Chapter 5
Impact of Copyright Protection on Re-creation of Digital Contents When Expression and Idea Are Divisible

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Abstract We consider the case in which the expression and the idea are completely divisible and copyright protection cannot be applied to very closely substitutable derivative work. Even if the ideas of these works are very similar, the substitute is regarded as an independent work, and not as a copyright infringement. Therefore, it is possible to supply closely substitutable goods based on similar ideas. Thus, the monopoly rent of the copyright holders might decrease, so they face the risk of failing to recover the initial cost. Assuming Bertrand competition with zero marginal cost, considering the nature of digital contents, we show that imitators have no incentive to enter the market in vertical product differentiation except in the case of a sufficiently high quality of imitation. Even if they can enter the product-differentiated market, they do not compete and divide the market to produce differentiated works. Thus, the original producer's monopolistic profit is maintained under the general copyright system.

5.1 Introduction

According to the nature of informational goods, copyrighted works have attributes of both non-excludability and non-competitiveness. Therefore, because of its low marginal cost, the prices of copyrighted works are preferably set low, or even at zero, if they are digital contents and the marginal cost is zero. However, if the price of a copyrighted work is equal to the marginal cost, the creation cost cannot be recovered and is ex ante considered a fixed cost as an incentive for content creation. Thus, the copyright law gives producers the exclusive right to use the works and to gather the creation cost within a certain period of copyright protection. Thus, it is illegal to sell copyrighted materials without any permission from the producers.

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In principle, on the other hand, copyright protects only expressions and not ideas. Even if the ideas of copyrighted works are very similar, the imitation is regarded as an independent work, and not as a copyright infringement, as long as the expressions are quite different. In other words, it is possible to supply closely substitutable goods based on similar ideas if the expressions are different. Thus, this effect might decrease the monopoly rent of copyright holders, who may have concerns about losing their monopolistic benefit easily.

Apparently, the depreciation of the monopolistic profit of the initial copyright holder is determined by several factors, such as production cost of similar goods and the amount of substitute goods. Because existing works are conceived from ideas, while alternative goods are obtained from existing works and only the expressions change, the cost of creation is naturally lower for substitute works than initial works. Thus, the profit on the original work might be lower than the creation cost.

Thus, the creation cost of an initial work might not be recovered, and initial works not produced. In this paper, we set up a benchmark model to check whether initial works are created or not.

The outcome actually depends on various factors, not only the cost difference but also the quality difference between the original and derivative works and the time required for re-creation. In this paper, we develop a simple Stackerberg market with Bertrand competition and zero marginal cost within which both initial works are first produced and then the imitator considers entering the market to produce a closely substitutable work. We check whether the monopoly profit can be obtained and whether or not the initial work is supplied, with both vertical and horizontal product differentiation.

We derive an astonishing result: with the strong pressure of Bertrand competition, the entrants obtain no profit even if they enter the market; thus, they have no incentive to produce an imitation work in vertical product differentiation. In horizontal product differentiation, they have an incentive to create a derivative work, but they differentiate the product sufficiently to avoid competing with each other unless strong pressure from price competition reduces the entrant profit to zero.

We also refer to an important aspect: expressions and ideas are closely related. In reality, it seems difficult to isolate ideas from expressions. Therefore, we also refer to the extent to which the inseparability of ideas and expressions influences monopoly profits.

As Arai Arai (2018) pointed out, no previous theoretical work has analyzed the divisibility of expressions and ideas.

In Sect. 5.2, we consider vertical product differentiation. In Sect. 5.3 we derive the market structure and the degree of horizontal product differentiation using the Hotelling model. In Sect. 5.4, we extend the model in which ideas and expressions are partially dispensable. Section 5.5 presents the concluding remarks.

