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An analysis of Chinese "Shanzhai" economics

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Abstract:

Behind the prosperity, the Chinese economy is always being considered as a copycat economy. Recently, the counterfeiting of cell phone products brings this topic onto the table and this topic is widely discussed by many people around the world. This paper provides several methods from microeconomic perspectives trying to analyze the influence of counterfeits generally on the competitive market and price of genuine goods. Also this paper will try to analyze the essential characteristics of the Chinese "Shanzhai" goods. These analyses will give answers to the questions like: Why the "Shanzhai" products were so powerful in China? How the "Shanzhai" economy affects the existing price of genuine goods? How the "Shanzhai" goods (counterfeits) attract ordinary consumers? This paper will try to investigate these questions from different aspects. Finally try to give an explanation why and how "Shanzhai" products exist and where "Shanzhai" economy will head to.

Acknowledgement:

Keywords:

"Shanzhai", counterfeits, genuine, second-degree price discrimination, snob appeal, prestige, demography attribute.

Contents

1. Introduction

"Shanzhai" products, counterfeit products, are usually considered brand infringement, technology imitation and property-right infringement. However, these products have existed in history for centuries and been beneficial for economic growth in many different countries and regions. The Chinese economy has experienced almost three decades of rapid economic growth with a nearly 8% GDP increase per year, a miracle in the world economic history. Even during the Asian financial crisis in 1997 and the current financial crisis, China's GDP continues to grow eight percent annually. Meanwhile the Chinese economy is considered as a copycat economy. Despite the fact that China has employed a GDP-focused growth policy, people still believe that the copycat economy contributes more to the prosperity of the overall economy. Recently, a counterfeit cell phone market has brought into question the direction of the country's economy.

This paper has two areas of focus: First, it will provide a microeconomic analysis of the influence of counterfeit products on the competitive market and on genuine price. Second, it will try to analyze essential characteristics of the Chinese "Shanzhai" goods in order to answer the following questions:

- Why were these "Shanzhai" products so powerful in China's macro-economy?
- How has the "Shanzhai" economy affected the normal consumers' welfare?
- How have the "Shanzhai" goods attracted ordinary consumers?

In order to start the analysis, one must first determine whether the "Shanzhai" economy can really influence the overall Chinese Marco economy.

2. The influence of the "Shanzhai" economy on the entire Chinese economy

An analysis requires that one consider the position of the "Shanzhai" sector in the huge Chinese real economy. First, look at the structure of Chinese macro economy, comprised of three important layers:

1). State-owned industry

State-owned industries generally include industries such as oil, electric, power, water and public service etc[1]. Being all owned by the government, they have monopoly characteristics.

2). Real economy

Real economy includes IT (information technology), informatics, internet and new technology industry etc., whose characteristics are sufficient capital, famous brand-names, advanced technology and strong management[2].

3). Wholesale industry

Competitive wholesale industries are electronics, clothes, bauble and small commodity calling[3].

Generally speaking, "Shanzhai" sectors mostly agglomerate in this third layer. In the recent three decades, the Chinese economy's energy essentially has come from small- and medium-size firms, most of which are located near Jiangsu, Guangdong and Shenzhen. They produce these "Shanzhai" products like ants and sell them to the global market at relatively low prices and reasonable quality.

Hundreds of thousands of reasons can be listed to explain this growth of the Chinese economy from a perspective of institution, labor, policy enforcement and legitimacy.

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[1] *Bank, oil, steel, telecom service, military, real estate which means access barrier are relatively higher but which have higher profit, but owned by state means most of them are monopoly or oligopoly.*
[2] *The profit of the second layer is still rich, but in china the players are always foreign capital investment or joint-venture.*
[3] *Their characteristics are low cost, low profit, low technology but easy entry.*

But from a statistical view, it was believed that the Chinese economy's success is mostly due to the second-and the third-layer economies, which indicates that the "Shanzhai" industry is providing mainstream push to the Chinese economy. The argument is here but needs some more supporting evidences.

Lots of the state-owned enterprises are big enough but not "strong". In the latest list of top 500 global enterprises, there are 26 Chinese enterprises, most of which are state-owned enterprises including Sinopec, China telecom, PetroChina[4] and 23 other enterprises[5]. As parts of stated-owned enterprises, most of them are national companies and as such are monopolies. Particularly, China Telecom in 2005 reported that the main operating income of the company reached 721.4 billion (increase 21.4% compared to 2004), the net profit was 14.39 billion (increase 44.9% compare to 2004), meanwhile another group of data revealed: until 2004, China telecom had 734.47 billion debt which mean the company has assets of 1111.54 billion but only gets 14.39 billion profit, with the rate of return on total assets only 2.63%.[6] This data indicates that China Telecom in fact is a poorly performing asset. Then, let's look at China's "big four banks"[7] in the list. Research found instances of fraud in the Jilin branch of China Construction Bank, amounting to 328 million. In 2005, an investigation into the Bank of China in Beijing showed 6.4 billion lost due to the Sen Hao's "credit cheating case." Another investigation of the Commercial Bank of China Hainan Branch in 2005 revealed Manager Jiaxiang Li bribed 2.75 million Yuan, resulting in the loss of more than 400 million Yuan of state property. A 2004 audit of the Agricultural Bank of China found that total corruption amounted to nearly 6.5 billion U.S. dollars. A typical strong enterprise must demonstrate at last incremental profitability, industry leadership through competition, a core competitive advantage, innovative ability, an ability to manage risk and high brand awareness. These evidence give us a simple aspect saying that the first-layer industries are not "strong" enough to be the

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[4] *Sinopec 23th, China telecom 32th, PetroChina 39th*
[5] *http://en.wikipedia.org/wiki/Fortune_Global_500#2009_list*
[6] *http://tieba.baidu.com/f?kz=115481829*
[7] *Bank of China, Commercial Bank of China, China Construction Bank and Agricultural Bank of China*

mainstream power in the Chinese entire Macro-economy. Judging from the above facts, we can simply come to the conclusion that the huge fortune on which the Chinese economy stands is actually created by the second- and the third-layer industries.

According to the previous introduction, the second-layer industries are mostly high-technology or have higher capital requirements to enter. The main sources of capital are FDI (Foreign Direct Investments) or joint venture corporations which are somewhat monopolistic. The participants of the second layer are either high-technology or extremely wealthy groups. The potential profit is high, but so are the required investments, meaning there are fewer players.

Then we need to prove that the third-layer is strong and energetic in the overall Marco-economy in China. The International Labour Office has predicted that early this year 52 million people will have lost their jobs in this financial crisis, but a good piece of news is they can still find job in the "underground" economy[8]. Further research also indicates the underground economy is the most energetic part in the developing countries' GDP. For example 92% of job opportunity is found in the "underground" economy in Latin America countries (Oppenhei mer, 2006).

As a copycat economy, the "underground" economy in China is mainly defined as the "Shanzhai" economy. (Sun Li., 2009) According to incomplete statistics of CIA[9], there are approximately 100 million workers working for the "Shanzhai" industry in China; that means about 40% of the agriculture laborers are actually working for the "Shanzhai" factory for low wages. Five percent of the industry's jobs involve outsourced tasks such as management, assignment or organizing firm activity. The Swedish Institute for Public Administration's research indicates that the more undeveloped the economy of the country, the worse the institution would be. The

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[8] *Global Employment Trends Update, May 2009*

[9] *https://www.cia.gov/library/publications/the-world-factbook/geos/ch.html*

lower of the personal income, the higher proportion the underground economy will take. In the IMF[10] 2008 report, China's GDP per capita was only 3.315 dollars, 104th among 185 countries, and the IMF also says that the "underground" economy of China is large. Apparently, "Shanzhai" products produced by small- and medium-size firms were a very important force in the Chinese economy. This is the most important precondition in this paper and the basis for further analysis.

In fact, as a copycat economy, plenty of pillar industry in China which agglomerate in first and second layers also acquire their core technology by imitation, plagiarism or buying abroad. The whole Chinese economy is actually based on this "studying" process, most energetic industries got benefit by "studying" the outside world. According to statistics, 88.63% Chinese industry have relationship with "Shanzhai" industry or have the mark of "Shanzhai". Although this argument cannot be corroborated by existing resource due to some political reasons, but this fact is widely well-known by people in China.

3. Background of "Shanzhai":

Literally, this word describes a group of people living a rustic existence in the mountains. In common usage, it refers to pirate products in some folk industry. The main characteristics are imitation, speed of production and commonality. Although this word actually existed centuries ago, it has just become popular in the recent 10 years in mainland China. Since 2003, when this "Shanzhai" phenomenon started in the cell phone market, it regularly became popular in all of China. Take it as an individual ideology; it also can be described as a potential consciousness that blindly worships famous brands such as Calvin Klein, Louis Vuitton, and Prada, or sports and show business celebrities.

