the number of workdays between the application and grant dates for the 1994 certificate through the year 2000, and that equals the number of workdays to obtain the 2000

[9]For instance, the brand Senda originated in Yancheng city and applied for an ISO certificate there; its subsidiaries in Shanghai, Jianhu, Beijing, Jilin, etc., also applied for and obtained ISO certificates from the corresponding QTSB branches.

certificate from the year 2001 on. The correlation between the number of days to obtain both sets of ISO certificates is very high, 0.96, suggesting that the relationship between a company and the government was rather steady in the period under examination. Further, there are more variations in the ISO indicator across brands or firms within the same local area than across regions. When I regress the ISO values on the series of dummies indicating the city of application, none of the cities carries statistically significant coefficients. The p-values of these coefficients range from 0.23 to 0.64.[10]

There is also no significant correlation between this relationship proxy and the company's size, sales, product quality, or production costs in my data. The largest correlation amounts to only 0.08. The manager of a famous Chinese-branded company complained about its poor relationship with the QTSB and the consequent slow response in fighting its counterfeits: *"Our company bases success on our ability and product quality and [we] never cared to work on relationships (Guanxi). It is frustrating that we have to go through slow processes in some applications such as the ISO and wait months before the government outlaws the reported localities of our counterfeits."*[11] In addition, Chinese consumers hardly notice these ISO certificates. Therefore, the ISO does not signal product quality and is not likely to influence prices in any way other than through affecting counterfeit entry and quantity.[12]

Figure II in Qian (2008) exhibits a generally positive relationship between the average number of workdays a branded company took to obtain the ISO certificates and the mean quantity of counterfeit sales it experienced after 1995. This correlation remains significant in regressions of counterfeit entry or sales on ISO days, after taking out company- and year-fixed effects. Section 3.1 provides more data to support IV validity.

[10]I also regress the number of days for passing each of the two sets of ISO standards, respectively, on the application city's per-capita income, growth rate, CPI, and income inequality measure for the relevant years and find no significant coefficients.

[11]I have translated these quotes into English from the original Chinese.

[12]Many sectors are privatized in China, the footwear industry included. None of the companies in my sample is state-owned. Shoe prices are also freely set by supply and demand.

2.2 Data Collection and Description

The design of our research suggests obtaining data on each brand's product prices, domestic sale quantities, costs, and sales, as well as information on counterfeit infringements. Due to the underground nature of counterfeits, I collect data through a combination of external data sources and original survey research. The Chinese Bureau of Statistics Industrial Census database contains detailed financial information and basic company characteristics (such as size and age) for all the registered companies in China. Several waves of data were available for the years 1995 and 1998-2005. While the database enlists the main products of each company, it does not contain any data on prices or product-level details. Systematic information about counterfeiting was not found in the existing Chinese or international data sources. It is therefore necessary to supplement data with my own survey research in China to acquire their financial statements and counterfeit confiscations.

Building on the database from Qian (2008), I gathered additional detailed information on sale quantities, transaction prices, and unit production costs at each quality level for each general type of product, and on the corresponding counterfeits for each of the 31 branded companies that are sampled through stratified random sampling method. The data are taken from the companies' annual financial statements and other relevant company records. Details of the sampling and survey methods are discussed in Qian (2008). I specifically requested companies' assistance in obtaining data from their databases.[13] The data provided by the company corroborate those recorded in the Industrial Census for the years available. The sales, sale costs, profits, and export aggregates of my sample mirror the trends in the Census of shoe companies. In addition, the price data in my surveyed sample mirror the general price trends of the three quality levels in the eBay dataset collected by researchers at University

[13]The company contacts were very responsible and they most times would not even give casual estimates during interviews. Every time I have a follow-up question, they would email or fax me after checking back with their resources.

of Chicago.[14] Qian (2008) details all the data diagnostics and sampling methods.

The detailed sale quantity, price, and cost data are now obtained for finer categorization of products as compared to Qian (2008). For instance, if a company produces six types of products, including high-leg, medium-leg, and regular leather shoes for both women and men, and there are three quality/cost levels within each type, then data on sales are disaggregated to each of the 18 quality-type combinations. The data approaches a product-level panel. The input and production costs for the products within each quality-type combinations are very similar, although there are still variations in color and style that the current data cannot fully capture. The life-cycle of each particular style is one to two years, however, the product lines remain active over the sampled years. That is, the machinery and organization of each product-line does not change for any given existing quality tier, manufacturing varying styles and colors corresponding to that quality tier. New product-lines added in later years are also clearly captured in the data and are analyzed. Such fine-level aggregations are appropriate for the analyses at hand, as we are exactly interested in the differential sales impacts at the quality-tier level.

In addition, I coded and compiled product-level shoe characteristics from the annual catalogs that I requested from the companies and stores. These product characteristics are also helpful in better controlling for quality and costs. I compiled a dataset of different characteristics for each type of shoe in the catalogs, consisting of materials, comfort, decorative patterns on the shoes, support and cushioning effects, ventilation, *etc.* Hedonic regressions reveal that these characteristics together account for 90% of the cost variations (Qian, 2008). The results lend credibility to the company data and to the results.

I collected data on the year counterfeits entered the market for each quality tier of each brand, whenever existed, from the "brand-protection" offices of each authentic company.

[14]The researchers collected transaction-level data on eBay for several product categories. Ting Zhu kindly shared the shoe data with me. For each transaction, the data includes the shoe brand and type, the final transaction price, shipping cost, seller and buyer IDs, product condition, starting bid, and number of bids.

Because the branded companies and the government, QTSB in particular, worked together to track down counterfeits, the QTSB shared with each branded company their statistics of counterfeits of the corresponding brand they confiscated. Given the unusual nature of the data, it is important to consider both its reliability and limitations. On the very basic question of authenticity, I have no reason to doubt that the data actually represent the branded companies' records of discovered counterfeits, the QTSB's records of raided counterfeits from the marketplace and production locations, and the financial records of the counterfeiters. These book-keeping records were kept internally as a tool for managing the day-to-day operations of the counterfeiting companies, and were confiscated with all the counterfeits when the government investigated and shut down these illegal entities. The QTSB also kindly shared with me some statistics on the characteristics of the shoes they confiscated from the counterfeiters. The details are discussed in Qian (2008).

One limitation of the data is that only the discovered or captured counterfeits are reflected in the data. Although the branded companies reported to me that they were able to track down most of their counterfeits and the remaining ones were minor and not as influential to them, it is prudent to view the counterfeits' sales as lower bounds of the true values. To ameliorate this potential bias, I generate a dummy variable for counterfeiting presence which takes on value 1 if a branded product experiences any amount of counterfeiting, and zero otherwise. I primarily study the impacts of entry and presence of counterfeiters on the authentic brands.

The data show that counterfeits for the authentic products of different quality levels within the same brand enter in the same years. It is possible that the annual data is too broad to capture monthly variations in entry by counterfeiters. This concern is clarified during interviews with branded companies. They reveal that counterfeiters usually imitate all levels of authentic products, even though they use similar inferior materials at large to produce shoes that mimic different appearances of these products. I analyze different quality

tiers separately, so the brand-level variations in counterfeit entry is more relevant than any minor variations at the quality level within a brand.

To control for the overarching economic environment and consumer purchasing power, I obtained data on a common set of macro-indicators: the GDP per capita PPP, GDP growth, and Consumer Price Index (CPI) in the sampled years from the World Development Indicator (WDI) database, and the annual Gini coefficients in China from the UN Human Development Reports. Because neither the countefeiting treatment variable nor the policy shift experiment (supplemented with brand-level variation in relationships to government) exhibits regional variations (Qian, 2008), regional factors are not likely to cause bias in estimates even if omitted. Furthermore, Qian (2008) collected regional level income per capita, growth, prices, and inequality data, and documented that results are unchanged to such regional controls. This paper therefore reports the national-level analyses. Some descriptive statistics of the 31 companies over the 12 year panel are displayed in Table 1.

2.3 Data Insights

Table 2 tabulates the sales of shoes at the three broad quality tiers that the companies classify as percentages of total sales domestically. It is interesting to note that the quality lines moved upward after entry by counterfeiters. That is, the higher-end shoes occupy larger shares in total sales post-entry and the low-end shoes witness their shares decline dramatically.

