Counterfeiting of Durable Goods

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Abstract

We consider a monopolist who faces a two period durable good market. In this scenario, it can often happen that the monopolist was benefited by the appearance of nondeceptive counterfeit products.

1 Introduction.

The counterfeit products are generally classified into two types: deceptive and nondeceptive counterfeiting (see Grossman & Shapiro 1988a, 1988b). In the type of deceptive counterfeiting, imperfectly informed consumers are not easy to make a distinction between the copies and the authentic merchandise; therefore, they might purchase the fakes accidentally and will be willing to pay less. This will affect manufacturers' reputation and profit as well. Both consumers and manufacturers do suffer the harms, and hence the social welfare is going to drop.

In contrast to the deceptive counterfeiting, consumers can distinguish the nondeceptive counterfeiting from the authenticity (real ones). In many cases, it is evident that consumers knowingly purchase the counterfeit products. In this scenario, the nondeceptive counterfeit product provides more opportunities for the consumption choice and generates more competition to the authenticity. Since consumer’s purchase yields social surplus (given the cost of making additional copies is insignificant), the short-term social welfare will rise.

However, this above mentioned argument does not take into account of the long-term negative effect. The incentive to create new work is provided by creator’s premium, fail to protect the trademark might weaken the motivation to innovate. This argument often emphasized by many researchers. Our paper challenges this conventional wisdom.

Specifically, we argue that the appearance of counterfeit product might even increase the firm's immediate profit. This phenomenon can be brought out quite succinctly in a model of durable-good monopolist.

It is well-known that the durable-good monopolist will be actually hurt by the ability to adjust his price (the so-called “Coase Conjecture” which was first stated by Coase, 1972). Since today’s purchases can be replaced by the tomorrow’s, many high-valuation consumers will refrain from buying in the early periods with the rational belief that the firm is going to lower the price in the future. The monopolist becomes the victim of his own flexibility to adjust the price over time. He would be better off if he could ex ante commit himself not to lower the price once high-valuation consumers have bought.

The intuition behind this paper runs as follows: when the counterfeit product is available (the copyright enforcement is not too harsh) and its price is right for the low-valuation consumers, it will be better for some of them to buy the fake rather than to wait for the price cutting in the future. Thus brandname firm has no incentive to reduce price much in the later period. This serves as a credible price-maintenance commitment to the high-valuation consumers. At some circumstance, the monopolist will earn more from the high-valuation consumers at the cost of discarding some of the low-valuation consumers.

In this scenario, the monopolist earns more profit and consumers have more choices.

The social welfare has nowhere to be hurt.

Notice that we are not saying it is always better for a durable-good monopolist not to protect its trademark.. Our purpose is to bring to light on a phenomenon which seems to have gone unnoticed in the literature.

Several studies also examine the incentives for the creator and their effect on social welfare.

Tan & Chu (1991) points out that harsher enforcement of the trademark protection laws will enlarge the market of the brandname firm. The incentive of escalating their products' quality will depend on how much the marginal consumer (the new consumers in their model) care about the quality. Hence, copyright protection might not necessarily strengthen firms' incentive to innovate.

Ben-Shahar & Jacob (2004) show that the appearance of counterfeit product does not necessarily diminish firm's long-term profit. The counterfeit product might lower the Monopoly' s price and form the barriers to entry. Thus, the firms make more overall profit at the cost of immediate profit loss. They claim that, in some circumstances, the creator might intentionally promote infringement of the copyright.

The remaining of this paper is organized as follows. In section II, we set up the durable-good monopoly model. Section III investigates the optimal pricing behaviors of the monopolist and conclusion is draw in last section.

2. The basic model

The phenomenon can be brought out in a simple linear model as the following.

There is a continuum of consumers represented by the unit interval [0, 1].

Consumer with a taste parameter $t \in [0,1]$ is willing to pay t dollars for a unit of the authentic product. For the sake of simplicity, here we collapse the future value of consumption into just one present discounted value t; moreover each buyer wishes to purchase just one unit of the product. Assume that, for simplicity, the monopolist's constant marginal cost is zero and the taste parameter of consumer t is uniformly distributed over the interval [0, 1]. Also we assume the monopoly sells the good for only two periods. Last, δ denotes the discount for the seller and buyers.

