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An economic model of fair use: Comment

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Abstract

We provide a correct analysis of Miceli and Adelstein [Miceli, T., Adelstein, R., 2006. An economic model of fair use. Information Economics and Policy 18, 359–373.], which studies the doctrine of fair use in copyright. We show that the optimal fair use standard is high enough to allow extensive copying in their model.

JEL classifications: K11; O34

Keywords: Fair use; Copyright law

1. Introduction

The doctrine of fair use in copyright allows some copying of the original without deeming the copier an infringer. This doctrine is codified in the copyright law of many countries,[1] and it has received renewed interest as internet technology advances.[2] In a recent paper, (Miceli and Adelstein, 2006, henceforth MA) present a very interesting model of fair use. In particular, they treat the original work and copies as different varieties lying on a continuum and assume that consumers vary in their valuation of these varieties. In this context, they interpret the doctrine of fair use as a threshold separating permissible copying from infringement. They analyze the producer's and consumers' behavior to derive an optimal fair use standard.

Unfortunately, however, MA's analysis is incomplete in that they fail to recognize consumers' incentives to make permissible copies. In this short paper, we reconsider the MA model and provide a correct characterization. We conduct the analysis noting the fact that the fair use standard, even when it is set to be very low, affects the decision of every consumer, which in turn restricts monopoly power. We show that the optimal fair

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[1] In the United States, for example, Section 107 of the Copyright Act states that "the fair use of a copyrighted work ... for purposes such as criticism, comment, news reporting, teaching ... scholarship or research, is not an infringement of copyright," and then lists four factors to be considered when deciding whether a particular use is fair. See Landes and Posner (2003) for a comprehensive treatment of copyright law.

[2] The recent case of Napster is a famous example. See Klein et al. (2002) for an economic analysis.

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use standard is high enough to allow extensive copying. This is in sharp contrast to MA's results that the optimal fair use standard does not allow extensive copying. Nonetheless, the interpretations of court decisions in MA's Section 5 are broadly consistent with the results in this paper.

In the next section, we present a correct analysis of the model. A very brief discussion is contained in Section 3. Since our objective is only to provide a correct characterization, we do not discuss more extensively the doctrine of fair use in copyright law. Interested readers may consult MA and the references therein.

2. Analysis

2.1. The model[3]

MA consider a model where the 'good' can be consumed in different varieties or versions. To capture this, they introduce a quality index z that ranges from zero to one, with $z = 1$ for the original. Consumers' valuations are uniformly distributed on the unit interval. The consumer with valuation $\bar{z} \in [0, 1]$ gets the gross benefit of

$$U(z) = \begin{cases} tz & \text{when } z \leqslant \bar{z}, \\ t\bar{z} & \text{when } z > \bar{z}, \end{cases}$$

when she consumes the original or a copy of quality z. Hence, a consumer type $\bar{z}$ has a marginal benefit of t up to her type but attaches no further value beyond that.

When the monopoly producer provides the good with quality 1 and no copying is feasible, the producer maximizes the profit of $(p - c)(1 - p/t)$ and the monopoly outcome is

$$(p_M, q_M, \pi_M) = \left(\frac{t + c}{2}, \frac{t - c}{2t}, \frac{(t - c)^2}{4t} \right),$$

where c is the producer's marginal cost and the demand is derived by finding the marginal consumer $\bar{z} = p/t$. Assume $t > c$ so that the quantity q_M is greater than zero.

Consider now the case when it is both feasible and legal to make a copy of any quality, with the marginal copying cost of c^c. That is, consumers can produce a copy of quality z at a cost of $c^c z$. Assume $c < c^c < t$. It is clear that a consumer type $\bar{z}$ will make a copy of quality $\bar{z}$ when she makes a copy since $c^c < t$. The consumer will purchase the original instead of copying if $t\bar{z} - p \geqslant (t - c^c)\bar{z}$, and the producer maximizes the profit of $(p - c)(1 - p/c^c)$. The outcome is

$$(p_C, q_C, \pi_C) = \left(\frac{c^c + c}{2}, \frac{c^c - c}{2c^c}, \frac{(c^c - c)^2}{4c^c} \right).$$