We can synthesize these differential effects of counterfeit entry on authentic sales of different quality levels as follows. In particular, entry by counterfeiters has two opposing effects on the branded products: business-stealing effect and advertising effect. The first effect arises when consumers substitute counterfeits for the authentic products of the infringed brand. This effect is most phenomenal when the quality of the counterfeits approaches that of the authentic products, as in the case of the low-end products sample. The second effect arises when counterfeits increases the brand awareness and help to capture new customers

Table 1: Summary Statistics

Variable:	**Pre-1995**	**Post-1995**
Percentage of Government Resources	.11	.02
	(.004)	(.001)
Workdays Authentic Company Took to Pass ISO	142	149
(Relationship Proxy)	(116.5)	(112.6)
Incorporation Year	1985	1985
of Authentic Brands	(11)	(11)
Number of Company Stores	0	684
	(0)	(533.5)
Authentic Brand-Protection Office Personnel	.17	4.0
(Head count)	(.46)	(2.23)
Quantity (in 10,000 pairs)	Price and Cost	in Deflated USD
Fake Sale Quantity	Median 0	85.71
		(75.85)
Fake Shoe Price	Median 0	7.32
	(8.33 to 10.4)	(4.2)
Fake Shoe Costs	Median 0	2.66
	(2.2 to 3.56)	(1.56)
Authentic High-end Shoe Price	43.3	61.48
	(20.46)	(40.58)
Authentic High-end Shoe Costs	33.53	47.01
	(19.14)	(30.03)
Self-enforcement Costs of Authentic Brands	520	81380
	(1550)	(83140)
Advertising Expenditure	1496700	2381500
	(2724200)	(3329300)
Real GDP per capita PPP	310.25	488.13
	(5.57)	(2.83)
No. of Obs.	62	310

Table 2: Summary Statistics on Average Percentage of Sales of Three Quality Tiers

Quality Tier:	**Pre-entry**	**Post-entry**
1. High-end	13.9%	23.0%
2. Medium-end	54.0%	61.5%
3. Low-end	32.1%	15.5%

for the brand. This effect will be more pronounced when the new customers who learned the brand name value high quality and authenticity. These consumers would then choose to purchase the high-end authentic products instead of counterfeits. In these cases, the new segment of customers recruited by the counterfeits will be gained by the authentic company, leading to the increased sales for the high-end products. I later formalize the intuitions in a vertical differentiation framework in the Theory section.

There is of course another layer of complexity associated with counterfeiting, namely asymmetric information generated by counterfeits as modeled in Qian (2006). Some consumers cannot distinguish counterfeits from authentic products, because counterfeits copy the branded products and mimic their appearances. Asymmetric information tends to enhance the business stealing effect when consumers are conned into purchasing the counterfeits. Qian and Gong (2009) shows that authentic companies innovate to differentiate their products from counterfeits, and counterfeits are limited in their technology. When the quality gap between the authentic and counterfeit products widens, it is harder for counterfeits to confuse consumers. Although counterfeiters attempt to mimic authentic products at most quality levels, their ability to imitate is increasingly limited when moving up the quality ladder. This business-conning effect therefore diminishes in the higher quality categories than the low-end one. The increased sales in the high-end products could also be explained by the higher prices consumers are willing to pay for these authentic products, because they are willing to pay a premium for authenticity or for the search cost of authentic products. Qian (2008) also documents this phenomenon of increased willingness-to-pay.

To tease out the mere advertising effect by the entry of counterfeits from the increased sales due to the new products, I separately compile the sales shares for products of fixed quality pre- and post-entry by counterfeiters and those for the new products introduced after the infringements in Table 3. Among the fixed quality tiers, the percentage sales of high-end shoes increased post-entry, but that of the medium-end and low-end shoes both declined.

However, such decline in the medium-end shoes tend to be overcompensated by the new products in the same quality tier, whereas the new products in the low-end are not sufficient to make up for the category percentage drop. More formal regression analyses are carried out in the following section.

Table 3: Summary Statistics on Average Percentage of Sales of Fixed Quality Tiers

Quality Tier:	**Pre-entry**	**Post-entry**
1. Existing High-end	13.9%	17.0%
2. Existing Medium-end	54.0%	35.8%
3. Existing Low-end	32.1%	5.6%
1. New High-end	0%	6.0%
2. New Medium-end	0%	25.7%
3. New Low-end	0%	9.9%

3 Empirical Identifications

With an even richer database than that of Qian (2008), there is more identification power at the product-quality level. In particular, each brand has several different quality levels, and I observe different sales quantity and values of products at each quality level. The loosening of the government enforcement for footwears therefore essentially created dozens of "mini-experiments" that I exploit to identify the entry effects of counterfeiters on authentic sales of these various products.

Since there is no within-brand variation in the entry timing of counterfeits for products of different quality levels, I conduct IV regressions of the entry effects on sales for each quality level separately, resulting in three sets of analyses. For each sample consisting of one quality level of all branded products, I execute the following two-stage least squares model.

3.1 First Stage IV Estimations

Following the identification strategy as in Qian (2008), I instrument for the entry of counterfeiters using the plausibly exogenous enforcement shift away from the footwear industry and its interactions with the relationship between each branded company and the government. I construct an indicator variable, Loose, to benchmark the years with diverted government enforcement efforts for shoes (Loose=0 prior to 1995 and 1 starting from 1995). I use this enforcement change and its interaction with the relationship between a branded company and the government (proxied by the days it took the brand to pass ISO standards, averaged across its subsidiaries in various regions) as the main instrumental variables for counterfeit entry. Because the enforcement change was due to a series of accidents that took place in other industries, it is plausibly exogenous. The IV exclusion restrictions are also fulfilled because tightened government enforcement elsewhere is not expected to affect shoe prices or sales directly. Since authentic prices are set by market equilibrium and the ISO time proxies for the relationship of a company only with the QTSB, this ISO proxy does not affect sales directly.

The entry by counterfeiters is identified with the equation below:

$$\begin{aligned} \text{Counterfeit}_{at} &= \gamma_0 + \gamma_1 * (\text{Relation*Loose})_{at} + \gamma_2 * \text{Loose}_t + \gamma_3 * \text{Relation}_{at} \\ &\quad + \gamma_4^T * \text{Year Dummies}_t + \gamma_5^T * \text{Firm Dummies}_a + \psi_{at} \end{aligned} \tag{1}$$

where Counterfeit_{at} is an indicator variable for the existence of counterfeits of brand a's product in the market at time t, and it equals 1 if there are positive amounts of counterfeits for a in the year t. Relation_{at} is the ISO proxy for the relationship between authentic company a and the government, and $(\text{Relation*Loose})_{at}$ stands for the interaction variable between this relationship proxy and the enforcement-change indicator.

In addition to the potential endogeneity of the entry variable, product price may be endogenous to sales as well. I adopt the traditional IV of product cost for that. This is

modeled as follows

$$lnP_{ajt} = \alpha_0 + \alpha_1 * lnC_{ajt} + \zeta_{ajt} \tag{2}$$

Where lnP_{ajt} denotes the log price of brand a's product j at the year t, and lnC_{ajt} similarly denotes the corresponding product cost in logs.

Different columns in Table 4 exhibit the estimations from several specifications of this first-stage IV regression. As shown in Columns (1) through (4), the legislation dummy and the interaction between Loose and relationships are highly correlated with counterfeit entry, statistically significant at the 1% level. The overall Wald Chi-square test or F-test for the instruments is highly significant as well. All these estimations tell a consistent and clear story that the policy shift and its interaction with the ISO relationship proxy are highly correlated with the treatment variables: counterfeit entry.[15]

3.2 IV Regressions for Sales of Fixed Quality Levels

The increases in sales share of high-end products in Table 2 could be in part due to the spillover effects of counterfeiting and, in part, a direct consequence of new product introductions after entry as documented in Qian (2008). To tease out these two parts, I match products of similar quality tiers before and after the entry by counterfeiters throughout the sample period, based on similar price and costs. I compile this sample of existing product-lines separately from the rest of the sample of new product-lines introduced after entry as authentic companies aimed to differentiate from the counterfeits. I then investigate the entry effects on sales of these existing product lines broken down to three quality tiers: high, medium, and low. The part of the sales increase due to potential advertising effect of coun-

[15]To address the potential concern that the legislation-change dummy might be confounded with other macro changes that are not picked up by the year effects, I conduct robustness checks using the fraction of the resources the QTSB devoted to the shoe industry as an alternative instrument to the legislation dummy, as in Qian (2008). The results are similar to those presented here and are collected in Qian (2008).

terfeits is likely captured by a positive coefficient on the entry dummy for the high-end shoes within the existing product lines.