When the monopoly charged price p_2 at period 2, the buyer with a taste parameter exceeding p_2 buy (if they have not yet done so), and the others do not buy. In the first period, the price that the consumers are willing to pay depends on the present price p_1 and their expectation of the market price during period 2. Let p_2^e be this expected price. Assuming that $p_1 \geq p_2^e$, it is easy to check that $(t - p_1) \geq \delta(t - p_2^e)$ $\Leftrightarrow$ $t \geq (1-\delta)^{-1}(p_1 - \delta p_2^e)$ and $t \geq (1-\delta)^{-1}(p_1 - \delta p_2^e)$ $\Rightarrow$ $t - p_1 \geq 0$. We conclude that consumers with a taste parameter exceeding $(1-\delta)^{-1}(p_1 - \delta p_2^e)$ buy at period 1 (this result from the fact that a high valuation buyer is more impatient to buy).Denotes this cut-off valuation by $\hat{t}(p_1)$, therefore, the demand in the first period is $q_1 = 1 - \hat{t}(p_1) \;\; = 1 - (1-\delta)^{-1}(p_1 - \delta p_2^e)$.

To complete the model, we assume that consumers anticipate correctly the price charged in period 2: $p_2^e = p_2$. From this, knowing q_1, consumers expect the monopoly to choose p_2 to solve

$$\max_{p_2} p_2(\hat{t}(p_1) - p_2)$$

From this, we determine $p_2 = \hat{t}(p_1)/2$. Therefore p_2 and $\hat{t}(p_1)$ satisfies

$\hat{t}(p_1) = (1-\delta)^{-1}(p_1 - \delta p_2)$ and

$p_2 = \hat{t}(p_1)/2$.

This implies that

$$p_2 = \frac{p_1}{2-\delta} \tag{1}$$

and

$$\hat{t}(p_1) = \frac{2p_1}{2-\delta}. \tag{2}$$

Then, in the first period, the monopolist chooses p_1 to maximize

$$\prod = \max_{p_1} p_1(1-\hat{t}(p_1)) + \delta p_2(\hat{t}(p_1) - p_2) \tag{3}$$

Substituting equations (1) and (2) into equation (3), we obtain

$$\prod = \max_{p_1} p_1(1-\frac{2p_1}{2-\delta}) + \delta(\frac{p_1}{2-\delta})(\frac{2p_1}{2-\delta} - \frac{p_1}{2-\delta})$$

It is easy to check that $p_1 = \frac{(2-\delta)^2}{2(4-3\delta)}$ and $\prod = \frac{(2-\delta)^2}{4(4-3\delta)}$.

Note that the monopolist could earn 1/4 by makes a once-and-for-all offer in the first period. We summarize the results above in the following claim.

Claim I. (i)The monopolist chooses the price $p_1 = \frac{(2-\delta)^2}{2(4-3\delta)}$ and $p_2 = \frac{(2-\delta)}{2(4-3\delta)}$. The consumers, with the taste parameter $t \in [\frac{(2-\delta)}{(4-3\delta)}, 1]$, purchase at period 1 and the ones, with the taste parameter $t \in [\frac{(2-\delta)}{2(4-3\delta)}, \frac{(2-\delta)}{(4-3\delta)}]$, purchase at period 2.

(ii)For any $\delta \in (0,1)$, the monopolist earn $\prod = \frac{(2-\delta)^2}{4(4-3\delta)} < \frac{1}{4}$ which is less than the profit he can earn by making a once –and –for-all.

3. An example

Now let us examine the model in which the nondeceptive counterfeit product is available. However, counterfeits might be discovered by the government and lead to a penalty. For simplicity, let it occurs with probability ϕ and b be the cost of each penalty. Assume that free entry prevails among the producers of counterfeits. This ensures zero profits for them. Finally, assume the marginal cost of each counterfeit is zero. We can simply denote the price of a counterfeit by $a = \phi \cdot b$.

Turning to the demand side of the model, consumers differ in their taste for the counterfeit product. Our final assumption regarding demand is that the buyers who value the authentic goods more are less likely to appreciate the counterfeit product. Let $f(t)$ denote the probability that consumer with the taste parameter t who value the authentic goods only. A consumer with a taste parameter $t \in [0,1]$ has the following preferences; he is willing to pay t dollars for a unit of the authentic product, q dollars for a unit of counterfeit good with probability $1 - f(t)$, and zero dollar for a unit of counterfeit good with probability $f(t)$.

Let $s = q - a$ be the net surplus of consumers if they buy the counterfeit product. Notice that s increasing as the government chooses the harsher penalty or more strictly enforce the trademark of the monopolist.