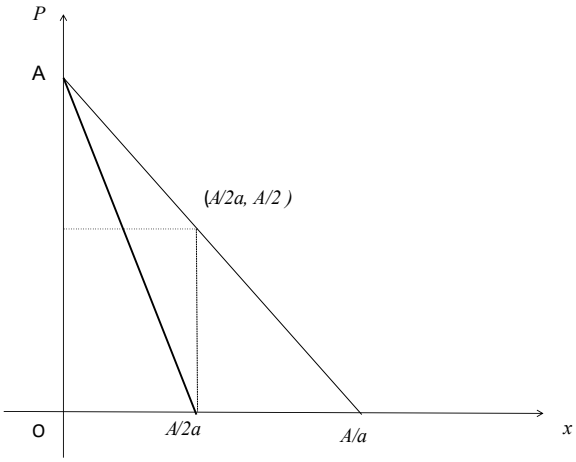

Fig. 5.1 Optimal contents provision without price discrimination

5.2 The Vertical Product Differentiation Model and the Benchmark Outcome

Suppose a market of digital content in which demand is simplified as a linear function $D(P)$; P is the price of the content and is described as a linear inverse demand function, $P^D(x) = A - ax$. The marginal cost is $= 0$. Further, the initial producer's cost to create the content is an ex-ante fixed cost, F.

In Proposition 5.1, we first set the condition that the initial producer creates the content when s/he could sell it as a monopoly product (Fig. 5.1).

Proposition 5.1 *If the initial producer sells it as a monopoly product without price discrimination, s/he produces it if and only if* $\frac{A^2}{4b} \geq F$. *With perfect price discrimination, s/he produces it if and only if* $\frac{A^2}{b} \geq F$.

In Proposition 5.1, there are no competitors. We now turn to the case in which it is possible to produce closely substitutable content by imitating the idea of the initial content, while the expression is quite different. This paper assumes that only one competitor enters the market and provides the same kind of content, which is a perfect substitute. We then consider vertical product differentiation. The difference is the fixed cost F'. We obtain an astonishing result through a quite well-known analytical method.

Proposition 5.2 *Suppose that both the initial producer and an imitator produce the same kind of content in the market. If they compete on price in Bertrand competition, the equilibrium price is zero because the marginal cost is zero. Thus, the imitator has no incentive to enter the market.*

Bertrand competition is too strong for the recovery of either the initial producer's or the entrant's creation cost. Imitators would enter the market only if their product

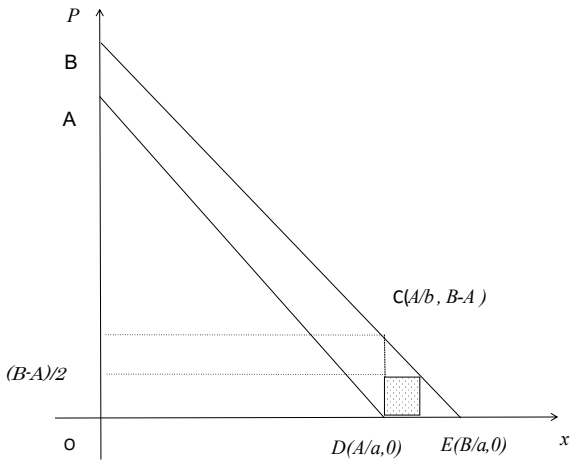

Fig. 5.2 Optimal contents provision without price discrimination

quality is sufficiently better than the original to compensate for the fixed cost of producing the re-creation. Thus, we consider vertical product differentiation.

Proposition 5.3 *Suppose the quality of the imitation is better than that of original content and the inverse demand function of the imitation is simplified as* $P^D = B - ax$, $B > A$. *The imitators have an incentive to enter the market if and only if their creation cost F' is*

$$F' \leq \frac{(B-A)^2}{4a} \tag{5.1}$$

By Fig. 5.2, if the fixed cost is less than the area of the small square described by Fig. 5.2, the fixed cost is recovered, and the imitator has an incentive to enter the market. The original producer, however, has no reward and is not compensated for the fixed cost. Thus, s/he has no incentive to create the original.

Proposition 5.4 *If Eq. (5.1) holds, the original producer has no reward and is not compensated for the fixed cost. Thus, s/he has no incentive to create the original.*

Interestingly, the necessary condition for the imitator to enter the market is that the imitation should have higher quality than original. Naturally, the creation cost of the imitation is lower than that of the original, even if the expression is completely changed. However, even if the cost of the imitation is lower than that of the original, the imitators cannot enter the market if the quality or attractiveness of the imitation is higher than that of the original and it seems difficult to produce. Thus, a prohibition against the use of expressions is all that is needed to allow enough monopoly power to compensate for the original producer's creation cost, although preventing imitations that are more attractive than the original might be a "related right."