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[10] *Data refer to the year 2008. World Economic Outlook Database-April 2009, International Monetary Fund. Accessed on April 22, 2009.*

3.1 Some "Shanzhai" examples in history:

"Shanzhai" products certainly carry a great deal of negative connotations, but they still play an important role in economic development. Not only in China but also in other countries, "Shanzhai" has greatly helped economic growth throughout history. In the mid-1940s, Japan was a poor country just recovering from World War II and had only three small-scale automobile factories. The annual production of these automobile factories was less than a thousand cars, while Ford in America put out 10,000 T-type models every day. A more severe problem was the Japanese factories didn't have any practical experience in car manufacturing at that time. However, Kiichiro Toyota[11] invested 130 million dollars to establish the Toyota Company and tried to imitate the Airflow from Chrysler. After a serial research on the American car, the Japanese found another way to produce the car with cheaper assembly than Ford and Chevrolet. They also changed the production line to manual labor in order to reduce the machine expenditure and labor cost. This imitation process continued for a very long time, and during that period the Toyota Company was actually a half "counterfeiter." After this period, Toyota started to set up their research and development departments in the mid-1960s, after which Toyota became a famous brand. Their cars are famous for the cheap price and the low oil wear. Later, Samsung in South Korea rode the imitation model to success in the early-1990s. Before, Samsung was a company only known for cheapness in the American market. However, the innovation in 1993 was that Samsung decided they have to improve by studying. From then on, Samsung started imitating the technology from Japan and USA. Until the 1997 Asian financial crisis, Samsung had a debt of nearly 17 billion. However, now it is among the top 500 enterprises in the world.[12]

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[11] *"Toyoda Kiichirō', June 11, 1894 – March 27, 1952) was a Japanese entrepreneur and the son of Toyoda Loom Works founder Sakichi Toyoda. He made the decision for Toyoda Loom Works to branch into automobiles, considered a risky business at the time. Shortly before Sakichi Toyoda died, he encouraged his son to follow his dream and pursue automobile manufacturing — Kiichiro created what eventually became Toyota Motor Corporation" from wikipedia http://en.wikipedia.org/wiki/Kiichiro_Toyoda .*

[12] *The imitating road of Enterprises in Japan and South Korea，2009 http://www."Shanzhai"ji.cn/opinion/20090512/10918.html*

As the only Chinese private corporation in global top 500 enterprises, Haier Group also experienced a period of technology imitating. Before the group was founded, Haier was just a small factory in the Qingdao province. Since 1984, the factory began to import the refrigerator-production technology from German LIEBHERR and started its miracle from then on. After seven years of R&D (Researching and Development)on this refrigerator technology, and after a series of innovations in management, capital management, merging and internationalization, the group suddenly became the biggest home appliance manufacturer in China. Now Haier has 20,000 employees and 8600 different categories, generic electrical products over 62 countries and regions. Beside the innovation on management, capital management, Haier's success was rooted mostly in the German technology that motivated the Haier Group to develop its own brand name. After Haier, several Chinese enterprises followed a similar strategy to success.

From these successful stories, we can summarize the "counterfeiting" processes involves trying to imitate other's advanced technology by disassembling then reassembling. Imitating is not an ignominious behavior but a higher jumping-off point to learn innovation ability and acquire core technology. But given the definition of "Shanzhai" in this paper, the examples above could be regarded "Shanzhailization", although much is pure technology transfer. The examples listed mainly describe the importance of "Shanzhailization" and technology adaptation, but in essence, they are different in transaction cost. A formal technology adaptation carries a high interior and exterior transaction cost while an informal "Shanzhailization" carries much less interior transaction cost, further analysis about transaction cost in firm will be discussed in section 5.

Moreover, from the angle of economic circle, this imitation initially will leave a positive impact on the whole real economy, then have a negative influence on the economy and market mechanism in the middle as the infringement problem or lack of innovation problem had been discovered. In the end, the imitation will disappear

along with the improvement of the people's living standard, restrained regulation and better legitimatization[13]. It is more like technology diffusion over regions; the process of a new Generalize Productivity Technology was introduced into new regions to develop, saturate then recede (Schumpeter, 1942). Combine the theory of Schumpeter and the condition of China, the "Shanzhai" process is still in the beginning of this transition, thus China's whole society will gain benefit from "studying" the outside world.

Counterfeit product is the most significant fact in "Shanzhai" sector which can influence supply and demand over the whole society. So follow the precondition, we will mainly talk about the counterfeit products impact on customers and markets, also firm behavior will be taken into consideration according to the benchmark we already have. Based on the knowledge and assumptions above and from the perspective of economics, two main angles will be focused: One from the view of consumers and the other from the view of firms. A dialectical materialism[14] theory will be used to observe economic activity, according to which, all those economic activities will then be analyzed from two different ways that are respectively positive and negative in the conclusion part of this paper. In this paper I will not talk about this theory too much but only use it as a guiding concept to explain the counterfeit phenomenon in China, aiming at expressing it on the one hand with a praise and on the other hand with a criticism attitude. "Shanzhai" did bring us convenient life and welfare; however, counterfeiting or "Shanzhailization" is nominally an illegitimate economic behavior after all.

3.2 Assumptions of "Shanzhai" products

By summarizing the empirical study of Grossman and Shapiro (1986), the counterfeit

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[13] *For example, developed countries such as Sweden, USA, UK seldom have this infringement problem, because the living standard of their citizen have reached a certain high level where they don't need to purchase counterfeit goods anymore.*
[14] *http://en.wikipedia.org/wiki/Dialectical_materialism*

should be divided into two main categories: In the first market with asymmetric information, the customer cannot observe the quality of goods; they cannot easily distinguish counterfeit from genuine. However in the second market with perfect information, including reputation, brand effect, price, after service and quality to the buyer, the counterfeits are sold to the consumers without any deception. For whatever reasons, these buyers are still willing to purchase the counterfeit with symmetric information. Here, we will focus on this latter market.

A consumer will knowingly purchase these counterfeits because:

1. The counterfeit product that infringes the brand name of the genuine goods offers good value for money in the light of its true quality or usefulness.[15]

2. The genuine goods[16] which have different brand or display, may functionally imitate other famous brand, by doing so to make the consumers believe the goods are different genuine goods. In this situation the "counterfeiting of status goods then may not deceive the individual who purchases the product, but rather the observer who sees the good being consumed and is duly impressed."[17] The Toyota, Samsung and Haier's cases would fall into this category.

So under these assumptions, we can theorize the counterfeit would have some impacts on the market. First, the counterfeit products would influence the price of the genuine goods with a relatively low price and give customers who are not willing to pay the high price for genuine goods a second choice. Secondly, a genuine goods seller will set up their price generally according to his cost, predicted net profit and the demand in the market, but for the counterfeiter, they can freely low down their price because they have a sufficiently low fixed cost that they only need to protect their piece of cake. Thirdly, price discrimination theory always works for both goods; it will help

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[15] *The question is: since the counterfeit got the same quality or even better than the standard, why it low his price. And in fact counterfeits generally are much lower quality than the authentic goods*

[16] *Actually they are counterfeit according to strict property right law, but they have registered themselves as genuine goods due the weak supervision in China.*

[17] *Page 5 FOREIGN COUNTERFEITING OF STATUS GOOD, Gene M. Grossman Carl Shapiro NATIONAL BUREAU OF ECONOMIC RESEARCH 1050 Massachusetts Avenue Cambridge, May 1986 Research*

both counterfeiter and genuine producer to reach their purposes. In China, market has a lack of supervision over regions, which means medium and small counterfeiters are easy to enter, and due to the irregular legislation the counterfeits are free to be trade in China's market. Particularly in some wholesale stores of Beijing and Shanghai only 20% of the products are genuine goods and the other 80% are counterfeit goods; some small region have even greater discrepancies[18]. However, the "Shanzhai" products need further elaboration: The "Shanzhai" products in China mostly define the small and medium goods such as cell phone, clothes, daily supplies and so on. The large scale manufacturing industry (the first and the second layer as I mentioned before) are still following the internationally accepted rules, and these industries are hard to enter. In line with the second assumption, as long as the genuine good has a unique brand name or appearance, it will be legitimate either nominally or in jure, though they potentially contain all the features of counterfeits.

3.3 The "Shanzhai" products and Chinese conventions.

"Shanzhai" products or counterfeits in China are different from their original conceptions. The counterfeits arise due to the high price of genuine goods and people's low living standard. The income of people may have increased year by year, but the average income compared to other countries is still low. At the same time the new products with higher technology or better quality goods with multi-functions are introduced into China. But the high prices of these imported genuine goods always make this desire empty. At this very moment, "Shanzhai" products or counterfeits are born in the underground market. These products would provide normal people illusive satisfaction comparable to genuine goods and, simultaneously try to adapt the new technology shock from imported genuine goods. For the domestic genuine goods, they are seldom imitated due to the low innovative ability, and the prices of them are always acceptable for normal consumers. So most "Shanzhai" goods are made trying

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[18] *A survey of Japanese half-monthly magazine "Pursuiting", January 23th 2007.*

to imitate prevailing famous brand name or technology abroad, and the "Shanzhai" sector developed with a rapid speed in mainland China.

After explaining why the Chinese "Shanzhai" sector would exist and boom so fast, we have to understand that the capability of a normal "Shanzhai" product is relatively limited. The most significant factor is technology. Normally, a new technology's adoption needs money and time. The money spent and times consumed are both long-term and tedious. A developing country such as China usually does not invest that much labor and capital doing the job. (The utility is higher for a developing country to invest more on either agriculture, or infrastructure). According to the data that China Science and Technology Statistics published on the website, the expenditure of R&D are relatively lower than the developed countries like Sweden (in 2005, the total R&D investment of Swedish reached 80.6 billion SEK which take 3.4 percent of the whole GDP)[19], Denmark (In 2003, Demark total R&D expenditure reached 36.6 billion DKK, 2.6% of that year's GDP)[20], U.S (the R&D expenditure of USA always keep around 2.5%, around 170 billion in 2007)[21], etc. Yet China's R&D expenditure has increased every year since 2000. The table below clearly describes the increasing of the Chinese R&D expenditure. (Cardinal number and proportions) But compare to the countries mentioned above, China's investments are smaller by comparison.

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[19] *Resource from a survey of "Swedish Daily" on 18 big Swedish companies*
http://www.p5w.net/news/gjcj/200603/t48825.htm
[20] *http://www.sts.org.cn/fxyj/zcfx/documents/200612222.htm*
[21] *Daniel Lederman-Laura Saenz., Innovation and Development around the World, 1960-2000., Office of the Chief Economist Latin America and the Caribbean., The World Bank.*

Name	Unit	2002	2003	2004	2005	2006	2007	2008
R & D expenditure	100 millions	1287.64	1539.63	1966.33	2449.97	3003.1	3710.2	4570
Growth rate compare to the last year	%	22.78	16.55	19.44	19.61	18.68	23.5	23.2
R & D expenditure / G D P	%	1.07	1.13	1.23	1.33	1.42	1.49	1.52

Source from: China Science and Technology Statistics

As a consequence from low R&D investment, "Shanzhai" products in China are always low-tech. It is very clear that all "Made in China" commodities around the world are small-medium, low-tech goods, counterfeited because they are easy to imitate and produce. The counterfeiters can gain enough profits just invest very little money. However, taking car manufacture as an example, to start a business need more investment and the manufacture process is even more difficult to acquire without independent innovation ability.