To test the counterfeit entry effect on the authentic product sales of the three existing quality tiers (High-, Medium-, and Low-ends), I estimate equations (1), (2) and the following equation (3) simultaneously (SEM) within each quality tier of shoes separately. Standard errors are clustered at the company level (Table 5).

$$log(Sales_{ajt}) = \beta_0 + \beta_1 * \text{Entry}_{ajt} + \beta_2 * lnP_{ajt} + \beta_3^T * X_{ajt} + \beta_4^T * \text{YearDum}_t + \beta_5^T * \text{ProdDum}_{aj} + \epsilon_{ajt} \quad (3)$$

where Entry_{ajt} is an indictor variable that takes on value 1 if there is positive presence of counterfeits in the market for the brand a's product j in year t. lnP_{ajt} is the log price of the product, and X_{ajt} is a matrix of control characteristics such as the company a's age and size and product j's shoe orientation (male or female) or usage (winter boots, slippery, etc.) at year t. The fixed effects for year (12 years) and product-lines within the quality tier of the 31 branded companies control for year-specific confounding factors and time-invariant product attributes.

Using the log sales quantity and values as alternative dependent variables, I arrive at robust results. Table 5 in the appendix presents the results and reveal interesting patterns. Counterfeit entry hurts low-end products but has positive effects on the high-end ones, statistically significant at the 5% levels. The sales of the high-end authentic products increased significantly after counterfeiters enter, controlling for year and product-line fixed effects and other time-varying company and shoe characteristics such as company age and size. This reflects the potential advertising effect of counterfeits for the brand. In particular, The coefficients translate to a 66% increase in quantity and 50% increase in values of high-end sales. Given that the mean sale quantity for the high quality tier shoes was 461 million Yuan pre-entry, this amounts to approximately 231 million Yuan of shoes sold on average. The medium-end authentic products did not witness significant changes in sales due to counterfeiting, although the sign of the coefficient on the instrumented entry variable was

negative. However, the sales of the low-end authentic products have dipped significantly upon entry of counterfeits, both in quantity and values. The coefficients on the instrumented entry dummy are -0.58 for low-end sale quantity and -0.75 for values, implying a 44% drop in sale quantity and 53% drop in sale values for the low-end shoes. Given the mean sale quantity of 1.4 billion Yuan, the loss is roughly 767 million Yuan of shoes due to the substitution effect. This demonstrates the fierce competitive effects of counterfeits.

In robustness checks, I repeat the simultaneous equations model analyses by adding a control for the log average price of counterfeits of each quality tier, as instrumented by the log unit product cost of counterfeits. The estimation results did not change qualitatively. That is, the entry coefficients remained positive and signficiant for the high-end sales quantity and values, and negative and significant for the low-end sales quantity and values. Since the data for counterfeit prices are less systematic, I kept my main specifications as described earlier. I further conducted robustness analyses with controls for time-variant brand advertisement expenditure. The results remained qualitatively similar. To the extent that the IV teases out plausibly exogenous parts of the counterfeit entry, the sales responses are less susceptible to omitted variable biases, especially in the time period immediately following entry.

3.3 Dynamic Effects of Counterfeits on Product-level Sales

While the previous section tests the overall impacts of counterfeit entry, this section traces the entry effects on authentic sales over a longer time horizon. For the samples of shoes at each calibre level, I regress the log sale quantity on the set of dummies indicating different years relative to entry by counterfeiters, controlling for the set of time-varying company characteristics, macro conditions, and company-fixed effects. That is, I simultaneously estimate

the following equations:

$$lnP_{ajt} = \alpha_0 + \alpha_1 * lnC_{ajt} + \zeta_{ajt} \quad (4)$$

$$log(Sales_{ajt}) = \beta_0 + \sum_{k=-5}^{5} \beta_{1k} * \text{YearTôEntry}_{a,j,k} + \beta_2 * \hat{lnP}_{ajt} + \beta_3^T * X_{ajt} + \beta_4^T * \text{YearDum}_t + \beta_5^T * \text{ProdDum}_{aj} + \epsilon_{ajt} \quad (5)$$

where I regress the log sale quantity of brand a product j at year t on the set of dummies indicating years (k) relative to entry from 5 years pre-entry to 5 years post-entry, controlling for the instrumented log product price and other characteristics. I plot the regression coefficients on the year indicators against the corresponding year relative to entry for the sample of existing product-lines and the sample of new product-lines in Figures 1 and 2, respectively. Because the new products were introduced only after facing the competition from counterfeiting, the coefficients for years prior to infringements were not plotted in Figure 2.

Figure 1 demonstrates the positive effects of counterfeits on the high-end shoes. Such an advertising effect is felt immediately upon entry of counterfeits and lasted for a few years before it dwindled. It is possible that counterfeits first served to improve consumer awarenesses of the brand, and later contributed negatively to the brand equity because some consumers might misattribute the inferior counterfeit quality to the brand itself. The negative impacts on the other two quality tiers are quite large and long-lasting. Some of the dips in these sales are compensated by the sales of new products in these two tiers, as indicated in Figure 2.

The findings presented so far further enhances those in Qian (2006), which indicate that the authentic companies' product upgrades in response to their counterfeit infringements. In particular, among the set of branded companies whose products started at similar price and quality levels, only those experienced counterfeit infringements strived to innovate after being counterfeited massively. The companies that had a good relationship with the government and did not experience massive counterfeiting threats did not witness internal quality upgrades. Such effects encounter interesting developments here. Not only did firms

innovate to ameliorate competition from counterfeits, they also gradually shift production lines to the high-end shoes over time. The findings in this study that counterfeits have positive effects for high-end products and a negative substition effect for the low-end products explains the incentives for the aforementioned business strategies. Since the quantity demanded increased, product variety increased, and the deflated price associated with basic characteristics are stable, the impact of counterfeit entry on consumer surplus seems positive to the first approximation.

4 Theory

Two strands of theoretical literature provide useful framework for conceptualizing the empirical findings here. One is the vertical differentiation model pioneered by Mussa and Rosen (1978) and Gawbszewicz and Thisse (1979) that analyzes the two opposing effects of entry: substitution effect and demand-enlarging effect. The other strand of literature debates the role of advertising. Becker and Murphy (1993) consider a framework where advertising is a complement to the good being advertised. Advertising has been theorized to reduce consumer search costs and assist in better matching and coordinations between consumers and brands (Grossman and Shapiro, 1984; Bagwell and Ramey, 1994). In the current context, counterfeits could serve as advertisements for the brand personality and assist in consumers' searches for their best-fitting brands. A recent study by Johnson and Myatt (2006) also suggests a new taxonomy of advertising, distinguishing between hype, which shifts out demand, and real information, which rotates demand by altering the price elasticity for brands.

Unlike the traditional advertising literature, my data depict a potential advertising effect through the entry of counterfeits. Since the authentic branded companies do not internalize such advertising costs in their own optimizations, the advertising hype can lead to heterogeneous sales impacts for authentic products of different quality tiers. I show that it

can both shift the utility function and rotate sales response functions for products of different quality levels. Assimilating advertising effects into a vertical differentiation model, I theorize a market with a multi-product branded company and examine how sale decisions change after a counterfeiter enters the market.

Consumer preference is a function of the product quality s, brand awareness b, and its price P: $U = V * s * b - P$; where the consumer taste for quality s, as denoted by V, is uniformly distributed between $[V^L, V^H]$. We assume $V^H \geq 2V^L$ to ensure that the market is "covered", and consumer valuations are monotonic in product qualities. Similar to Connor and Rumelt (1991), parameter b here captures brand awareness and network externality, which is an increasing function of the number of users of the product: $b = f(N)$.