2.2. Fair use

In MA, the fair use is formally captured as the upper bound, z_F, on allowable copying. That is, consumers can legally make copies of any quality $z \leqslant z_F$, but it is an infringement to make a copy of quality higher than z_F. Let the bound be given and the enforcement of copyright is perfect.[4] For a consumer type $\bar{z} \in [0, z_F]$, the net benefit from purchasing the original is $t\bar{z} - p$. She will make a copy of quality $\bar{z}$ when she makes a copy; thus the net benefit from a copy is $(t - c^c)\bar{z}$. Hence, a consumer type $\bar{z} \in [0, z_F]$ will purchase the original if and only if $p \leqslant c^c\bar{z}$. As for a consumer type $\bar{z} \in [z_F, 1]$, the net benefit from purchasing the original is $t\bar{z} - p$. On the other hand, she will make a copy of quality z_F when she chooses to; thus the net benefit from a copy is $(t - c^c)z_F$. Hence, she will purchase the original if and only if $t\bar{z} - p \geqslant (t - c^c)z_F$, i.e., $p \leqslant t(\bar{z} - z_F) + c^c z_F$. We emphasize

[3] We reproduce the model as well as notations as closely as possible. Hence, this section on the model setup does not contain any new results. Matters become different in the beginning of the next section.

[4] The enforcement of copyright, such as detecting and punishing infringement, is far from perfect in reality. Many recent papers, including Yoon (2002), study the optimal level of copyright protection that relates to this aspect.

that the fair use bound z_F affects the behavior of consumer types $\bar{z} \in [z_F, 1]$ since it gives the option of self-producing a copy of quality z_F even though the quality is lower than the optimal level for them. It therefore constrains the producer's monopoly power, as the demand function below shows.

Fig. 1 explains this relationship graphically. The horizontal axis represents the consumer types and the vertical axis represents price as well as benefits.

The linear function $p = c^c\bar{z}$ for $\bar{z} \in [0, z_F]$ and the linear function $p = t(\bar{z} - z_F) + c^c z_F$ for $\bar{z} \in [z_F, 1]$ determine the cut-off consumer type. For a price below $c^c z_F$, say p', consumers with $\bar{z} \geqslant p'/c^c$ will purchase the original while others make copies. For a price above $c^c z_F$, say p, consumers with $\bar{z} \geqslant \frac{p+(t-c^c)z_F}{t}$ purchase the original while others make copies. Note that a consumer type $\bar{z} \in [0, z_F]$ makes a copy of quality $\bar{z}$, while a consumer type $\bar{z} \in [z_F, \frac{p+(t-c^c)z_F}{t}]$ makes a copy of quality z_F.

The demand function for the original can be easily derived from Fig. 1 by reading the horizontal axis from 1 to the left. It is

$$D(p) = \begin{cases} 1 - \frac{p}{c^c} & \text{when } p < c^c z_F, \\ 1 - \frac{p+(t-c^c)z_F}{t} & \text{otherwise.} \end{cases}$$

It is worth emphasizing that, when $z_F > 0$, the producer competes with legitimate fair use copying even for the consumer type $\bar{z} = 1$ as the demand function shows. In other words, the maximum willingness to pay for every consumer moves downward since she has an option of making a legitimate copy of quality z_F. Letting $P(q)$ be the inverse demand function, the marginal revenue function $MR(q) \equiv \mathrm{d}[P(q) \cdot q]/\mathrm{d}q$ is given by

$$MR(q) = \begin{cases} t(1-2q) - (t-c^c)z_F & \text{when } q \leqslant 1 - z_F, \\ c^c(1-2q) & \text{otherwise.} \end{cases}$$

Fig. 2 shows the marginal revenue curve. Since $c^c(2z_F - 1) - [(t+c^c)z_F - t] = (t - c^c)(1 - z_F) \geqslant 0$, the curve $c^c(1 - 2q)$ lies above the curve $t(1 - 2q) - (t - c^c)\, z_F$ at $q = 1 - z_F$. Note that the case when $z_F = 0$ corresponds to the situation when only the original is available; while the case when $z_F = 1$ corresponds to the situation when copying is both feasible and legal. Note also that, since the marginal cost c is non-negative, if $z_F \leqslant 1/2$ then only the curve $t(1 - 2q) - (t - c^c)z_F$ is relevant for the producer's decision.