The time-lag to produce an imitation is worth considering. The initial producer obtains some profit if the imitator delays to enter the market even if the competi-

tor's product quality is sufficiently higher. Thus, the more the delay, the greater the incentive to create original works.

5.3 Horizontal Product Differentiation of the Hotelling Model

Derivative works are characterized by not only vertical product differentiation but also horizontal differentiation. In this section we consider horizontal product differentiation following the Hotelling model based on the sequential location choice of Fleckinger and Lafay (2003).

We study a market where consumers belong to a segment [0, 1]. Consumers are spread over the market according to a uniform distribution. There are two stages in the leader-and-follower game. First, the initial producer, as the leader, chooses the location. We simplify the location choice of the initial producer by assuming 0. Although it seems a strong assumption in a location choice game, it is more natural for quality differentiation of the content. We discuss this point later. Then, the imitator chooses location $ain[0, 1]$. After the location choice stage, both choose the price simultaneously based on Bertrand competition. If they compete with each other, they are supposed to engage in Bertrand competition, and the price goes to zero. However, if they do not have to compete, because other suppliers cannot satisfy the users' preferences (since they too difficult to reflect in the content), one producer manufactures the product monopolistically. In addition, we assume no price discrimination for the initial content producer and imitator, although they can set a single different price in a segmented market.

The consumer's content evaluation is constant for any $xin[0, 1]$ and v. Further, the difference in preferences is expressed as the distance. The marginal disutility to consume the content from the difference location is assumed to be v.

Thus, if there is no entrant, the original content producer faces the downslope demand function as in the previous section, $P^d(x) = v - vx, x \in [0, 1]$. The imitator enters in sequence and chooses the location based on the leader's position, 0. The leader and the follower have full and complete knowledge about the system.

We should note several points. First, quality choice is modeled in this paper as location choice. The initial content producer's quality is first fixed at 0. The leader usually chooses the location freely, most often at the center of the distribution, in the general Hotelling model. In this quality choice model, however, it is difficult to consider the notion of the side. If the incumbent chooses the center of the interval, only the entrant chooses either side of the interval. Even if the quality is very similar, the incumbent gets at most half of the share and is definitely ensured at least half of the market. That a half share is ensured to the incumbent even without the support of copyrights is an interesting and not trivial result. In order to avoid trivial results, we assume that the initial producer's content quality is chosen at 0. Second, considering

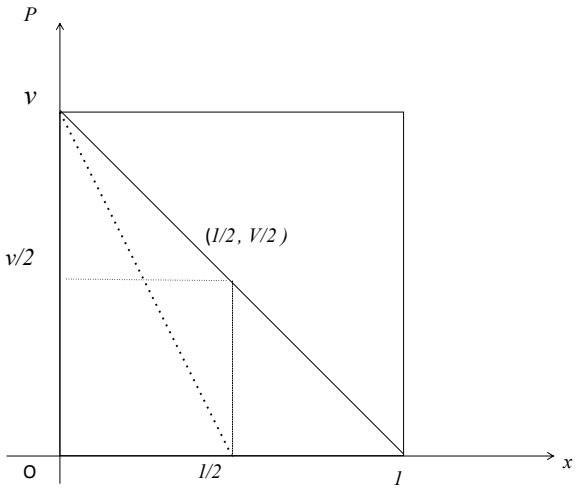

Fig. 5.3 Optimal contents provision without price discrimination

the nature of the content, location decisions are naturally costly and are made once and for all; relocating is considered prohibitively costly and is not permitted.

We solve the problem through backward induction. At the second stage, the imitator decides the price and whether to compete or not based on the location choice, a. We present this situation in Definition 5.1 (Fig. 5.3).

Definition 5.1 If the imitator and initial producer, but not the border agent, compete, both set the price at zero. If no agent, other than the border agent, can access both producers, the market is defined as segmented. Then, the imitator and initial producer never compete, and each sets a single price different from the other's.

Then, they choose the location as stated in Lemma 5.1.

Lemma 5.1 *The incumbent sets location a far enough to prevent competition between producers for any user.*

If they compete, the price falls to zero, which is definitely lower than the competition-based price. Thus, the entrant's optimal strategy is to set a price higher than 0 by choosing a, where no customer can access both producers. Thus, we have the following lemma for prices based on a

Lemma 5.2 *The incumbent sets the price* $p_i = v/2$ *and obtains the monopoly rent* $\pi_i = v/4$*, while the entrant provides only* $[1/2, 1]$*. Thus,* $1/2 \geq a \geq 1$*, and the price is set at* $p_e = \min va, v/2 - va$.