There is at first one original producer with products of two qualities: $s^H > s^L$. The unit costs of producing the two types of qualities are c^H and c^L, respectively. The producer attempts to maximize joint profits in the two segments of market: upper segment who purchases s^H, and the lower segment who purchases s^L. The prices of these two products are set accordingly.

In a market with counterfeits, a counterfeiter enters with product of quality s^F and unit cost $c^F < c^L < c^H$. Let P^H, P^L, P^F be the prices for the original high- and low-quality authentic goods and the counterfeit good, respectively.

We first consider the case that the producer simply optimizes its prices. Before counterfeits enter the market, an indifferent consumer with valuation V is equally happy with consuming the high-quality product or the low-quality one if: $Vs^H * b - P^H = Vs^L * b - P^L$ $\Rightarrow V = \frac{P^H - P^L}{(s^H - s^L)b}$; and the lowest valuation among the consumers who would still purchase the low-quality good is: $\underline{V}s^L * b - P^L = 0 \Rightarrow \underline{V} = \frac{P^L}{bs^L}$. Any consumers with an even lower taste will not purchase because she would derive negative utility otherwise. It is then easy to get the demand for each type of products:

$D^H(P^H, P^L) = V^H - V = V^H - \frac{P^H - P^L}{b(s^H - s^L)}$

$D^L(P^H, P^L) = V - \underline{V} = \frac{P^H - P^L}{b(s^H - s^L)} - \frac{P^L}{bs^L}$

The original producer maximizes total profits:

$(P^H - c^H)D^H(P^H, P^L) + (P^L - c^L)D^L(P^H, P^L)$ *w.r.t.* P^H and P^L, and yields:

$$P^{L*} = \frac{bV^H s^L + c^L}{2}, \quad P^{H*} = \frac{bV^H s^H + c^H}{2} \tag{6}$$

$$D^{L*} = \frac{c^H s^L - c^L s^H}{2bs^L(s^H - s^L)}, \quad D^{H*} = \frac{V^H}{2} - \frac{c^H - c^L}{2b(s^H - s^L)} \tag{7}$$

After counterfeits enter the market, the boundary condition becomes: $\underline{V} s^F * b - P^F = 0$ $\Rightarrow \underline{V} = \frac{P^F}{bs^F}$. I introduce another consumer with valuation V^F who is indifferent between purchasing the original and counterfeit products. $V^F s^F b - P^F = V^F s^L b - P^L \Rightarrow V^F = \frac{P^L - P^F}{b(s^L - s^F)}$. Due to assumptions (7) and (10), the market is segmented into the following parts: consumers with the lowest tile valuations $[0, \underline{V}]$ do not purchase anything, consumers with slightly higher valuations $[\underline{V}, V^F]$ will purchase the counterfeits, consumers in the interval $[V^F, V]$ will purchase the low-quality product, and the consumers in the upper segment $[V, V^H]$ will enjoy the high-quality product. I thereby derive the demands for the high- and low-quality original products and that for the counterfeits:

$D^H(P^H, P^L, P^F) = V^H - \frac{P^H - P^L}{b(s^H - s^L)}$

$D^L(P^H, P^L, P^F) = \frac{P^H - P^L}{b(s^H - s^L)} - \frac{P^L - P^F}{b(s^L - s^F)}$

$D^F(P^H, P^L, P^F) = \frac{P^L - P^F}{b(s^L - s^F)} - \frac{P^F}{bs^F}$

The original producer maximizes $(P^H - c^H)D^H + (P^L - c^L)D^L$ *w.r.t.* $P^i (i = H, L)$ and the counterfeit producer maximizes $(P^F - c)D^F$ *w.r.t.* P^F. If the authentic company is the Stackelberg leader in the game, then I could solve the reaction function of the counterfeiter and then plug into the authentic profit function. The equilibrium prices and demand are solved to be:

$P_c^{H*} = \frac{bV^H(2s^L s^H - s^F(s^H + s^L)) + s^L c^F + 2c^H s^L}{4s^L - 2s^F}$

$P_c^{L*} = \frac{s^L(c^L + c^F) + (2bV^H s^L + c^L)(s^L - s^F)}{4s^L - 2s^F}$

$P_c^{F*} = \frac{P^L s^F + c^F s^L}{2s^L} = \frac{2c^L s^L s^F - 3c^F s^L s^F + c^L s^F(s^L - s^F) + 4c^F s^L s^L + 2s^L s^F bV^H(s^L - s^F)}{2s^L(4s^L - 2s^F)}$

$D_c^{H*} = \frac{V^H}{2} - \frac{c^H - c^L}{2b(s^H - s^L)}$

$D_c^{L*} = \frac{s^F V}{2(4s^L - s^F)} + \frac{c^H - c^L}{2b(s^H - s^L)} + \frac{2s^L c^F - 4s^L c^L + 2s^F c^L}{2b(s^L - s^F)(4s^L - s^F)}$

Lemma 1 *b increases after being counterfeited as a result of a larger user base of the brand.*

Proof: Please see appendix.

Proposition 1 *When b increases after being counterfeited, equilibrium sales of the high-end product increases. i.e.* $\frac{\partial D^{H*}}{\partial b} > 0$.

Proof: $\frac{\partial D^{H*}}{\partial b} = \frac{c^H - c^L}{2b^2(s^H - s^L)} > 0$. This proposition explains the increased demand and sales for the high-end authentic product due to the advertising effect of the entry of its counterfeits.

Proposition 2 *Monopoly demand of low-end product* $\frac{\partial D^{L*}}{\partial b} > 0$ *iff* $\frac{s^H}{c^H} \geq \frac{s^L}{c^L}$.

Proof: $\frac{\partial D^{L*}}{\partial b} = \frac{c^L s^H - c^H s^L}{2b^2 s^L (s^H - s^L)}$. This is greater than zero if and only if $c^L s^H - c^H s^L > 0$. This is equivalent to $\frac{s^H}{c^H} \geq \frac{s^L}{c^L}$. This suggests that increased brand awareness will raise low-end product demand if and only if the quality-cost ratio of the high-end product is higher than that of the low-end product. When the two types of products are sufficiently differentiated in their quality, then the increased brand awareness could expand market share for both branded products. Otherwise, the demand for low-end product may decline while its optimal price increases.

Proposition 3 *When holding b fixed,* $D^{L*} > D_c^{L*}$ *iff* $\frac{c^F}{s^F} < \frac{c^L}{s^L}$.

When holding b fixed, I can compare the equilibrium demands of the low-end product in markets with and without counterfeits by taking the differences: $D^{L*} - D_c^{L*} = \frac{P_c^L - P^F}{(s^L - s^F)b} - \frac{P^L}{bs^L}$. We substitute in the reaction function of the counterfeiter $P^F = \frac{P_c^L s^F + c^F s^L}{2s^L}$ and the equilibrium prices P_c^L, P^L. After rearranging and canceling terms, I have $D^{L*} - D_c^{L*} = \frac{c^L s^F - c^F s^L}{4bs^L(s^L - s^F)}$. This difference is positive if and only if $c^L s^F - c^F s^L > 0$, which is equivalent to $\frac{c^F}{s^F} < \frac{c^L}{s^L}$. The condition says that the cost-quality ratio of counterfeits is less than that

of the low-end authentic product. Since counterfeiters copycat the authentic designs and use very inferior materials to produce their counterfeits, this condition often holds in practice. The proposition formalizes the substitution effects of counterfeits on the authentic products.

The above two propositions outline two opposing effects by the entry of counterfeits on the low-end authentic product: advertising effect to increase brand awareness and substitution effect to steal demand. Since counterfeits do not directly compete with the high-end authentic product, its equilibrium sale quantity increases when counterfeits enter the market and boost the brand awareness. The equilibrium sale quantity of the low-end authentic product is influenced by the two opposing effects of counterfeits, and will decline when the substitution effect outweighs advertising effect.

5 Experiments

I conduct experiments on 62 Master students at Northwestern University and University of Illinois at Chicago to test the causal effect of counterfeits and to tap into the motivations underlying their purchase intent. I randomly assign these students into two groups, each taking a different survey. The survey for the treatment group exposes the subjects to actual photos of a counterfeit together with three quality tiers of authentic shoes with the brand Muniao, and asks them to rate their purchase intent for each type of authentic and counterfeit shoes. The respondents therefore rate their purchase intent based on full comparisons of all products, similar to the real-world condition where counterfeits coexist with the authentic products in the market. The survey for the control group differs in the order of the questions and pictures. It first presents only the three quality tiers of authentic shoes for respondents to rate purchase intents for, and then exposes respondents to a picture of the counterfeit shoes to be rated. Respondents have to answer questions in sequence and cannot look ahead. The ratings for the authentic products in the control condition therefore reflect

purchase intents without the presence of counterfeits. This study enables between-subject comparisons of purchase intent across the treatment and control groups.