We analyze the producer's optimal choice by dividing the cases. Consider first the case when $z_F < \frac{c^c+c}{2c^c}$. This occurs when $c > c^c(2z_F - 1)$. Hence, from the first-order condition $t(1 - 2q) - (t - c^c)z_F = c$, we get

$$(p_{\mathrm{I}}, q_{\mathrm{I}}, \pi_{\mathrm{I}}) = \left(\frac{t + c - (t - c^c)z_F}{2}, \frac{t - c - (t - c^c)z_F}{2t}, \frac{(t - c - (t - c^c)z_F)^2}{4t} \right).$$

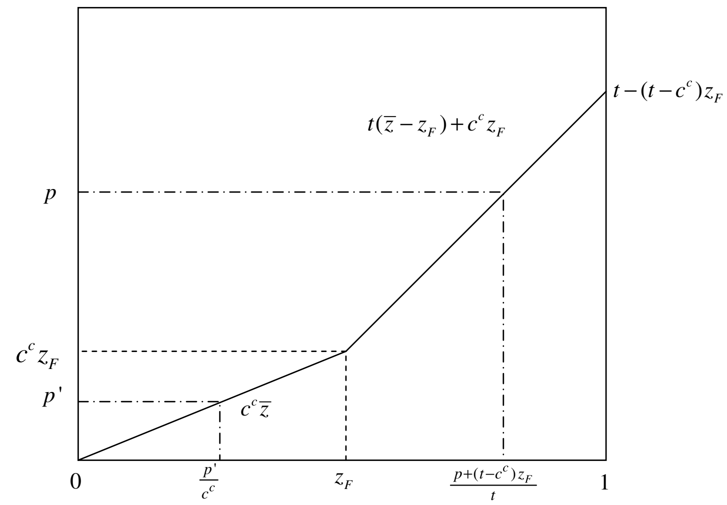

Fig. 1. Consumer choice.

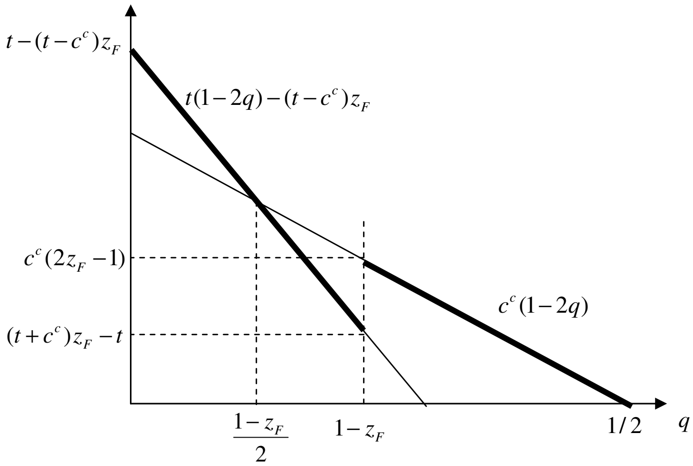

Fig. 2. The marginal revenue curve.

Next, consider the case when $\frac{c^c+c}{2c^c} \leqslant z_F \leqslant \frac{t+c}{t+c^c}$. This occurs when the marginal cost c lies between $c^c(2z_F-1)$ and $(t+c^c)z_F-t$. In this case, the marginal cost curve meets the marginal revenue curve at two points. Therefore, the producer needs to compare two quantities. The first quantity is $q_{\mathrm{I}} = \frac{t-c-(t-c^c)z_F}{2t}$ as before. The second quantity is $q_{\mathrm{II}} = \frac{c^c-c}{2c^c}$ which is derived from the first-order condition $c^c(1-2q) = c$. The optimal decision when the marginal revenue is $c^c(1-2q)$ is in fact

$$(p_{\mathrm{II}}, q_{\mathrm{II}}, \pi_{\mathrm{II}}) = \left(\frac{c^c+c}{2}, \frac{c^c-c}{2c^c}, \frac{(c^c-c)^2}{4c^c}\right).$$