Besides the reasons above, a penalty possibility must be considered: If the counterfeit car is discovered by the government, the counterfeit car might be expropriated which will make investor suffer loss. Generally speaking, a very important feature of Chinese "Shanzhai" products is that they are always small-or medium-size commodities agglomerating in the third layer of Chinese real economy, so the products can be produced easily and trade safely. The recent cell phone counterfeits booming business is resulting from the MTK chips being invented which tremendously decrease of the costs of the technology on a Multi-functional mobile

phone. With low technology involvement and readily available technology, the counterfeits goods can be made up. If not available, the counterfeiters will just keep on watching and wait for their chances.

However, how can these small-medium counterfeits affect a country's destiny? Chinese counterfeits are not as simple as you may think. As I mentioned before, the Chinese economy was a big copycat machine. Even though plenty of legitimate goods are superficially genuine goods in Chinese market, they may use a counterfeit outsourcing for help. These latent counterfeit underling firms can produce accessories for upper level producers to decrease the production cost (Oliver 1988). So under the above proofs, we may believe that "Shanzhai" products or counterfeits in Chinese domestic market take a very big market share, especially in small-medium commodities.

This paper will use different methodologies to explain the "Shanzhai" economy in China from four hierarchical parts: The first part will explain how a "Shanzhai" firm sets its price after the genuine producer when there are genuine goods already existing in the market, and how both prices were affected if they compete with each other in a competitive market, mainly using oligopoly and duopoly models. The second part will explain the "Shanzhai" economy from the view of supply and demand using a theory of second-degree price discrimination as well as how the second-degree price discrimination mechanism influences the quota between genuine and counterfeits in the market with low quality and high quality goods, which will separately represent counterfeits and genuine goods. The third part will focus on explaining the utility function of "Shanzhai" products from a view of snob appeal and commodity prestige using a model from Grossman and Shapiro, and the interference of government policy. Beside the characteristic of counterfeits, in the fourth part of my theoretical discussion, I will focus on explaining a methodology with respect to demographic attributes of the consumers.

Logically speaking, we assume in the very beginning, there were no counterfeits in the market, but due to the technology diffusion and transfer from abroad as well as the improvement of people's living standard; the counterfeits start to appear following emerging demand. As a consequence, these counterfeits "Shanzhai" products will compete with the genuine goods in price, however they have disadvantages in quality, a warranty and intellectual property rights that would lead to discrimination or at least distinguished from the genuine goods. This development is appropriately described by the second-degree price discrimination. Then we will analyze it from a more demand-driven perspective to say how the snob-appeal and prestige can attract consumers. Finally, the selection process is bidirectional; an individual characteristic can also determine the consumers' purchase budget. Follow the logical reasoning process, we may see the procedure more clearly.

4. Empirical studies and theoretical methodologies

4.1 Dynamic and static analysis of the price of "Shanzhai" products

Now let's look into the price mechanism of the "Shanzhai" products, how will a "Shanzhai" producer's entering the market influence the price of genuine goods? How will the prices be set up in an duopoly market? As a precondition, we have to admit that no matter what protective methods the genuine producers have implemented, they cannot stop counterfeiting if the counterfeit are risk neutral (but they are actually risk lovers). Take some special products for example; the function of the counterfeit and the genuine goods is approximately the same (such as software, clothes, small home appliance etc). Moreover, these kinds of products are certainly of low cost because they have no expenditures on R&D investment or advertisement. In this paper I will

take the cell phone counterfeit industry as a very special case because this case is a very typical "Shanzhailization" as the core technology was cracked and introduced with low cost.

4.1.1 Typical Bertrand Model:

First I use a typical Bertrand Model to explain the price mechanism between the counterfeits and genuine goods. A typical Bertrand Model usually used to analyze the interactions among firms that set prices and their consumers. Several assumptions must be clarified if this model will be used: 1. There are at least two firms producing homogeneous products; 2. Firms do not cooperate; 3. Firms have the same marginal cost (MC) of production; 3. The marginal cost is unchanged; 4. The demand curve is linear; 5. Firms competed with each other by setting prices at the same time; 6. Consumers will randomly select the lowest price of goods among firms. (Bertrand., 1883)

After above assumptions, in a competitive market if we implement an extremely strict property-right protection, there will be no counterfeit in the market while the genuine goods producer would be the only producer in the market, and the whole market were supposed to be a complete monopoly market.

The inverse demand function is: $p_1 = a - bq_1 \quad p_2 = a - bq_2$

The demand functions are:

$$q_1 = \frac{a}{b} - \frac{p_1}{b}, \quad q_2 = \frac{a}{b} - \frac{p_2}{b}$$

The cost functions are: $c_1 = f + cq_1, \quad c_2 = f + cq_2$

The profit functions are: $\mu_1 = \frac{(a-p_1)(p_1-c)}{b} - f, \quad \mu_2 = \frac{(a-p_2)(p_2-c)}{b} - f$

Where p_1 is the price for the quality goods and q_1 is the quantity demand for the genuine goods (consequently, p_2 will be the price for counterfeit goods and q_2 will

be the quantity for counterfeit goods), f means fixed cost and c means unchanged marginal cost plus average variable cost. So if we differentiate the profit function with respect to p_1, we obtain the optimum price set would be:

$$p_1 = c + \frac{a-c}{2}.$$

If there is a counterfeit producer in the market as well as a genuine goods producer we can recognize the market as a competitive market. Their respective price can be formulated like below:

$$p_1 = a - b(q_1 + \theta q_2) \quad , p_2 = a - b(\theta q_1 + q_2)$$

Where a and b are positive constants. Where the value of θ is $-1 \leq \theta \leq 1$, when θ is negative the model will become a complementary commodities demand model. When $\theta=0$, one commodity's price only related with his own quantity and both of them are not substitute. Vice versa, the closer θ to 1 the more substitute for genuine goods and counterfeit. So when θ equal to 1 quality goods and counterfeit are perfect substitutes. Apparently the counterfeit in China or else in the world determine the $-1 \leq \theta \leq 1$, however θ is approximately closer to 1 in reality.

Then we get the inverse demand function from the model:

$$q_1 = \frac{[(1-\theta)a - p_1 + \theta p_2]}{(1-\theta^2)b}$$

$$q_2 = \frac{[(1-\theta)a - p_2 + \theta p_1]}{(1-\theta^2)b}$$

Then we look at the cost and profit functions, if we associate the linear demand model with the model above we can give a profit function for the genuine goods producer:

$$\mu_1 = \frac{(p_1-c)[(1-\theta)(a-c)-(p_1-c)+\theta(p_2-c)]}{(1-\theta^2)b} - f$$

And respectively if we assume the fixed cost of counterfeiter is 0 (because they don't have R&D expenditure or other expenditure generally), the cost function of counterfeiter will be: $c_2 = cq_2$ and his profit function will be:

$$\mu_2 = \frac{(p_2 - c)[(1 - \theta)(a - c) - (p_2 - c) + \theta(p_1 - c)]}{(1 - \theta^2)b}$$

Maximize μ_1 with the first order condition respect to p_1 gives the optimum price set by genuine goods producer with the respect to the counterfeiter is:

$$2(p_2 - c) - \theta(p_1 - c) = (1 - \theta)(a - c)$$

Then we can come to the equilibrium price formula below:

$$p_1 = p_2 = c + \frac{(1-\theta)(a-c)}{2-\theta} \quad \text{------------------(BC1)}$$

4.1.2. Sequential quantity competition model

But in a typical Bertrand Model, several assumptions are not practical in reality, especially the Bertrand Model require both firms compete with each other by setting price simultaneously. First of all, only the genuine goods exist in the very beginning, and the counterfeits always follow. Then, a Bertrand Model will be a little bit arbitrary in this condition, but a sequential quantity competition model (Stackelberg., 1934) can be used to describe the competition more precisely. In a sequential quantity competition model, all the assumptions in Bertrand Model will constant except for the fifth, which means the firms will set the price at different times. So if we give the same assumptions, and specially we assume the whole market's demand is q; both of

the genuine producer and counterfeiter meet linear demand p=a-q, where q is the total quantity so q=q₁+q₂, both firm are facing fixed cost c. Counterfeiter enter the market after genuine producer which means in this quantity-competition game, genuine producer is the quantity leader.

Counterfeiter maximize his profit with:

$$\pi_1 = q_1\big(a - (q_1 + q_2)\big) - cq_1$$

With F.O.C:

$$\frac{\partial \pi_1}{\partial q_1} = a - (q_1 + q_2) - q_1 - c = 0$$

The reaction function of counterfeiter is:

$$q_1 = r_1(q_2) = \frac{a - q_2 - c}{2}$$

The genuine producer's profit maximize problem is:

$$\pi_2 = q_2\big(a - (q_1 + q_2)\big) - cq_2$$

F.O.C.

$$\frac{\partial \pi_2}{\partial q_2} = a - (q_1 + q_2) - q_2 - c = 0$$

$$q_2 = \frac{a - q_1 - c}{2}$$

Because genuine producer is the leader, it maximizes supposing counterfeiter will react on its reaction curve:

$$\pi_2 = q_2\left(a - \left(\frac{a - q_2 - c}{2} + q_2\right)\right) - cq_2$$

F.O.C.

$$\frac{\partial \pi_2}{\partial q_2} = \frac{1}{2}(a - 2q_2 - c) = 0$$

$$q_2 = \frac{a - c}{2}$$

$$q_1 = \frac{a - q_2 - c}{2} = \frac{a - c}{4}$$

$$\begin{cases} p_1 = 2 - q_1 = 2 - \dfrac{a - c}{4} \\ p_2 = 3 - q_2 = 4 - \dfrac{5(a - c)}{8} \end{cases}$$

$$\begin{cases} q_1 = \dfrac{a - c}{4} \\ q_2 = \dfrac{a - c}{2} \end{cases}$$

In this quantities-price set, the genuine producer will happy not to produce low-quality goods and both of the Firms will get their profit maximize. It is clear that genuine producer will produce twice quantities as the counterfeiter ($q_2 = 2q_1$).

But the realism is that China is a big global factory. There are hundreds of thousands of counterfeiters producing the same goods as well as the genuine producers. So, when more counterfeit appear, they would compete with each other. It means that the players of the game are no longer the genuine goods producer but the other counterfeiters. Meanwhile counterfeit goods are perfect substitute, the competition among them are pure price competition. The classical Bertrand model believes when all the commodities are homogenous, both prices will finally equal to each other[22], apparently, the conclusion of the Bertrand model is tenable for multi-counterfeiters according to equation BC1.