When the monopoly charged price p_2 at period 2, the buyer with a taste parameter $p_2 \le t \le s$ buy with probability $f(t)$ (if they have not yet done so), and the others do not buy. We assume that $f(t)$ is increasing and continuous function. In the first period, the price that the consumers are willing to pay depends on the present price p_1 , s and their expectation of the market price during period 2. Let p_2^e be this expected price. Assuming that $p_1 \geq p_2^e$, it is easy to check that consumers with a taste parameter exceeding $(1-\delta)^{-1}(p_1 - \delta p_2^e)$ and $\delta \cdot s$ buy at period 1. Denotes this cut-off valuation by $\hat{t}(p_1)$, therefore, the demand in the first period is $q_1 = 1-\hat{t}(p_1)$ $= 1-(1-\delta)^{-1}(p_1 - \delta p_2^e)$.

Similarly, we assume that consumers anticipate correctly the price charged in period 2: $p_2^e = p_2$. From this, knowing $\hat{t}(p_1)$, consumers expect the monopoly to choose p_2 to solve

$$\max_{p_2} p_2 \int_{p_2}^{\hat{t}(p_1)} f(t)dt \quad \text{if } \hat{t}(p_1) \leq p_2 + s$$

and

$$\max_{p_2} p_2 [\int_{p_2}^{p_2+s} f(t)dt + \hat{t}(p_1) - (p_2+s)] \quad \text{if } \hat{t}(p_1) > p_2 + s$$

Therefore p_2 and $\hat{t}(p_1)$ satisfies

$$\hat{t}(p_1) = (1-\delta)^{-1}(p_1 - \delta p_2) \tag{4}$$

$$p_2 = \int_{p_2}^{\hat{t}(p_1)} f(t)dt \Big/ f(p_2) \quad \text{if } \hat{t}(p_1) \leq p_2 + s, \tag{5}$$

and

$$p_2 = [\int_{p_2}^{p_2+s} f(t)dt + \hat{t}(p_1) - (p_2+s)] \Big/ [f(p_2) + 1 - f(p_2+s)] \quad \text{if } \hat{t}(p_1) > p_2 + s \quad (5')$$

Denoted the solution of equations (4), (5) and (5') by $p_2(p_1, s)$ and $\hat{t}(p_1, s)$. Then, in the first period, the monopolist chooses p_1 to maximize

$$\prod(s) = \max_{p_1} p_1[(1 - p_2(p_1,s) - s) + \int_{\hat{t}(p_{1,}s)}^{p_2(p_1,s)+s} f(t)dt] + p_2(p_1,s) \int_{p_2(p_1,s)}^{\hat{t}(p_1,s)} f(t)dt \tag{6}$$

if $\hat{t}(p_1,s) \le p_2(p_1,s)+s$,

and

$$\prod(s) = \max_{p_1} p_1(1-\hat{t}(p_1,s) + p_2(p_1,s)[\int_{p_2(p_1,s)}^{p_2(p_1,s)+s} f(t)dt + \hat{t}(p_1,s) - (p_2(p_1,s)+s)] \qquad (6')$$

if $\hat{t}(p_1,s) > p_2(p_1,s)+s$.

Claim II. Let $\delta = 2/3$ and let

$$f(t) = \begin{cases} 5(t-0.4) & if \quad 0.4 \le t < 0.6 \\ 0 & if \quad t < 0.4 \\ 1 & if \quad t \ge 0.6 \end{cases} .$$

We have $\prod(0.1) > \prod(s)$ for $s \le 0$.

Proof. Let $p_1 = 0.45$, by the equations (4) and (5) (for now we assume $\hat{t}(p_1) \le p_2 + s$, and it will be verified later), which implies that

$$\hat{t} - 0.45 = \tfrac{2}{3}(\hat{t} - p_2)$$

and

$$\frac{\int_{p_2}^{\hat{t}} 5(\tau - 0.4)d\tau}{5(p_2 - 0.4)} = p_2 .$$

Therefore, we have

$p_2 = 0.417$ and $\hat{t} = 0.517$.

By the definition of $\prod(s)$, we obtain

$$\prod(0.1) \ge (0.45)(1-\hat{t}) + \tfrac{2}{3}\int_{0.417}^{0.517} 5(\tau - 0.4)d\tau = 0.2393 .$$

By Claim I, let $\delta = 2/3$, $\prod(s) = \dfrac{(2-\delta)^2}{4(4-3\delta)} = \dfrac{2}{9}$ for $s \le 0$.

It is clear that $\prod(0.1) > \prod(s)$ for $s \le 0$. $\square$

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