Observe that this outcome is equal to (p_C, q_C, π_C). The producer will choose q_{I} if and only if $\pi_{\mathrm{I}} \geqslant \pi_{\mathrm{II}}$. Since π_{I} is decreasing in z_F while π_{II} is independent of z_F, and $\pi_{\mathrm{I}} > \pi_{\mathrm{II}}$ at $z_F = \frac{c^c+c}{2c^c}$ and $\pi_{\mathrm{I}} < \pi_{\mathrm{II}}$ at $z_F = \frac{t+c}{t+c^c}$, there is a cut-off value z_F^0 strictly between $\frac{c^c+c}{2c^c}$ and $\frac{t+c}{t+c^c}$ so that the producer chooses q_{I} when $z_F \leqslant z_F^0$ and q_{II} when $z_F > z_F^0$.[5] Finally, consider the case when $z_F > \frac{t+c}{t+c^c}$. It is clear that the producer's optimal choice is $(p_{\mathrm{II}}, q_{\mathrm{II}}, \pi_{\mathrm{II}})$.

Summarizing the discussion, we get two regimes:

In Regime 1 when $0 \leqslant z_F \leqslant z_F^0$, the producer's choice is

$$(p_{\mathrm{I}}, q_{\mathrm{I}}, \pi_{\mathrm{I}}) = \left(\frac{t+c-(t-c^c)z_F}{2}, \frac{t-c-(t-c^c)z_F}{2t}, \frac{(t-c-(t-c^c)z_F)^2}{4t}\right).$$

In Regime 2 when $z_F^0 < z_F \leqslant 1$, the producer's choice is

$$(p_{\mathrm{II}}, q_{\mathrm{II}}, \pi_{\mathrm{II}}) = \left(\frac{c^c+c}{2}, \frac{c^c-c}{2c^c}, \frac{(c^c-c)^2}{4c^c}\right).$$

In Regime 1, the mass $1-q_{\mathrm{I}} = \frac{t+c+(t-c^c)z_F}{2t}$ is the number of copiers of quality z_F or lower. Since $1-q_{\mathrm{I}}-z_F = \frac{t+c-(t+c^c)z_F}{2t} > \frac{t+c-(t+c)}{2t} \geqslant 0$ for $z_F \leqslant z_F^0 < \frac{t+c}{t+c^c}$, we know that the number of copiers exceeds z_F. The consumer type $\bar{z} \in [0, z_F)$ makes a copy of quality $\bar{z}$, and the consumer type $\bar{z} \in [z_F, 1-q_{\mathrm{I}})$ makes a copy of quality z_F. In Regime 2, on the other hand, the number $1-q_{\mathrm{II}} = \frac{c^c+c}{2c^c}$ of copiers is less than z_F.

The analysis in this section is completely different from that in MA, except for the definition of the fair use standard z_F. In particular, we derived the equilibrium outcome as explicitly considering consumers' optimal

[5] By equating $\pi_{\mathrm{I}} = \pi_{\mathrm{II}}$, we actually get $z_F^0 = (\sqrt{tc^c}+c)/(\sqrt{tc^c}+c^c)$.

responses. MA, on the other hand, fail to recognize the fact that the monopolist has to cope with the marginal consumers' incentive to make allowable copies.[6]

2.3. Welfare analysis

As shown in MA, the socially optimal level of fair use is $z^* = c/c^c$. This is so because the original is produced at the quality of $z = 1$ with a cost of c. Hence, it is socially efficient for consumers with low $\bar{z}$ to self-produce a copy of quality $\bar{z}$ with the cost of $c^c\bar{z}$. We get the socially optimal level by equating $c = c^c\bar{z}$. In other words, the social cost of production is minimized when consumers with $\bar{z} \leqslant c/c^c$ self-produce with the cost of $c^c\bar{z}$ while consumers with $\bar{z} \geqslant c/c^c$ purchase the original that is produced with a cost of c. The social welfare at the first-best outcome is

$$W^* = \int_0^{z*} (t - c^c)\bar{z}\mathrm{d}\bar{z} + \int_{z*}^1 (t\bar{z} - c)\mathrm{d}\bar{z} = \frac{tc^c + c^2 - 2c^c c}{2c^c}.$$