We have looked into the price mechanism with a principle of perfect competitive market, but the Chinese "Shanzhai" economy is not a simple duopoly with small "Shanzhai" enterprises. It is more complicated, and we must consider influences such as the nature of firms, selection of consumers, price discrimination, organization of

[22] http://en.wikipedia.org/wiki/Bertrand_model

industry chain, objective selected by demography attribute and so on. In the next section, we will look into it from a perspective of second-degree price discrimination to analyze as monopolists how the "Shanzhai" products are sold to different consumer groups according to their demand, and how the price will change according to bundle quantity.

4.2 Using a second-degree price discrimination to analyze the price of the "Shanzhai" products.

① *Three different price discriminations*:

In practice, price discrimination is widely used by sellers to reach their purposes. Prior research in pricing has showed the effectiveness of price discriminations and product- differentiation strategies when a firm markets its products to heterogeneous consumers. Traditional microeconomics summarized there are three different sorts of price discriminations which are "differentiated by whether the monopolist is able to observe consumer preferences and implement non-linear pricing" (Chemi Gotlibovski ,Nava kahana., 2009*)*

(1) First-degree price discrimination, which is also recognized as perfect price discrimination, involves "charging a different price for each unit of the good in such a way that the price charged for each unit is equal to the maximum willingness-to-pay for that unit."(Varian, H.R., 1992)

(2) Second-degree price discrimination is a non-linear price discrimination which gives impossible for the firms to isolate consumers individually or into groups. "When consumers differ in their willingness to pay for a product, firms can extract greater profits by segmenting consumers. This can be achieved either by offering multiple product qualities in the market and allowing consumers to self-select."[23]

(3) Third-degree price discrimination, unlike the first one, also charge the different

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[23] *Second-degree price discrimination for information goods under nonlinear utility functions, Proceedings of the 34th Hawaii international conference on System sciences-2001.*

price for different purchasers, however the third-degree price discrimination group the consumers into different groups by observing the consumers' characteristic such as gender, age, income etc, "but each purchaser pays a constant amount for each unit of the good bought."[24]

② *Back ground of the second-degree price discrimination:*

We find that first- and third-degree price discrimination do not fit the genuine-counterfeit model in isolating consumers. Second-degree price discrimination better explains the competition between the genuine goods and "Shanzhai" products mainly because, until the recent analysis in my paper, the sellers were unable to observe consumers' heterogeneity. Only by implementing the second degree price discrimination, the monopolist can achieve their goals grabbing the market share or increasing their profit. Then we need to explain the working principle of the second degree price discrimination.

The second-degree price discrimination is widely used in practices. Quantity discount and quality discount are the most common ways to implement the second-degree price discrimination; I will explain them via some cases. For examples, if one piece of clothing costs 100 dollars, usually the seller will set two clothes price of 150 dollars or three clothes of 220 dollars to induce you to purchase more. This can also be recognized as quantities discount (the more you buy the less for each unit you will pay). Unlike quantities discount, there are quality discount as well. As an example, you may find it is cheaper to give a call in the night after 9 o'clock than in the daytime. There are also a two-part tariffs which charge different price for different part of purchase, "common examples are office machine rentals (rental fee and number of units used), telephone services (monthly charge and air time), taxicabs (initial meter reading and per-kilometer charge), amusement parks (entry fee and per-ride charge), club entry (entry fee and drinks), and certain public utilities."(Gotliboyski, Kahana., 2009) But in this paper we will mainly focus on

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[24] *Varian, H.R., 1992. Microeconomic Analysis, 3rd ed., W.W. Norton*

quality and quantities discount. Besides the examples I have raised above, there are also other various non-linear price discriminations in the second-degree price discrimination, but all of them have a same benchmark: The sellers cannot observe the consumers' individual characteristic.

As far as we know about "Shanzhai" firms and genuine producers, within the field they are playing in, they are impossible to observe the consumers preference which indicates they must use a non-linear price discrimination to set up their package-price strategy to obtain their maximum profit. Previous sector analysis on homogenous products of counterfeit and genuine goods has showed the influence on the prices, Bertrand model was used to describe the condition after the counterfeiters went into the contestable market. However, if we compare the "Shanzhai" products to the genuine goods on function and appearance, they can be taken as the same generic goods with different additional value like quality and after service. A typical example is the information goods such as counterfeits software, these goods are indifferent in function and appearance compare to genuine goods, but normally the genuine goods provide better after service or other sort of additional value. And a very important assumption must be made to indicate that the marginal cost of production is near zero or invariant with product quality. (Shapiro, C and Varian, H.1999) Again we use the old examples to explain this theory, phone call charge and price of train tickets can be listed to do the job. To give a call in the night and daytime, you will face different price scheme only because you don't often talk with people in the night. Or the difference between first-class seat and second-class seat on a train, the substances of the seats are the same, the price schemes are different only because of the first-class seats are more relaxing and loose or better serviced, however the second-class seats are narrow, crowd and lack of nice service.

Follow those examples, we can conclude that one feature of second-degree price discrimination is "package pricing". For example, telecom companies often sell the time bundle with the fee of using the phone; train companies sell the service bundled

with the seat, but both goods remain unchanged. "When consumers have heterogeneous tastes for several products, a monopolist may bundle to reduce that heterogeneity, earning greater profit than would be possible with component (unbundled) prices." (Gregory S. Crawford., 2007) Recent research shows bundling in second-degree price discrimination allows firms to extract a maximum consumers surplus while the welfare of consumers can be hampered, particularly when consumers are induced to purchase goods they are less interested in (Bakos and Brynjolfsson 1999; Armstrong 1996). Notably, the bundling strategy in second-degree price discrimination on consumers is widely recognized as an effective business strategy (Varian 2003; Carlton and Perloff 2001; Saloner et al. 2001).

③ *General model*:

Next, we need to look at the general model from demand side. In an uncontestable market there, counterfeiter and genuine producer, which could be considered as a joint monopoly. We assume that this joint monopolist faces two different groups consumers, respectively labeled H and L, (H means high demand consumers and L means low demand consumers, they will be called type-2 and type-1 consumers respectively in the next text.) the absolute numbers of consumers in respective groups is the same n. The utility of an individual from group H and L depends on the quantity q consumed, according to previous introduction about second degree price discrimination the marginal utility are positive as the quantity are increasing but the second derivative are negative, so we have: $U_i (x_i, r_i) = u_i(x_i) - r_i$, where $u_i' > 0, u_i'' < 0$. Here x is a quality index represents respectively high quality and low quality. So the utility functions' first and second derivative will have the same signs. "The assumption that the consumer with the larger total willingness-to-pay also has the larger marginal willingness-to-pay is still constant in every level of the quality x" (Varian, H. R., 1992), which means $u_H' (\bar{x}) > u_L' (\bar{x}), \forall \bar{x}$. "This ensure that in (r, x) space indifference curves of the two types cross only once (single crossing property). Reservation utility of consumer type i is given by $U_i = u_i(0) - 0$. The general cost function is considered as a fixed cost F" (Weichenrieder., 2004) (or assume to be 0

later on) and constant marginal cost, c:

$$C\,(nq_H + nq_L) = F + c * (nq_H + nq_L), \forall\,(nq_H + nq_L) > 0.$$

In this no-entry market, the monopolist maximizes profits by offering unobserved consumers H and L bundles price (r_i, q_i) such that every individual consumer in different groups will pick up the price scheme voluntarily, according to their own characteristic. Formally, the firm's profit maximize problem is:

$$\max_{\{tH,tL,xH,xL\}} \pi = nq_H + nq_L - C(nq_H + nq_L) \qquad (1)$$

$$\text{s.t.} \quad u_L(q_L) - r_L - u_L(0) \geq 0 \qquad\qquad (1a)$$

$$u_H(q_H) - r_H - u_H(0) \geq 0 \qquad\qquad (1b)$$

$$[u_H(q_H) - r_H] - [u_H(q_L) - r_L] \geq 0 \qquad (1c)$$

$$[u_L(q_L) - r_L] - [u_L(q_H) - r_H] \geq 0 \qquad (1d)$$

Equations from 1a to 1d are so called self-selection constraints. 1b is redundant and can be eliminated. 1a must be binding, If this were not the case, the firm could increase profits by marginally increasing r_L and r_H while keeping quantities constant and still satisfying all other constraints. 1c need to be binding as well, or the revenue r_H would possibly increase. The first-order conditions are:

$$u_H' = c \qquad\qquad\qquad (2)$$

$$u_L' - c = \left[u_H'(q_L) - u_H'(q_L)\right] > 0 \qquad (3)$$

This imply that, under provision for low demand consumers, they have a marginal value exceeds marginal cost by consuming an inefficiently small amount of the goods. However, equation 2 means the high-demand consumers have a marginal willing-to-pay equal to marginal cost at the optimal price discrimination.

④ Added assumptions about demand and the solution to the standard problem in terms of the figures.

Unlike the general model, we need to assume that the fixed costs are equal to zero,

and this assumption will keep constant till the end of this section. Then we also need to simply assume the genuine goods are all high quality goods while the counterfeits are all low-quality goods. In this no-entry market, there two firms respectively A and B are producing with approximately zero fixed cost. We consider firm A as counterfeiter while firm B as genuine producer. Firm A can only produce low-quality goods ("Shanzhai" firm) while firm B can both produce low-quality goods and high-quality goods[25] (genuine goods). The inverse demand curves are respectively $p_1 = 2 - q_1$ for firm A and $p_2 = 3 - q_2$ for firm B. (D_1 and D_2 in figure $1 - 3$) Likewise, both of them can be seen as a joint monopolist in an uncontestable market. Combine these assumptions above with different conditions, we can draw the figures from 1-3.