The average purchase intent for the counterfeit stimuli are similar across the treatment and control groups, and so do the ratings on general attitudes toward counterfeits. The demographic information also show that the two groups are rather comparable, thanks to the random assignments. The average purchase intent for the set of stimuli are tabulated in Figure 3. As compared to the control group, the treatment group for whom the counterfeit is present in the consideration set when rating all products exhibit higher average purchase intent for the high-end authentic shoes and lower average purchase intent for low-end authentic shoes. Such differences account for at least half a point on the 5-point Likert scale and are statistically significant at the 6% and 5% levels . The difference in the average purchase intent for the medium-end shoes is not significant either managerially or statistically across the groups.

I conducted a follow-up survey four weeks after these respondents took their first study that they were assigned to (either the experiment survey or the control one). The follow-up survey is the same for all respondents. They see actual photos of the three quality tiers of authentic Muniao shoes and its counterfeit. They then rate their purchase intent for each of these shoes, and comment on their purchase motivations. The survey then asks a series of questions on their general attitudes toward counterfeits, using balanced Likert scales. Finally, each respondent copy down the serial number that was uniquely assigned on his/her first survey before exiting this follow-up survey. This number is what I use to match two surveys by the same respondent while allowing respondents to keep their identity anonymous. By observing the purchase intent of respondents in the control group pre- and post-exposure to the counterfeit image, I am able to analyze the within-subject changes in purchase intent due to the exposure to counterfeits.

The average purchase intent for the counterfeit stimuli are not statistically different

across the two surveys for the treatment and control groups, and so do the ratings on general attitudes toward counterfeits. This provides useful benchmarking for the consistency of respondent attitudes in the two waves of questionnaires on items under identical conditions. Figure 4 tabulates the average purchase intent among the respondents who rated for authentic shoes prior to seeing counterfeits in the first questionnaire while being aware of counterfeits in the second. Their purchase intent for the high-end authentic product was 0.35 higher on a 5-point Likert scale, on average, in the second survey. Such increase in purchase intent due to seeing the counterfeit together with the authentic shoes is statistically significant at the 3% level, based on pair-wise t-tests. Being exposed to the counterfeit, however, reduces the average purchase intent within-subject for the medium-end and low-end authentic shoes, statistically significant at the 1% and 2% levels.[16]

I explicitly ask respondents about their motivations for the purchase intent in the survey. Almost all respondents qoute the price-quality ratio or value of products as an important determinant. A majority of the respondents commented that they would like to purchase a variety of products, including the counterfeits. This aligns with a strand of sociology theory on omnivorism, which predicts that high-status consumers are skilled enough to traverse a broad taste hierarchy by possessing knowledge of a diverse array of objects (Peterson 1992, Erikson 1996, Peterson and Kern 1996, and Richardson 2008). A number of respondents in the treatment group wrote that counterfeits provide indication that the brand must be famous. Quoting one respondent here, "brand is a guarantee for quality. I dont know this brand, but it should [to] be good if it has counterfeit followers". Several other respondents expressed that trying the products would be helpful. The next steps of the research would be to provide real shoe stimuli for respondents to try and feel before rating their purchase intent.

[16]It is worth mentioning that respondents in general seem to have lower purchase intent for the medium- and low-end authentic shoes in the second survey than the first, although the decline was more pronounced in the control group as described here.

6 Conclusion

Economic impacts of counterfeits are urgent concerns for business managers and policy makers. This paper collects a panel data on Chinese shoe companies to investigate the sales impacts of counterfeit entries. In particular, I identify an exogenous change in government enforcement efforts in monitoring footwear trademarks, occurring since 1995, and its differential impacts on counterfeit entry for branded companies with varying degrees of closeness with the government. Using the interaction between legislation change and relationship proxy as an IV, I obtained empirical results robust across various specifications and consistent with theory predictions. In addition, the causal relationship between counterfeiting and purchase intent for authentic products are established in experiments too, where the presence of counterfeit shoes was randomly manipulated to two comparable samples of respondents.

The study uncovers heterogeneous effects of counterfeit entry on sales of authentic products of three quality tiers among the existing product lines. In particular, counterfeits have both advertising effects for the brand and substitution effects for authentic products. The advertising effect dominates substitution effect for high-end authentic product sales, and the substitution effect outweighs advertising effect for low-end product sales. Such differential effects reinforces incentives for authentic producers to innovate and move upward in the quality portfolio. The market shares for the higher quality products increased post-entry and that of lower end products declined. There is also evidence for product-line proliferation after the entry. Similar heterogeneous effects on the purchase intent of high-end, medium-end, and low-end branded products are replicated in experimental settings. Responses in the experiments suggest that counterfeits signal brand popularity to at least some consumers and a large number of consumers prefer to traverse a variety of quality levels. Counterfeits therefore steals demand for the low-end authentic products while has positive spillover effects for the high-end authentic products. These new findings substantiate and enrich the discovery in my other research (Qian 2008) that authentic firms' average prices and quality increased

after entry by counterfeits. Combining these studies, we gain a deeper understanding of how counterfeit entry under weak intellectual property protection affects innovation incentives of firms and markets.

In sum, this paper identifies the heterogeneous effects of counterfeits on authentic product sales through a combination of field data, theory, and lab experiments. The findings have important policy implications. Since counterfeits hurt primarily low-end authentic products and have even positive net effects on high-end ones, the focus of the enforcement against counterfeits can be directed toward low-quality counterfeits. It seems not only socially beneficial to weed out low-quality counterfeits and keep certain levels of higher-quality competitions, but also privately efficient to the branded companies. The positive spillover effect of a low-quality entrant on the brand is also identified elsewhere in Anderson, Qian, and Simester (2009) using the comprehensive scanner database by an American apparel company. The findings here therefore have general applications besides counterfeiting.

References

Aghion, P., Bloom, N., Blundell, R., Griffith, R., and Howitt, P. (2005), "Competition and Innovation: An inverted U relationship" *The Quarterly Journal of Economics,* **CXX (2)**, 701-728.

American Apparel and Footwear Association (2005), *ShoeStats,* **AAFA**.

Anderson, Eric, Yi Qian, and Duncan Simester (2009), "Spillover Effects of a Low-quality Entrant," Working Paper, Northwestern University and MIT.

Athey, S. and Schmutzler, A. (2001), "Investment and Market Dominance", *RAND Journal of Economics*, **Vol.32, No.1**: pp. 1-26.

Bagwell, K. and Riordan, M. H. (1991), "High and Declining Prices Signal Product Quality", *The American Economic Review,* **81:1**, 224–239.

Batra, G., Daniel Kaufmann, Andrew H. W. Stone (2003), *Investment Climate Around the World: Voices of the Firms from the World Business Environment Survey* **World Bank Publications**.

Branstetter, L., Fisman, R., and Foley, C. F. (2006), *The Quarterly Journal of Economics,* **February 2006**, 321-349.

Bresnahan, T. (1989) "Empirical Methods for Industries with Market Power," chapter 17 in *Handbook of Industrial Organization*, **Volume II**, Richard Schmalensee and Robert Willig, eds., (Amsterdam:Elsevier Science Publishers B.V.).

Caves, R. E., Whinston, M. D. and Hurwitz, M. A. (1991), " Patent Expiration, Entry and Competition in the U.S. Pharmaceutical Industry: An Exploratory Analysis", *Brookings Papers on Economic Activity,* **Brookings Institute**.

Chinese National Bureau of Statistics (1995), *Codebook for the Third Chinese National Industrial Census*, National Bureau of Statistics.

Choate, Pat (2005). *Hot Property : The Stealing of Ideas in an Age of Globalization.* Westminster, MD, USA: Alfred A. Knopf Incorporated, 2005.