The monopoly power of the producer prevents this first-best outcome. Taking the optimal choices of the consumers and the producer, we have the following. The social welfare for Regime 1 is given by

$$W_{\mathrm{I}} = \int_0^{z_F} (t - c^c)\bar{z}\mathrm{d}\bar{z} + \int_{z_F}^{1-q_{\mathrm{I}}} (t - c^c)z_F\mathrm{d}\bar{z} + \int_{1-q_{\mathrm{I}}}^1 (t\bar{z} - c)\mathrm{d}\bar{z}$$

and the social welfare for Regime 2 is given by

$$W_{\mathrm{II}} = \int_0^{1-q_{\mathrm{II}}} (t - c^c)\bar{z}\mathrm{d}\bar{z} + \int_{1-q_{\mathrm{II}}}^1 (t\bar{z} - c)\mathrm{d}\bar{z} = \frac{4tc^c + 3c^2 - 6c^c c - (c^c)^2}{8c^c}.$$

Consider Regime 2 first. Since $z^* = \frac{c}{c^c} < \frac{c^c+c}{2c^c} = 1 - q_{\mathrm{II}}$, strictly more than the efficient number of consumers make copies in Regime 2. This is because of the monopoly pricing. We have $W_{\mathrm{II}} < W^*$. We also observe that W_{II} is independent of z_F.

As for Regime 1, we have

$$\frac{\partial W_{\mathrm{I}}}{\partial z_F} = \frac{(t - c^c)[t + 3c - (t + 3c^c)z_F]}{4t}.$$

Therefore, W_{I} is maximized at $z_F = \frac{t+3c}{t+3c^c}$. Note, however, that this maximum can be achieved only when $\frac{t+3c}{t+3c^c} < \frac{\sqrt{tc^c}+c}{\sqrt{tc^c}+c^c} \equiv z_F^0$. Otherwise, the level of fair use should be set at z_F^0. In summary, the optimal level of fair use under Regime 1 is $\min\left\{\frac{t+3c}{t+3c^c}, \frac{\sqrt{tc^c}+c}{\sqrt{tc^c}+c^c}\right\}$. To determine the second-best level of fair use that takes monopoly behavior under consideration, we need to compare W_{I} and W_{II}. If $\frac{t+3c}{t+3c^c} < z_F^0$, then the second-best W_{I} is achieved at $\frac{t+3c}{t+3c^c}$ and

$$W_{\mathrm{II}} - W_{\mathrm{I}} = \frac{3(t - c^c)(c^c - c)^2}{8c^c(t + 3c^c)} > 0.$$

If $\frac{t+3c}{t+3c^c} \geqslant z_F^0$, then the second-best W_{I} is achieved at z_F^0 and

$$W_{\mathrm{II}} - W_{\mathrm{I}} = \frac{(t - c^c)(c^c - c)^2}{2(\sqrt{tc^c} + c^c)^2} > 0.$$

[6] MA claim that, for $z_F \leqslant z_M$, the monopolist's optimal price is $p_M = (t + c)/2$ and consumer types in $[z_M, 1]$ still purchase from the monopolist. This is not true. Consider the consumer type $z_M = (t + c)/2t$. The net benefit when she purchases the original is $tz_M - p_M = t \cdot (t + c)/2t - (t + c)/2 = 0$, while that when she makes a copy of quality z_F is $tz_F - c^c z_F > 0$ for $z_F > 0$. Therefore, this consumer chooses to make an allowable copy of quality z_F instead of purchasing. Since the last inequality is strict, some consumer types above z_M, i.e., consumer types $z_M + \varepsilon$ for small ε's also choose to make copies of quality z_F. Hence, the profit is not as supposed in MA. The monopolist's optimal pricing decision has to take this effect into account, which is what we have done in this section. MA's analysis for the case when $z_F > z_M$ also contains the same flawed reasoning.