Once you take the self-selection constraint into consideration, equilibrium can be formulated that the monopolist can extract the entire low-demand consumer's surplus while returning some more surplus to high-demand consumers in order to induce them consume more. Equilibrium can be found by measuring the decreasing in profits collected from the low-demand to the marginal increase in profits collected from the high-demand consumer, and these equations are just another way to express the general model with self-selection:

$$p_2 - p_1 = p_1$$
$$(3 - q_l^m) - (2 - q_l^m) = 2 - q_l^m$$
$$q_l^m = 1$$

At this time, q_l^m can be taken as a fictitious equilibrium that firm A and firm B used to grab their own consumers in this game. For firm A, if the q was 1, his package price will be A (the area equal to 1.5) in figure 1 even though this is a not profit maximize choice, while firm B would like to only serve the high-demand consumers so he would charge the biggest amount quantities while giving biggest area B to the

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[25] *Technology is downwards compatible.*

high-demand consumers as surplus to induce them stay with firm B. Which activity makes the package price equal to A+C in figure 1 (the area equals to 3.5).   The cases that firm A try to produce more and an interference of firm B are possible to alter this equilibrium into a new one.
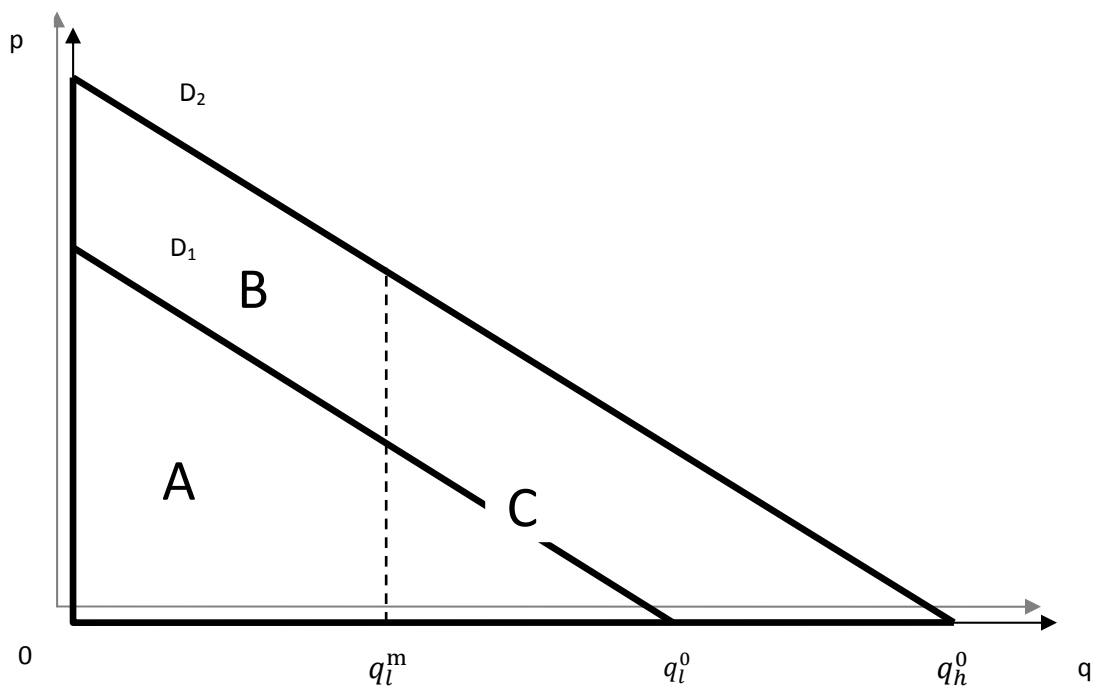

Figure 1

There might be a parallel case that the self-selection process gets out of work; in this condition the high-demand consumers would claim themselves as low-demand consumers in order to consume the low-demand's bundle. In the absence of self-selection problem, the firm A would sell q_l^m to low-demand consumers and firm B only sell q_h^0 to the high-demand consumers at a "price" that are equal to their respective consumer's surpluses, i.e., the area under their respective demand curves. High-demand consumer pays A+B+C to consume q_h^0 and low-demand consumer pays A to consume q_h^0 in figure 2."[26]

[26] *Varian, H.R., 1992. Microeconomic Analysis, 3rd ed., W.W. Norton Second-degree price discrimination PP247.*
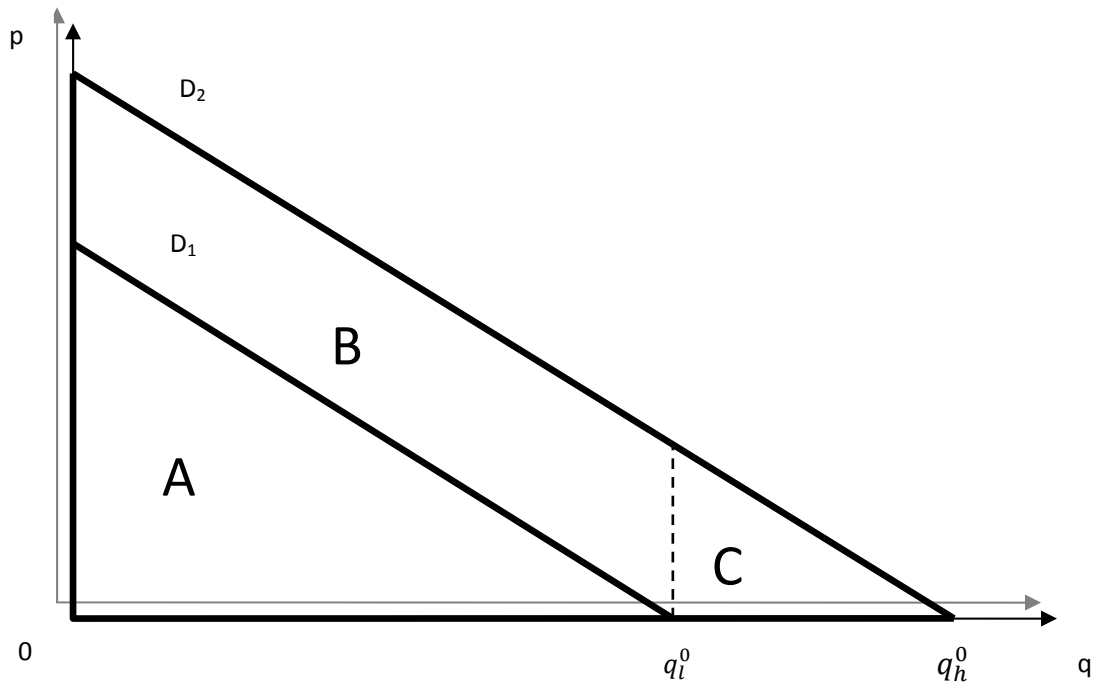
Figure 2

④ . The argument that B will not try to enter A's market

As far as we know, the technology are downward compatible, the firm B can produce both high and low quality goods. Logically, firm B would try to produce both goods in one hand grab the market from Firm A. But, a Firm B will never do this, a profit maximize rational firm B will not try to enter A's market in fact.

People may doubt why? Before we answer the question, we need bring out some old and new assumptions. Like assumed before, Firm B have superior technology can both produce genuine goods and counterfeits, while Firm A only have inferior "Shanzhai" technology. Followed the equilibrium in the previous paragraph, Firm A serve low-demand consumer, Firm B serve high-demand consumers separately. Their demand curve and utility functions remain the same, and the fixed cost for each firms is zero. There are equal proportions of low-demand consumers and high-demand consumers. Firm B have priority to decide whether or not to enter Firm A's market. The information in this market is symmetric.

According to these assumptions, we may come to a Nash equilibrium between Firm A and Firm B:

- Firm A offers the package bundle price ($q_1 = 2, r_1 = 2$) which extract full surplus at the efficient level of   . (area A in figure 2)

- Firm B thus offers another package bundle price ($q_2 = 3, r_2 = 2.5$), which extract maximal surplus under the self-selection constraint that high-demand consumers need no longer purchase any low-quality goods. (area A+C in figure 2).

This interesting Nash equilibrium is resulting from competition between two actors one of which can only produce low-quality goods while the other can produce both high and low quality goods. This conception is close to the conception of monopolistic second degree price discrimination except for there are no distortion of consumption. Firm A will not lower the quantity offered to type-1 consumers. As long as the fixed cost is zero, firm A will produce as more as he can. Since Firm A enter the market after Firm B, with a beautiful hope that Firm B will not enter Firm A's market, Firm A would produce more but stop at a spot (2, 2) which can extract full surplus from type-1. On the other hand Firm B already knew the information that Firm A cannot interfere his market due to the technical restraint, so he would maximally extract surplus under the self-constraint to induce type-2 consumers to purchase his bundle. Under these conditions, Firm A have no incentive to deviate from the bundle above.

However, there might be a big possibility that Firm B will use his superior technology to produce low-quality goods and interfere Firm A's market. Firm A know this possibility, he also know that interference of B can bring on two results: one is Firm A's revenue suffer loss while the other is type-2 consumers will come to the market 1 purchase low-quality goods which leads to higher revenue. In the sequential game, Firm A will definitely give a choose that lead the game to a better off outcome for him.

Now, we assume Firm B will next enters market 1. As long as there are positive profits, the revenue from market 1 will be positive, $r_1' \geq 0$ (r_1' is the revenue of Firm B from producing q_1' low-quality goods, it will at least slightly above 0). Firm B will produce low-quality goods as much as Firm A, so $q_1' = 2$. Due to the entering of firm B, the division of the market would be indeterminate. In this circumstance, the entire surplus of high-demand consumers from buying goods 1 is 4(area red in figure 3), leave the maximum price that B can charge high-demand consumers for goods 2 equal to the area G in figure 3, which is $r_1' = 0.5$. If a greedy firm B try to increase the package price charge on the type-2 consumers, the high-demand consumers will no longer willing to stay with B, again, they may claim them as low-demand consumers and choose the firm A's bundle. In the other way round by producing the same quantities counterfeit in market 1, Firm A have a prior strategy to undercut B's profit by just producing more. If B would like to compete with Firm A in type-1's market, Firm A would defend himself by offering constant package price and infinite quantities. This strategy will make B get zero profit from market 1 as return. Now in market 2, B has to offer enough surplus to his original high-demand consumers so he can only gain 0.5 from the type-2 consumers. Add these revenues from both markets, firm B will face a revenue equal to 0.5 at most (Fredrik, 2010). Given this, we can determine that a rational firm B would choose not to enter market 1.