Curry, D. J. and Riesz, P. C. (1988), " Prices and Price / Quality Relationships: A Longitudinal Analysis", *Journal of Marketing,* **52**, 36-51.

Darby, M. and Karni, E. (1973), "Free Competition and the Optimal Amount of Fraud", *Journal of Law and Economics,* **V.16, No.1**, 67-88.

Ellickson, P. (2004), "Supermarkets as a Natural Oligopoly", *Working Paper.* http://www.econ.duke.edu/ paule/

Ellickson, P. (2007), "Does Sutton Apply to Supermarkets?", *RAND Journal of Economics.* **38(1)**.

Fisman, Ray (2001), "Estimating the Value of Political Connections", *Americal Economic Review* **Vol.91, No.4.**: pp. 1095-1102.

Frank, R.G. and Salkever, D.S. (1997), "Generic Entry and the Pricing of Pharmaceuticals", *Journal of Economics & Management Strategy,* **6:1**, 75–90.

Fudenberg, D. and Tirole, J. (2000), "Pricing a Network Good to Deter Entry", *The Journal of Industrial Economics,* **48:4**, 373–390.

Gabszewicz, J. and Thisse, J.-F. (1979), "Price Competition, Quality and Income Disparities", *Journal of Economic Theory,* **20:** 340-359.

Gabszewicz, J. and Thisse, J.-F. (1980), "Entry (and Exit) in a Differentiated Industry", *Journal of Economic Theory,* **22:** 327-338.

Galloni, A. (2006), "Bagging Fakers and Sellers", *Wall Street Journal,* January 31, B1-2.

Gans, J., Hsu, D. and Stern, S. (2003), "The Impact of Uncertain IP Rights on the Market for Ideas: Evidence from Patent Grant Delays, *mimeo*, Northwestern University.

Gomez, E.T., Jomo K.S., (1997). *Malaysias Political Economy: Politics, Patronage and Profits*, First Edition. Cambridge University Press, Cambridge.

Gordon, W. and Watt, R. (2003), *The Economics of Copyright,* Edward Elgar Publishing limited.

Grossman, G. and Shapiro, C. (1988), "Counterfeit Product Trade", *American Economic Review,* **78**, 59-75.

Hong, S.-H. (2008), "Measuring the Effect of Napster on Recorded Music Sales," Manuscript available at https://netfiles.uiuc.edu/hyunhong/www/research.htm.

Hui, Kai-Lung and I.P.L. Png (2003), "Piracy and the Legitimate Demand for Recorded Music", *Contributions to Economic Analysis and Policy*, **Vol. 2 No. 1**, Article 11.

Jaffe, A. and Lerner, Josh (2004), *Innovation and Its Discontents*, Princeton University Press.

Johnson, S., and Mitten, T. (2003), "Cryonyism and Capital Controls: Evidence from Malaysia," *Journal of Financial Economics*, 67:351382.

Khan, B.Z. (2004), "Does Copyright Piracy Pay? The Effects of U.S. International Copyright Laws on the Marke for Books, 1790-1920", *NBER Working Paper Series,* **10271**.

Khwaja, A. and Mian, A. (2005), "Do Lenders Favor Politically Connected Firms? Rent Provision in an Emerging Financial Market," *Quarterly Journal of Economics*, No.483, issue 4: 1371-1411.

Kortum, Samuel and Josh Lerner (1998), "Stronger Protection or Technological Revolution: What is Behind the Recent Surge in Patenting?" *Carnegie-Rochester Conference Series on Public Policy*, **48**: 247-304.

Lanjouw, Jean and Cockburn, Iain (2000), "Do Patents Matter? Empirical Evidence After GATT." *NBER working paper*, W7495.

Liebowitz, S. J. (2006a), "File-sharing: Creative Desctruction or Just Plain Descrution?" *Journal of Law and Economics*, **49**: 1-28.

Liebowitz, S. J. (2006b), "Economists Examine File-Sharing and Music Sales," in *Industrial Organization and the Digital Economy*, eds. G. Illing and M. Peitz. Cambridge: MIT Press, 145-174.

Liebowitz, S. J. (2008), "Research Note: Testing File Sharing's Impact on Music Album Sales in Cities," *Management Science*, **54**: 852-859.

LVMH (2006), News. $http://www.lvmh.com/fonctionalite/pg_faq_lutte.asp$

McCalman, Phillip (2001), "Reaping What You Sow: An Empirical Analysis of International Patent Harmonization," *Journal of International Economics*. LV: 161-186.

Milgrom, P. and Roberts, J. (1986), "Price and Advertising Signals of Product Quality ", *Journal of Political Economy* , **94** , 796-821.

Metrick, A. and Zeckhauser, R. (1999), "Price Versus Quantity: Market-Clearing Mechanisms When Consumers are Uncertain about Quality", *Journal of Risk and Uncertainty,* **17:3**, 215–242.

Mobarak, A. M. and Purbasari, D.P. (2006), "Corrupt Protection for Sale To Firms: Evidence from Indonesia", Colorado University Working Paper.

Moser, Petra (2003), "How Do Patent Laws Influence Innovation? Evidence From Nineteenth-Century World Fairs", *NBER Working Paper* 9909.

Nelson, P. (1974), "Advertising as Information, ", *Journal of Political Economy,* **82:4**, 729-754.

Oberholzer-Gee, Felix and Koleman Strumpf (2007), "The Effect of File Sharing on Record Sales: An Empirical Analysis," *Journal of Political Economy,* **115:1**.

Perloff, J., Suslow, V., Seguin, P. (2005), "Higher Prices from Entry: Pricing of Brand-name Drugs". *http://are.berkeley.edu/ perloff/PDF/match*05*.pdf*

Qian, Yi (2006), "Pricing and Marketing Impacts of Entry by Counterfeiters and Imitators" *working paper,* **Harvard University**

Qian, Yi (2007), "Do National Patent Laws Stimulate Domestic Innovation In A Global Patenting Environment? A Cross-Country Analysis of Pharmaceutical Patent Protection: 1978-2002" *Review of Economics and Statistics,* **89:3. MIT Press**.

Qian, Yi (2008), "Impacts of Entry by Counterfeiters," *Quarterly Journal of Economics,* November 2008, Vol. 123, No. 4: 15771609. **MIT Press**.

Qian, Yi and Qiang Gong (2009), "Quality and Pricing Responses to Counterfeiting," working paper, Northwestern University.

Quality and Technology Supervision Bureau of China (Also named as "General Administration of Quality Supervision, Inspection and Quarantine") (1991-2004), *Year Books.*

Quality and Technology Supervision Bureau of China (Also named as "General Administration of Quality Supervision, Inspection and Quarantine") (2000), *Guidelines for ISO Applications and Frequently Asked Questions.*

Rob, Rafael and Joel Waldfogel (2006), "Piracy on the High Cs: Music Downloading, Sales Displacement, and Social Welfare in a Sample of College Students," *Journal of Law and Economics,* **Vol. XLIX, April**, p.29-62.

Sakakibara, Mariko and Branstetter, Lee (1999), "Do Stronger Patents Induce More Innovation? Evidence From the 1988 Japanese Patent Law Reforms." *NBER Working Paper* 7066.

Scandizzo, S. (2001), "Counterfeit Goods and Income Inequality" *IMF Working Paper,* **WP/01/13**, January.

Scherer, F.M. and Weisburst, S. (1995), "Economic Effects of Strengthening Pharmaceutical Patent Protection in Italy." *International Review of Industrial Property and Copyright Law* **26**:1009-24.

Shaked, A., and Sutton, J. (1983), "Natural Oligopolies" *Econometrica,* **51:5**, 1469-1483.

Shapiro, Carl and Hal Varian (1999), *Information Rules: A Strategic Guide to the Network Economy*, Harvard Business School Press.

Sutton, J. (1991), *Sunk Costs and Market Structure: Price Competition, Advertising, and the Evolution of Concentration.* Cambridge, Mass: The MIT Press, 1991.

World Customs Organization (2004), "Counterfeiting Congress Calls for Public-private Cooperation". http://www.wcoomd.org/ie/En/Press/press.html May 25, 2004.