Thus, we derive the following proposition.

Proposition 5.5 *Thus, the entrant chooses* $a = 3/4$ *and sets* $p_2 = 3v/4$*. The market is segmented and the entrant receives more revenue than the incumbent.*

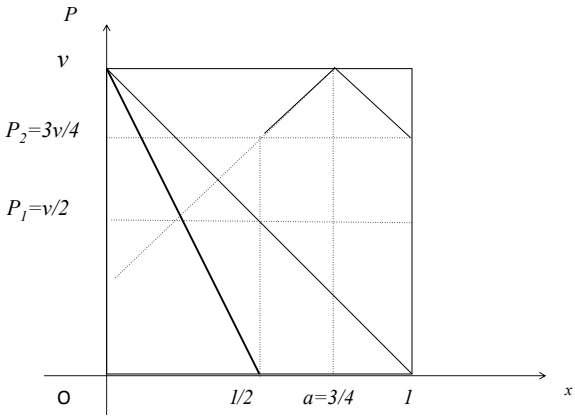

Fig. 5.4 Location choice and profit of entrant

Thus, we derive the following proposition:

Proposition 5.6 *The incumbent is ensured a monopolistic profit with the price set at* $p_1 = v/2$. *Thus, even under horizontal product differentiation, the initial producer is ensured a monopoly rent and has no disincentive for ex-ante content production.*

In fact, there is a very complicated boundary problem: if $a \geq 1/2$, customer $x = 1/2$ can access both content types. In this model, we avoid the boundary problem by assuming that the boundary customer chooses either content with the same probability (Fig. 5.4).

A strong disincentive of Bertrand competition is that the entrant refuses to compete with the incumbent in both vertical and horizontal product differentiation. Thus, the initial producer is ensured a monopoly rent unless the entrant's product is of a sufficiently higher quality to allow the imitation cost to be recovered in the face of Bertrand competition.

5.4 When Expressions and Ideas are Partially Divisible

In the previous section, it is assumed that ideas and expressions are dispensable. Assuming Bertrand competition with zero marginal cost, considering the nature of digital contents, we show that unless the quality of the imitation is sufficiently high, imitators have no incentive to enter the market under vertical product differentiation. Even if they can enter a product-differentiated market, they do not compete and divide the market to produce differentiated works. Thus, no entrant appears, and the monopoly power of the initial producer can be maintained.

From a more realistic viewpoint, on the other hand, expressions and ideas are partially inseparable. In this section, we consider a possibility of investment for the re-creator to increase the indivisibility while the original author has an incentive to increase the indivisibility to deter the entrant by producing re-creative work.

Naturally, there is a certain threshold to decide whether any work is a copyright infringement or not. If the original author can easily set the threshold high enough to deter re-creation by an entrant, entry is impossible; similar results apply as for other intellectual property rights.

However, where such a threshold is too costly to create, it is easy to enter the market by imitating the original idea; the discussion then remains the same as in the previous section.

Then, what about the middle case? First, even if you do so, the re-creator cannot generate revenue unless s/he creates a more valuable work. It follows that the same results as in previous section apply in case ideas and expressions are partially dispensable.

5.5 Concluding Remarks

We consider the case in which the expression and the idea are completely divisible and copyright protection cannot be applied to very closely substitutable derivative work. Even if the ideas of the derivative work are very similar, it is regarded as an independent work, and not as a copyright infringement. Thus, it is possible to supply closely substitutable goods based on similar ideas. This might decrease the monopoly rent of the copyright holders, so they face the risk of failing to recover the initial cost.

Because of the nature of digital content, we assume Bertrand competition with zero marginal cost in the market. We show that except in the case of a sufficiently high quality of imitation, imitators have no incentive to enter the market in vertical product differentiation. Even if they can enter the product-differentiated market, they do not compete and divide the market to produce differentiated works. This is because Bertrand competition is too strong for the entrant to recover the imitation cost. It is also applicable where the idea and the expression are partially dispensable. Thus, the original producer's monopolistic profit is maintained under the general copyright system.

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