So far as we analyzed for a monopolist who wants to maximize the profit, a rational firm B would never try to produce the counterfeit and compete in the counterfeit market as long as the fixed cost is equal to zero. Seizing the high demand consumer (type 2) would always be firm B's best strategy. By offering the genuine goods to the high income consumers, firm B can maximize his profit and balance the market quotas.

The precondition about the zero fixed cost is not mature enough, however, a little bit arbitrary. Once the fixed cost is not equal to zero, the configuration of the package price will alter for sure. A prediction (Xinping, Xinmei, Xuanyuan, Qin, 2000)

indicated the increase of fixed cost of counterfeit will hamper the counterfeit sale. While in the other way round, the increase of cost could stimulate the genuine goods sale.
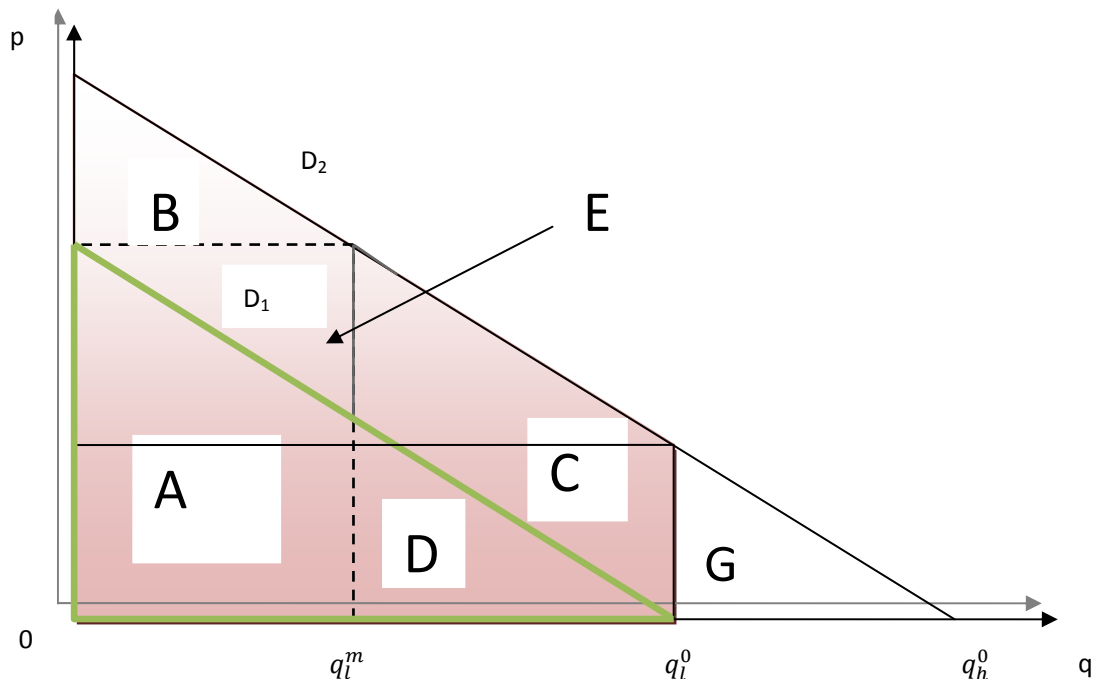

Figure 3

4.3 The Snob-appeal and prestige of "Shanzhai" products:

Grossman and Shapiro (1986) provided another interesting theory to investigate the counterfeit's effect on the domestic market by assuming all the domestic firms produce high-quality, brand-names goods, and all the foreign firms produce only low-quality, counterfeit products[27]. Another assumption is also made to address that these products will be exported to the domestic market. This is from the perspective of host country but the conception, essentially snob appeal and adding prestige onto utility function, is very constructive. This theory provides a clearer way from a mathematic perspective and relates it to political affair, which makes the result more

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[27] *Include counterfeits and cooperate labeled products like the firms have brand access but not originality firms.*

persuasive.

According to the two assumptions we have made in section 3.2, the counterfeit producers do not deceive the consumers who are able to distinguish the counterfeits from the high-quality, brand-names products. Based on the assumption, they define $V(y) \equiv H(y) - L(y)$, where $H(y)$, $L(y)$ present the utility function of purchasing a high-quality goods or a low-quality goods where y is the number of consumers, who are only willing to purchase high-quality goods or low-quality goods, out of the total number of consumers N, $y \in [0, N]$, so $V(y) > 0$ which means the utility function of purchasing a high-quality goods is always higher than purchasing a low-quality goods. $V'(y) < 0$ which means consumers with low indexes value quality most of all. If y buys a high-quality, brand-name product, he enjoys $H(y)$ and an additional benefit, $S(x,y)$.

Here, they introduced an additional benefit, $S(x,y)$, to represent the snob appeal of the goods according to Leibenstein (1950) where x measures the prestige associate with the particular brand. So if simply take x to be the total number of sales of a given counterfeit label, they will have the gross utility for a consumer who purchase a counterfeit product as: $L(y) + S(x,y)$, where $S_x < 0$ here which means that the counterfeits degrade the prestige of the quality goods.

Then they assume $S_y < 0$ to indicate that the consumers who value quality relatively little also place a lower value on prestige. Because the high-income consumers can afford both the quality and the status, in order to get higher utility of stratifications, the consumers who can afford goods will definitely pick a good according to his better attribute. Quality is the priority will be considered no matter by H or L buyers.

Then, for the supply side, they assumed that there are m distinguishable trademarks. So, for domestic firms who produce high-quality goods either at home or abroad, every genuine goods will be produced with a constant marginal cost c. They sell these

goods at price p_i and earn profits of $\pi_i = (p_i - c)z_i$ where z_i is the output for the domestic market. For counterfeits, they are produced at a constant marginal cost a. Here they impose a possible penalty or an additional cost b[28] with which the cost of a counterfeit good might be equal or even higher than the high quality, genuine good. They also assumed a probability parameter Φ that the counterfeit might get this penalty. On one hand the government might uncover some counterfeiters via its policy enforcement, or the other side blocked by the exported market with higher tariff. Then the price of the counterfeit q would equal to b/ (1- Φ) where the unit costs of producing a counterfeit good b will be equal to q (1- Φ). The home firms still chose outputs z_i as in Cournot competition, and the model has a structure of a Cournot oligopoly facing a competitive fringe. (Gene M. Grossman, Carl Shapiro, 1986)

Assume monopolist want to maximize profit, so the counterfeits and genuine goods are available in supply. If we assume there are only a single trademark owner, no matter what output level z is, the monopolist will find consumers indifferent regarding genuine goods and a counterfeit, which requires the premium for genuine goods, p-q (where p and q is the price of genuine and counterfeit separately), should be equal to the consumer's valuation V (z), or it can be interpret as:

$$p = V (z) + q. \qquad\qquad (1)$$

If x is the sale of counterfeit and genuine goods, the consumer with snob appeal x is the one who indifferent toward a counterfeit and a genuine one, so the status appeal of the copy must just compensate for its higher price:

$$S(x,x) = q - a. \qquad\qquad (2)$$

Consequently, equation (1) gives the inverse demand curve if the consumer chooses

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[28] *b will be a penalty If counterfeit were revealed by local government, or in other case it might be discovered by import country etc. So, here b will be an additional cost if there are extra expense involved in making the copy resemble the name-brand good.*

$z<x^*$ in which more counterfeits will be produced, and the marginal consumer for the monopolist is the one who is indifferent for genuine and counterfeit:

$$H(z) + S(z,z) - p = L(z) - a, z < x^* \text{ or}$$
$$p = V(z) + S(z,z) + a, \text{for } z > x^* \tag{3}$$

In particular condition which the counterfeit doesn't exist, the monopolists will set the marginal revenue equal to marginal cost in order to get the profit maximize, and then the firm's first order condition will be:

$$V(z) + zV'(z) + q = c \tag{4}$$

But in a market with counterfeiters where the prestige of the genuine is out of the firm's control, the genuine producers must compete with the counterfeiters to get more consumers by offering a similar level of status but lower prices. Finally, there might be a group of consumers who are indifferent between purchasing a counterfeit and buying nothing. Assume there are w of them and these groups of consumers has: $L(y) = a$.

Like section 1 of the oligopoly market, we analyze oligopoly markets with more trademarks m>1, and assume they cannot control the snob appeal of their products, any improvement for the brand-name like advertisements will result in more counterfeits and improve the snob-appeal of the copy counterfeits until the status of brand is equal to the others.

So if $Z \equiv \sum z_i$ consumers are about to buy high-quality goods, the premium for quality will be:

$$p = V(z) + q \tag{1'}$$

The consumers $X = \sum x_i$ who is indifferent between a genuine and counterfeits will reach the requirement since "each of these alternatives provides the same low level of quality, the indifference condition requires"(Grossman, Shapiro., 1988):

$$S(x, mx) = q - a \qquad\qquad (2')$$

In a Cournot competition, each firm take others' output as given and choose z_i to maximize profits. Equilibrium (1') face a marginal revenue curve given by

$$MR_i = V(z) + z_i V'(Z) + q.$$
$$Z = mz$$

The Nash-equilibrium is: $V(mz) + zV'(mz) + q = c \qquad\qquad (4')$

Equations (1'), (2') and (4') associate with the total number of consumers w can describe the symmetric counterfeiting equilibrium which indicate a price increase beyond the marginal cost will bring negative effect on both the genuine and counterfeits. The consumer will choose the goods according to their preference on the price, quality and prestige. The counterfeit only capture the consumers only with intermediate tastes.

Then Grossman and Shapiro used this model particularly to analyze four influent specific conditions such as: enforcement and confiscation policy, regime effect, tariffs and free entry by trademark owners. The conclusion is even when some consumers could identify the counterfeits, they would still willing to purchase them for the premium rather than the genuine goods. A consulting firm found the attitude of consumers are changing. The reasons why high-income consumers buy genuine goods are mainly because they have high quality and prestige. They also found the counterfeits gradually improve their status, so the intermediate index consumers (they are indifferent consuming the counterfeits or genuine) come out. This will encourage

the importer to take the risk that their products being confiscated by the government. Which clarifies a theory by Marx that has ever said: If there are 100% profit, the capitalist would make a desperate move and take a risk in desperation; if there are 200% profit, capitalist would be in defiance of any law and regulations; if there are 300% profit, the capitalist would trample everything in the world.