Appendix

Proof for Lemma:

The total number of users for the brand under the multiproduct monopoly condition is $N_m = V^H - \frac{P_m^L}{s^L}$, and that under the competitive market with the counterfeits is $N_c = V^H - \frac{P^F}{s^F}$. As derived in the model, the reaction function of the counterfeit price $P^F = \frac{P_c^L s^F + c^F s^L}{2s^L}$. Rearranging the terms, we have $\frac{P^F}{s^F} = \frac{P_c^L}{2s^L} + \frac{c^F}{2s^F} < \frac{P_m^L}{2s^L} + \frac{c^F}{2s^F}$. With very low marginal cost of counterfeit products c^F, the last term is negligible. Hence, $\frac{P^F}{s^F} < \frac{P_m^L}{s^L}$. It follows that $N_c = V^H - \frac{P^F}{s^F} > V^H - \frac{P_m^L}{s^L} = N_m$. Since $b = f(N)$, with $f(.)$ increasing, $b_c > b_m$. The entry of counterfeits enlarges the total number of users of the brand, including authentic or counterfeit products, and increases the brand awareness.

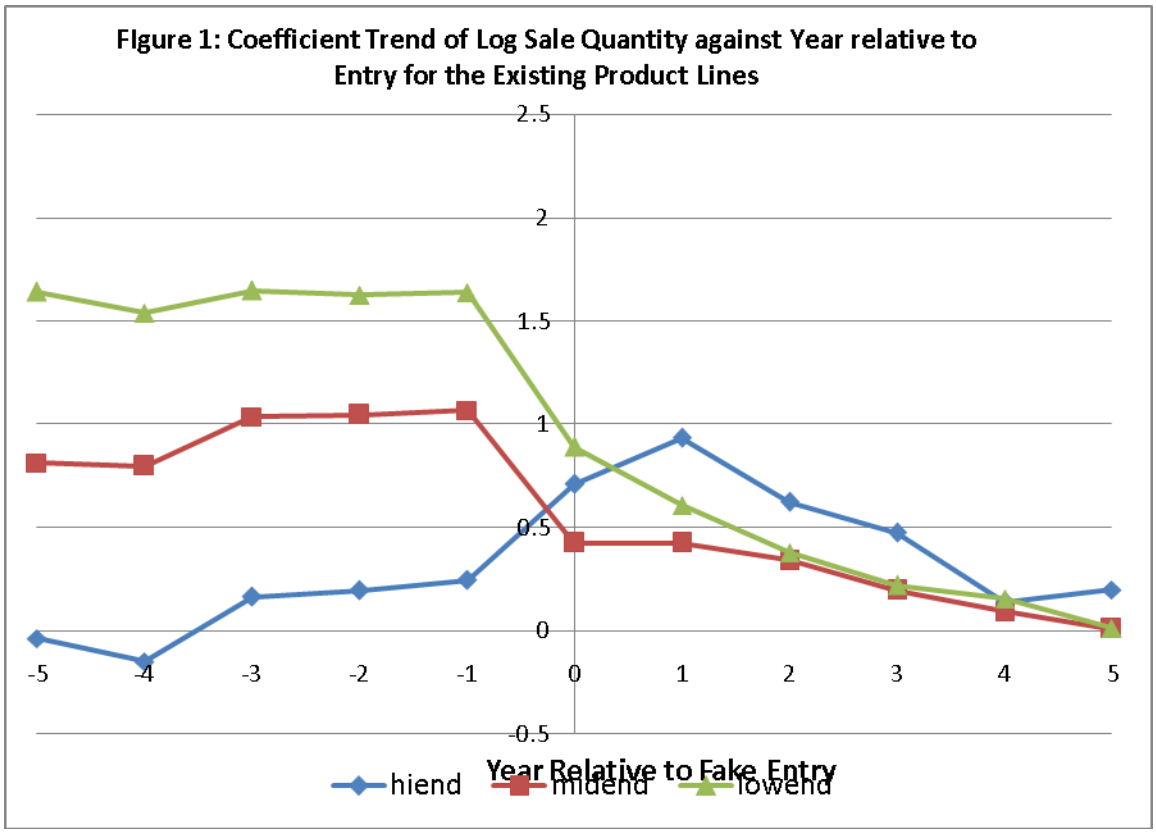
Table 4: First-stage IV Regression

Dependent Variable:	Fake Entry			log price
	(1)	(2)	(3)	(4)
Loose	.72***	.27***		
	(.04)	(.05)		
Relation		.001	.001	
		(.001)	(.001)	
Loose*relation		.014***	.002***	
		(.002)	(.000)	
Year trend	-.000	.04**		
	(.000)	(.01)		
Log Cost				.704***
				(.009)
Year Fixed Effects	No	No	Yes	Yes
No. of Obs.	372	372	372	10392
p-values	.00	.00	.00	.00

Table 5. IV Regression Results for Log Sale Quantity and Values of Three Fixed Quality Tiers

Notes: Each column reports one regression specification that is executed in the sample of quality tier as specified in the column header. Point estimates are reported in the first row aligning with the corresponding independent variable. Standard Errors are clustered at the product-line level, and are reported in the second row for each corresponding independent variable.

	log sale quantity			log sales		
Variable	**High-end**	**Medium-end**	**Low-end**	**High-end**	**Medium-end**	**Low-end**
	(1)	(2)	(3)	(4)	(5)	(6)
Log deflated price	-0.21	-0.34	-0.36	-0.18	-0.18	-0.84
	0.29	0.37	0.29	0.39	0.43	0.37
Fake entry	**0.51**	-0.28	**-0.58**	**0.41**	-0.08	**-0.75**
	0.21	0.17	0.24	0.20	0.24	0.38
Age	0.00	0.00	0.00	0.01	0.01	0.00
	0.01	0.01	0.00	0.01	0.01	0.01
Employment	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00
Log GDP per capita	0.61	-6.93	-17.18	1.87	-4.90	-18.49
	2.23	2.59	2.64	3.05	3.36	3.30
Log consumption (deflated)	-0.69	2.54	6.09	-1.22	1.58	6.88
	0.87	1.00	0.98	1.15	1.26	1.22
Economic growth	0.07	-0.03	-0.17	0.07	0.00	-0.23
	0.04	0.04	0.04	0.04	0.05	0.05
Consumption/GDP	0.00	-0.09	-0.20	0.02	-0.06	-0.22
	0.03	0.03	0.03	0.04	0.04	0.04
Gini Coefficient	0.07	0.29	0.57	0.04	0.24	0.61
	0.08	0.09	0.11	0.11	0.12	0.12
Male Shoes	0.08	0.54	0.41	0.15	0.63	0.51
	0.06	0.06	0.06	0.08	0.06	0.05
Tall-leg boots	-1.56	-1.58	-1.59	-1.59	-1.52	-1.76
	0.10	0.12	0.12	0.14	0.14	0.16
Medium-leg boots	-1.01	-1.06	-1.10	-1.06	-1.10	-1.31
	0.03	0.05	0.07	0.04	0.06	0.08
Slippery	-1.52	-1.49	-1.58	-1.54	-1.54	-1.57
	0.08	0.07	0.07	0.11	0.09	0.07
Sport Shoes	0.90	1.47	1.52	1.32	1.89	1.92
	0.23	0.21	0.22	0.28	0.25	0.24
Constant	14.35	-6.47	-14.71	21.66	5.38	-19.43
	7.38	7.46	6.91	7.97	7.91	8.44
Year FE	Y	Y	Y	Y	Y	Y
Firm and ShoeType FE	Y	Y	Y	Y	Y	Y
N	1944	1945	1944	1859	1861	1860


FIgure 1: Coefficient Trend of Log Sale Quantity against Year relative to Entry for the Existing Product Lines
2.5
2
1.5
1
0.5
0
-0.5
-5
-4
-3
-2
-1
0
1
2
3
4
5
Year Relative to Fake Entry
hiend
midend
lowend