Enforcement policies aim at deterring counterfeiting from abroad will not improve the domestic welfare. A small tariff on the counterfeit is believed to be welfare-improving, but large tariffs may deter intermediate consumers purchasing counterfeits, which will make the social welfare decline. In the condition that foreign suppliers of counterfeits are perfectly elastic, the stricter enforcement will not welfare-improving. However if the consumers place an equal value on prestige a probability of confiscation will rises the domestic welfare.

4.4 An analysis of demographic attributes

Vice versa, the consumers will finally make their decisions by themselves; purchase button are always being controlled by the consumers. To buy or not to buy is a question, but only in the demand side. If there were no demand, there would be no supply. As a consequence, the consumption of counterfeits can be influenced by the characteristic of the consumers. For example, low income consumers will seldom have a capability to purchase high-price goods because this is not his optimum budget, according to Abraham Maslow.[29] Associate with the theory of Maslow, the basic purpose of living in the world for a human being is surviving in society. After that follow a primary living status, food, and housing. The actualization of self becomes the hardest thing for a human being, and this is at the top of his Hierarchy of Needs. In this theory, most people agglomerate at the base of this pyramid have limited

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[29] *Maslow set up a hierarchy of five levels of basic needs: Physiological Needs, Safety Needs, Needs of love affection and belonging, Needs for Esteem and Needs for Self-Actualization. In which sense, the consumption of counterfeits or genuine goods only base on individual income.*

consumption ability for genuine goods. Counterfeits sometimes become necessity while genuine goods become luxury goods. Moreover, other variables such as gender, age, marital status, education and occupation apply to purchase decisions. Consumers select objectively according to their preferences. Consumers are rational to purchase goods base on their utility function, income, even gender age and marriage status. Safa and Jessica (2005) provide an analysis about the consumption of counterfeit in Shijiazhuang of China using a Logit econometric model, based an accidental survey (Krejcie and Morgan, 1970; Jennings, 2001) .This survey are full of other factors rather than price that can influence buyers' behavior.

The main methodology was Logit Model Formulation, with binary dependent variables as the yes-or-no intent to buy counterfeit (1 otherwise 0). The independent variables were gender, age, marital status, annual income, occupation, education qualification and identification ability. Descriptive statistics were used to explain the special cases while the "nonparametric T-test" was also used to test the mean deviations between two groups. (Norusis, 1999; Coakes, 2001; Safa, 2004) The Mann-Whitney test was introduced to express if there is any difference between deceptive and non-deceptive groups of consumers in terms of socio-demographic attributes."[30] However, in my paper, we have to ignore this influence by deceptive or not, because the assumptions made in Section 2 assume that the counterfeits are not made with the intent of deceiving the consumers. In order to use a Logit analysis, the study also used the probability of intent to by counterfeit producers with independent variables list above. Since the dependent variable is dichotomous and constrains the application of OLS procedure, ML(maximum likelihood) estimators have been used by employing Logit analysis (Gujarati, 2003; Pindyck and Rubinfeld, 1998). After a serial of transformations, they obtain a linear formula to present the Lin of percentage that whether a consumer will buy a counterfeit or not as:

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[30]   Mohammad Samaun Safa and Wang Jing Jessica, Influential Decision Factors of Counterfeit Consumers in Shijiazhuang City of China: A Logit Analysis, Research Centre, Binary University College, Malaysia binary University College, Malaysia. Page 8. 2005

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = Z_i = \beta_0 + \beta_1 gen + \beta_2 ag + \beta_3 ms + \beta_4 ai + \beta_5 oc + \beta_6 ed + \beta_7 ia + \mu \ [31]$$

Table 1 gives a descriptive, comparative statistic for the survey:

Table 2 shows the results of Logistic Regression Analysis

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[31] *Where P_i is the probability consumer will purchase a counterfeit, so $1-P_i$ presents the probability the consumer will not buy the counterfeit.*

Table 1. Demographic attributes of the respondents

Item	Variable	Total (301)	Deceptive (n^2= 136)	Non-deceptive (n=147)
Gender	Male	141(46.8)	63(46.32)	68(46.25)
	Female	160(53.2)	73(53.67)	79(53.74)
Age	Under 20	30(10.0)	7(5.1)	21(14.3)
	21-30	147(48.8)	72(52.9)	66(44.9)
	31-40	54(17.9)	25(18.4)	23(15.6)
	41-50	28(9.3)	11(8.1)	16(10.9)
	51-60	31(10.3)	16(11.8)	15(10.2)
	Over 60	11(3.7)	5(3.7)	6(4.1)
Marital status	Single	108(35.9)	42(30.9)	39(27.3)
	Partnered	52(17.3)	28(20.6)	33(23.1)
	Married	134(44.5)	61(44.9)	68(47.6)
	Others	7(2.3)	5(3.7)	3(2.1)
Annual income (RMB)	< 12000	159(52.8)	68(50.0)	83(56.5)
	12000-24000	77(25.6)	35(25.7)	36(24.5)
	24000-36000	32(10.6)	14(10.3)	16(10.9)
	36000-60000	20(6.6)	10(7.4)	9(6.1)
	60000-120000	8(2.7)	5(3.7)	2(1.4)
	>120000	5(1.7)	4(2.9)	1(0.7)
Occupation	Government administrative/ state owned work unit/	25(8.3)	9(6.6)	15(10.2)
	Professional/ technical staff	45(15.0)	24(17.6)	19(12.9)
	Worker/ attendant / staff	35(11.6)	16(11.8)	16(10.9)
	Foreign equity enterprise	6(2.0)	4(2.9)	2(1.4)
	Admin personnel/ factory director/ manager	27(9.0)	12(8.8)	12(8.2)
	Private Enterprise/ Company	37(12.3)	16(11.8)	19(12.9)
	Student	48(15.9)	15(11.0)	31(21.1)
	Teacher	10(3.3)	6(4.4)	4(2.7)
	Doctor	31(10.3)	18(13.2)	11(7.5)
	Unemployed	15(5.0)	8(5.9)	5(3.4)
	Housewives	19(6.3)	7(5.1)	11(7.5)
	Others	3(1.0)	1(0.7)	2(1.4)
Education Qualification	Below High school	65(21.59)	27(19.9)	34(23.1)
	High school	65(21.59)	33(24.3)	29(19.7)
	College diploma	90(29.9)	44(32.4)	39(26.5)
	Bachelor Degree	64(21.3)	25(18.4)	36(24.5)
	Master degree	16(5.3)	7(5.1)	8(5.4)
	PhD	1(0.3)	-	1(0.7)
Identifying Ability	Very difficult	51(16.9)	20(14.7)	29(19.7)
	Difficult	99(32.9)	42(30.9)	55(37.4)
	A little difficult	27(9.0)	13(9.6)	12(8.2)
	Moderate	64(21.3)	31(22.8)	26(17.7)
	A little easy	13(4.3)	9(6.6)	4(2.7)
	Easy	36(12.0)	15(11.0)	16(10.9)
	Very easy	11(3.7)	6(4.4)	5(3.4)

Variables	Coefficient	Standard error	Wald	Sig.	Odd ratio
Constant	-23.523	51671.788	0.000	1.000	0.000
Age	-	-	14.022	0.015	-
31-40	1.988	0.977	4.141	0.042	7.303
51-60	2.582	1.039	6.170	0.013	13.221
Marital	-	-	15.928	0.001	-
Income	-	-	9.418	0.093	-
Occupation	-	-	19.692	0.050	-
Education	-	-	12.554	0.028	-
Chi-square statistics[6]	5.222 (8 df)			0.734 (p-value)	
-2 Log likelihood	309.872				
Cox and Snell R Square	0.237				
Nagelkerke R Square	0.316				

Table 2. Results of Logistic Regression Analysis:

Table 1 shows the absolute number of respondents in each categories. Table 2 give the result of this regression. In table 2, it is obvious that most of the variables are significantly influencing the intent to buy counterfeits. By regressing on SPSS, coefficients will be arranged to each variable. People in the age group of 31-40 and 51-60 age groups seems have more intent to buy counterfeits. This result can be explained as China's economy reform beginning early 90's. People born before that period would have less money for genuine goods; Safa and Wang Jing describe them as "remained within a relatively low economic level with low living standards and struggled to 'dress warmly and eat their fill.'" The other variables such as marital status, education, occupation and income were also found can affect the intent to buy counterfeit. Marital status, education and occupation as well as income can influence consumers' intent to purchase counterfeits at a low to high significant level (1%-5%-10%).

Following the result of Wee (1995) Safa and Jessica(2005) believe that age will not affect the counterfeit purchase. However, counterfeits seem more popular among people who are younger than 20. The snob-appeal have higher utility for them, but they cannot purchase genuine goods due to lack of money, however, they can turn to

counterfeit looking for some illusive satisfactions. For older age groups, quality may be the main factor when they are purchasing goods, and genuine goods might be more "valuable" then a counterfeit.

There is definitely auto-correlations existing among age, income and occupation, which might affect the result of the regression. Multi-colinaerity could exist as well. A better prediction could be generated using Weighted Least Square to run this regression, but if the auto-correlation still exists, it would be better to eliminate the co-integration first then use GWLS instead.

The result shows the occupation and education variable may affect the choice to buy the counterfeits, but the regression was not very clear. Compared to the professional/technical demographic group, student groups bought more counterfeits, perhaps due to their lower wages.

Consumers are more aware of anti-counterfeit efforts than they were five years ago. I personally think, however, that the anti-counterfeit efforts usually have no impact on the market, and those counterfeiters will avoid punishment because they still hold some way with officials. The anti-counterfeit efforts are still a glass roof that Chinese people cannot reach in the near future.

5. Results from analyzing the "Shanzhai" history and development in China

Until now the paper has systematically and theoretically explained

1) Why the "Shanzhai" sector has become popular in mainland China.

2) How the "Shanzhai" sector competed with genuine producers in an duopoly market.

3) How respectively the genuine goods and counterfeits grab their own market share using a second-degree price discrimination mechanism.

4) How a tariff or government interference would change the equilibrium between them.

5) How and why the individual characteristic would influence the purchase decisions.

Generally speaking, Chinese "Shanzhailization" is determined by the technology acquired. Once a new technology is introduced, the "Shanzhai" sector will face a new challenge and shock. During the last decades, "Shanzhai" reform always saw technical doorsill decline and production-cost decreases. Now "Shanzhailization" in China imitates electronic products without any permission of genuine producers. Actually, there is no strict conception of "Shanzhai": Popular opinion thought those electric products with their register trademark made by imitating other's technology will be defined as "Shanzhai". Although this word at first was made only to describe counterfeit cell phone, nowadays counterfeit of digital camera, TV and various digital products are all considered as "Shanzhai."

Take "Shanzhai" cell phone sector as example: Before the MTK chips were invented; most of the cell phones were produced using LoCosto, OMAP and ULC Solution chips.[32] With new MTK chips,[33] the average cost of producing a cell phone has

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[32] *These chips companies only sell their chips, for other further works, the R&D department of the customer*

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largely decreased, so the whole counterfeit cell phone industry started booming in the mainland China. As a consequence, the whole industry chain became simpler and easily organized. The MTK chips succeeded to integrate the cell phone chips and the multimedia functions together, so the subordinate companies only have to assemble accessories, and these cell phones can enter the market within a very short period.

Consider the Bertrand model, after a counterfeit enter the contestable market, the prices of both high and low-quality goods will reach the same level. But in a one-shot game, if the counterfeit firm enters into the market as a quantity follower, it would only produce half as many quantities compared to the genuine goods. If we look at the this event from a point of transaction cost, comparing a "Shanzhai" cell phone to a genuine, trademarked cell phone, the "Shanzhai" industry's accessories are entirely from the outside market and only have price mechanism between each other. There is no R&D investment or management cost. Genuine cell phone firms have to compete with each other through management and assignment work. Normally, we believe the one with general cost will own the market. But according to Grossman and Shapiro's theory, genuine goods don't only have an advantage in quality and after service but also can also add value via snob-appeal and prestige. Some consumers can be attracted by the snob-appeal and prestige due to their outward utility curve and higher income budget. Likewise, the counterfeits cannot always win only in the price; they will face the trade barriers, import and export government penalty and tariff, plus any alteration would change this equilibrium into a new Nash equilibrium. We also must look at the consumer's preference by investigating the various individual characteristic, which can make the individual budget curve changed.

Next, one must consider the organization of production. Why does a specific firm exist? How can the firm be beneficial? According to R.H.Coase in his article "The

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company have to work on them. As a consequence, the subordinated company must have their own R&D departments to finish the rest part.
[33] *MTK adopted MediaTek's MT6205, MT6218,MT6219, MT6226, MT6227, MT6228 chip using ARM7 core, using MT6305 and MT6305B as battery control chips, MT6129 as RF chip. Which is the mainstream chip in the trade union. http://zhidao.baidu.com/question/24067968.html*

Nature of the Firm" (1937)[34], when the transaction cost of the market is higher than the interior management cost of the firm, the firm will be established. The existence of the firm can save unnecessary transaction cost in external market, simultaneously take the high transaction cost outside the market place by relatively lower interior transaction within the firm. When the marginal transaction cost of the market equals the interior marginal management cost, the firm will expand its scale. Coase also noted the firm would stop only when the transaction cost on the market or in another firm was equal to the interior management cost. Henry Ford[35] followed this blueprint in car manufacturing, he expanded his car manufacture into steelmaking and rubber plants simply because he could not find the necessary outside markets. Nowadays, all the accessories can be found in the market, which makes the whole producing process easier. This suggests the nature of the firm is paradoxical.

"Shanzhai" enterprises do not enjoy from the internal "low" transaction cost within firms but benefited from low external outsourcing transaction costs. By using the outside marketing mechanism, "Shanzhai" firms minimized their transaction cost by turning to the outside market. Producing a cell phone, from designing to marketing, the "Shanzhai" firm does not have to worry about a original firm strategy. The participants in the "Shanzhai" sector do not have to compete with each other like traditional firms, the price mechanism already coordinates each other's activity. "Company town" is defined as the economic agglomeration which has several extend meanings:
(1). Scale economies within a firm, (2) localized economies, (3) industrial complex economies, (4) urbanization/regionalization economies, (5). mobile economies (J.-C.

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[34] **"The Nature of the Firm"** (November 1937) 4(16) Economica 386-405 by Ronald Coase is a brief but highly influential essay that offers an economic explanation of why individuals choose to form partnerships, companies and other business entities rather than trading bilaterally through contracts on a market.

[35] **Henry Ford** (July 30, 1863 – April 7, 1947) was the American founder of the Ford Motor Company and father of modern assembly lines used in mass production. http://en.wikipedia.org/wiki/Henry_Ford

Yang, 2007).

Traditional economic theory usually don't take the space economy like regions, time, transport cost etc. as main factors. "In real world, we can assume different production efficiency and function according to different region."[36] According to the theory of company town[37] and the Chinese social conventions, this "company town" is an agglomerate scale economy in some special regions such as the Greater Pearl River Delta and Ynagzi River Delta regions. These special economic zones are urbanization/regionalization economies under the protection of local government. In China big companies always have national stockholders, which means they have strong bureaucracies and they could be bail out anytime when they get into trouble. Those small-medium firms are always located nearby geting their profit and protection from the big enterprises. As outsourcing firms, their benefits are closely related to the benefit of the upper level firms. Every interest group in different hierarchies must find equilibrium to balance the benefit. Here, a "big company town" formed (Yang, 2007): The main task of each accessory was to do a strictly defined job, and each accessory's fortune would be assigned as a means to benefit the whole. Even if there are some accessories firms get into trouble and have to close, new accessories will join due to the relatively low labor cost and low entry doorsill. This organization is a typical performance of regional economies, but the internal system are intricate. The reason that why it can grow so fast is technology. This "company town" are the creatures of technology diffusion, along with the regional economic divergence and converge from the other region to these so called "company towns". This abnormal organization can be explained by the Chinese convention, labor, education, bureaucracy and some other features.

Apparently, the second-degree price discrimination gives us a very interesting aspect from the price-bundling strategy to investigate the question. Unlike under traditional

price mechanism, the counterfeit seller usually produces low-quality goods and bundle nearly nothing to maximally extract consumers' surplus. As such, the counterfeit product's package price would be much lower than the genuine product's. The genuine seller is trying to give back as much surplus to the consumer as possible to induce them to purchase more. Second-degree price discrimination indicates that a downwardly compatible technology would allow the genuine producer to interfere with counterfeiter's business, but a greedy genuine-goods producer can only make his profit decrease by doing so. A social-welfare increase can be achieved if the genuine and counterfeit exclusively serve their own type of consumers. This leaves an ironic conclusion: The genuine seller gives the surplus back to the rich people, while the counterfeiter is trying to extract all surplus from poor people with a relatively lower package price. We can then predict that the more counterfeits in the market, the more polarized social welfare will be.

Despite of "Shanzhai" products' positive effects, the poor quality of "Shanzhai" products immediately counteracts their comparative advantage. Consumers are rational, when the quality of a product failed to meet their expectations, they will feel deceived. This is contrary to my assumption that counterfeits are not being sold for deceiving. In this situation, the equilibrium would be broken according to Grossman and Shapiro's theory. From the supply side, because there are too many "Shanzhai" firms in China -- and most of them lack supervision, so the competition mechanism is unregulated -- those firms have to compete with each other while maintaining production. In this price battle, most of them will have no extra energy to improve quality. In "Shanzhai" cell phones case, the principle idea behind the MTK chips only ensure the quality and the function of the chips; the quality control of the final product will be the responsibility of the subordinate factory or firms.

On the other hand, low-quality goods still have their markets. Like a grass root, the "Shanzhai" economy tenaciously lives in this complicated market. However, given global economic history, the "Shanzhai" industry is destined to decline as brand

infringement or property-rights infringement becomes more policed. In the short term, the "Shanzhai" phenomenon has improved social welfare or at least satisfied the needs of consumers in developing countries. As described earlier, any interference from a genuine producer will harm social welfare. The only effective method to improve social welfare, then, is to transform the nature of the counterfeit goods into genuine goods. In the long run, if a country wants to stabilize his economy and let his economy develop sustainably, there must be a successful monitoring mechanism and a healthy legal system. "Shanzhai" economy is a good beginning but never be a best ending.

6. Conclusion

This paper has systematically described the "Shanzhai" economy's origination and development, albeit from a macro perspective due to the unobservable variables of the "underground economy." According to modern econometrics, this problem could be investigated by using latent variable, or new mathematic methodology.[38] Once these data could be observed, we could build econometric models to see more clearly how the "Shanzhai" economy could be influenced and in what ways the "Shanzhai" sector could impact the whole economy. (See more information in Marno Verbeek (2008): A Guide to Modern Econometrics, 3rd edition.) Moreover, the Chinese "Shanzhai" phenomenon is heavily related to Chinese bureaucracy and interior uniform norms. An institutional economic theory associated with Chinese conventions would be more persuasive in explaining this topic.

After a series of analyses and explanations, we found the "Shanzhai" economy and even "Shanzhai" phenomenon is not a coincidence but inevitable. Some famous brands such as Samsung and Toyota had similarly history relied on imitation. Nowadays, "Shanzhai" can only be prosperous in a developing market economy. The

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[38] *http://en.wikipedia.org/wiki/Latent_variable*

"Shanzhai" phenomenon seemingly a strategy of plagiarizing, imitating, studying then finally innovating to become a new genuine, this order can never be violated. Without plagiarism and imitation, "Shanzhai" would never exist, but without innovation, "Shanzhai" would never break through and would remain "Shanzhai" forever.

The enterprises and individuals without resources and weapons, in order to avoid a lost destiny, will use any permissible methods to achieve victory in a fiercely competitive world. "Shanzhai" is sometimes a methodology used by weaker groups to change their situations and create resources for themselves. "Shanzhai's" inside spirit is struggling for changing and never gives up. Amartya Sen[39] has said in his article "Development as Freedom" (1998): "The essence of human freedom is the ultimate objective of development, and an important means of development is related to economic, politic, social values, and many other aspects of an integrated process."   I believe after some correct guidance by the government, the "Shanzhai" sector could evolve into a different industry which can distinguish from brand infringement, property right plagiarism then become a new engine of innovation that would lead to a new, tremendous economic growth.

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