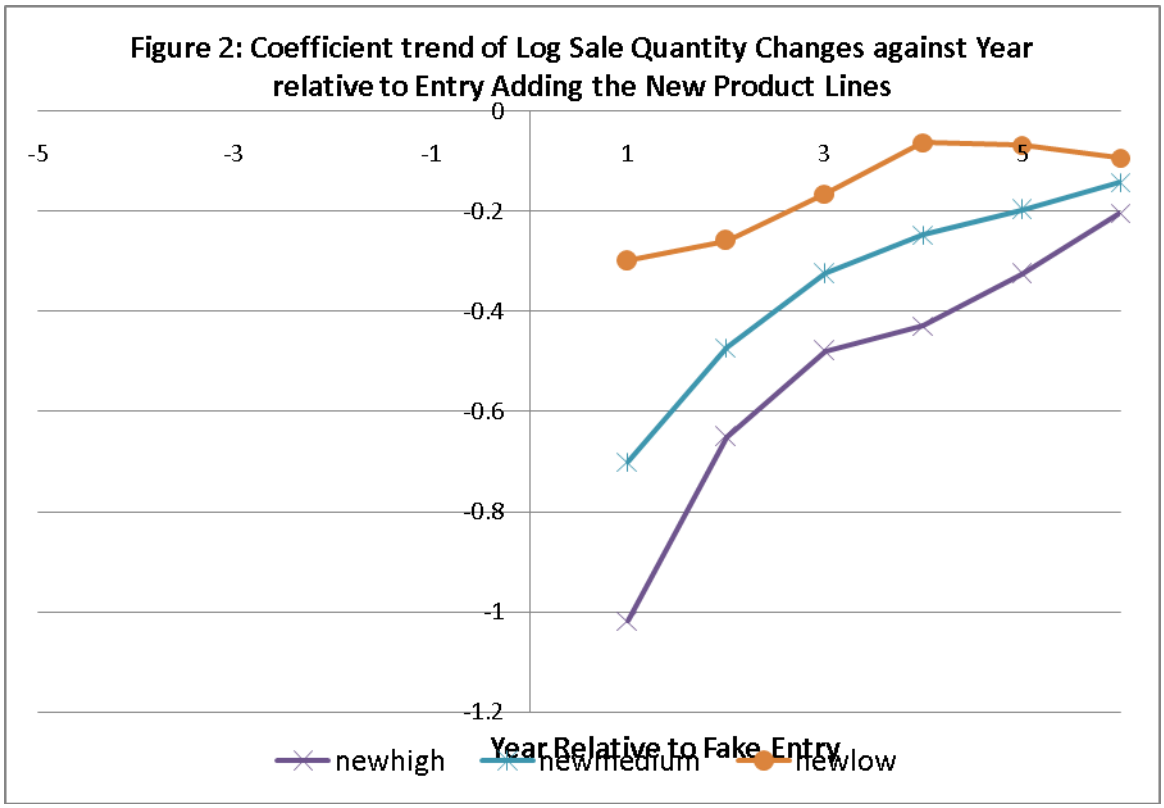
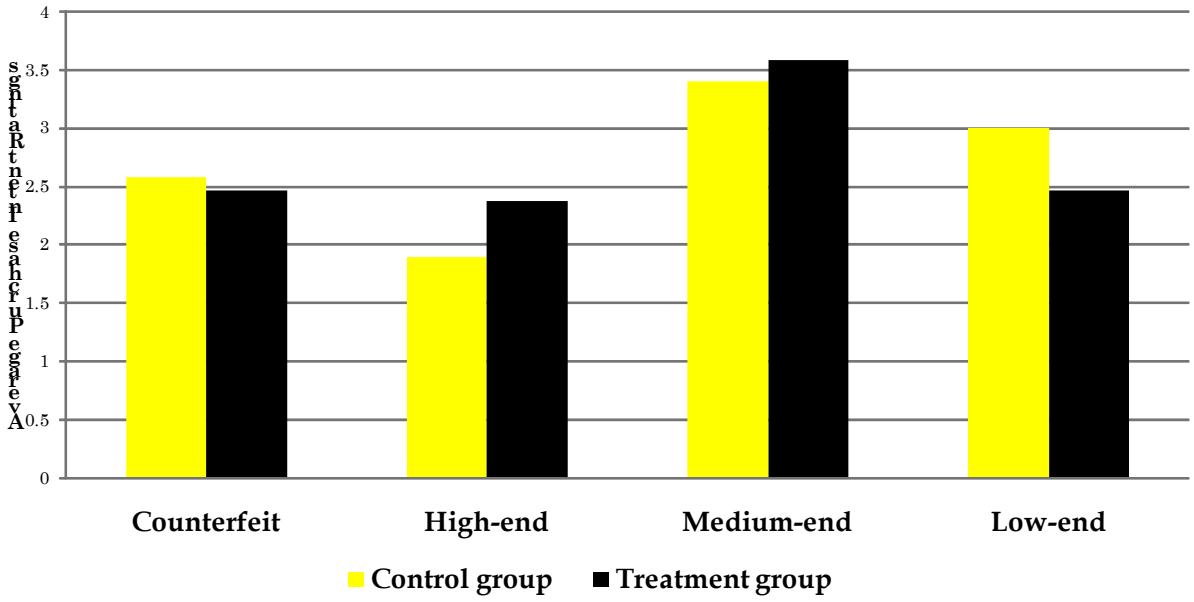
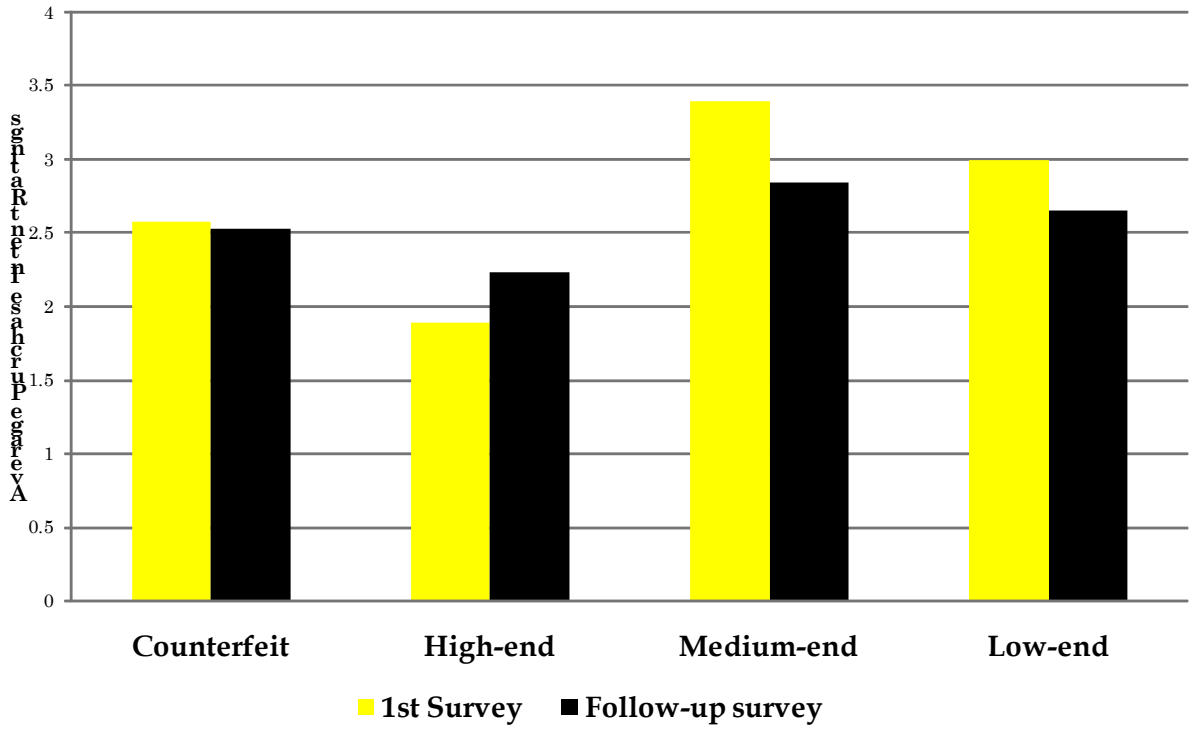

Figure 2: Coefficient trend of Log Sale Quantity Changes against Year relative to Entry Adding the New Product Lines
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-5
-3
-1
1
3
5
Year Relative to Fake Entry
newhigh
newmedium
newlow

Figure 3. Purchase Intent Across Treatment and Control Groups



P = 0.72 P = 0.06 P = 0.55 **P = 0.04**

Figure 4. Purchase Intent Within the Control Group



P = 0.16 **P = 0.03** **P = 0.01** **P = 0.02**