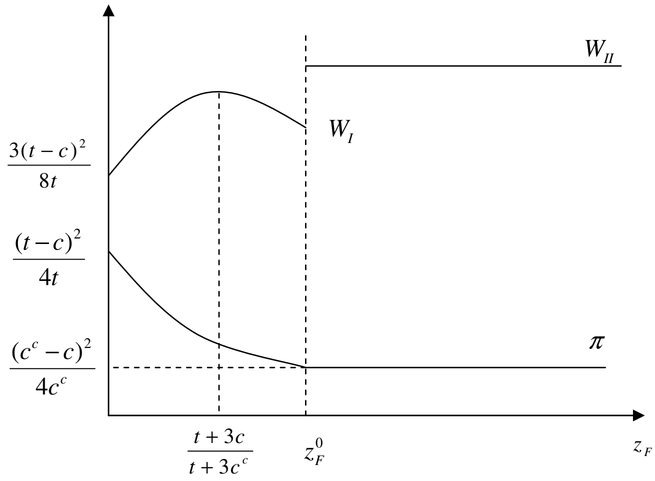

Fig. 3. The profit and the social welfare.

Therefore, the second-best outcome occurs under Regime 2. Since W_{II} is independent of z_F, the exact level of fair use is immaterial as long as it is higher than z_F^0. Since $z_F^0 = \frac{\sqrt{tc^c}+c}{\sqrt{tc^c}+c^c} > \frac{c}{c^c} = z^*$, the second-best level of fair use exceeds the first-best level of fair use. The reason is that the society needs to allow more extensive copying to counteract the monopoly behavior of the producer.

The discussion on social welfare up to this point did not consider the incentive to develop the original. To complete the picture, let us take this dynamic perspective. The original work may not be produced if the fair use standard is so permissive that the resulting profit cannot cover the fixed cost of development. What is the optimal level of fair use in this case? First, if the development cost K is such that $K \leqslant \pi_{\mathrm{II}} = \frac{(c^c-c)^2}{4c^c}$, then the conclusion above still holds: Any level above z_F^0 is optimal for social welfare. Next, if $\frac{(c^c-c)^2}{4c^c} < K \leqslant \frac{(t-c)^2}{4t}$, then we need to consider two cases.[7] The first case is when $\frac{t+3c}{t+3c^c} < z_F^0$ holds. Fig. 3 depicts this situation.

The profit and the social welfare as functions of the fair use standard are shown in Fig. 3. The profit is decreasing under Regime 1 and constant under Regime 2. The social welfare achieves the maximum of Regime 1 at $\frac{t+3c}{t+3c^c}$. However, this is lower than the social welfare under Regime 2 as previously shown. Note that the jump in social welfare occurs since the producer's quantity jumps from q_{I} to q_{II} at z_F^0.

Define z_F^D as the level of fair use when the resulting profit just covers the development cost. That is, z_F^D is the value that satisfies

$$\frac{(t-c-(t-c^c)z_F^D)^2}{4t} = K.$$

If $\frac{t+3c}{t+3c^c} < z_F^D < z_F^0$, then the optimal level of fair use is $\frac{t+3c}{t+3c^c}$. Observe $z^* < \frac{t+3c}{t+3c^c}$ so the second-best level of fair use still exceeds the first-best level. Otherwise, i.e., if $z_F^D \leqslant \frac{t+3c}{t+3c^c}$, then the optimal level is z_F^D.

The second case is when $\frac{t+3c}{t+3c^c} \geqslant z_F^0$. This case is easier since the social welfare under Regime 1 is strictly increasing over the range $[0, z_F^0]$ and W_{I} at z_F^0 is lower than W_{II}. Therefore, a figure similar to Fig. 3 clearly shows that the optimal level of fair use is z_F^D.

The upshot of this analysis is that, unless the development cost is so high that this is the overwhelming constraint, the second-best level of fair use is higher than the first-best level. The reason is that the fair use standard is used to counteract the monopoly power of the producer. In particular, when the development cost is lower than $\pi_{\mathrm{II}} = \pi_C$, it is optimal to allow extensive copying, i.e., to set the level above z_F^0, to induce the outcome of Regime 2.

Let us lastly see how the optimal fair use standard changes as the marginal copying cost c^c decreases. Fig. 4 depicts a typical behavior.[8]

[7] The case when $\pi_M = (t-c)^2/4t < K$ is ruled out since the good will not be produced even under the strongest protection of copyright if this inequality holds.

[8] This figure corresponds to Fig. 5 in MA.

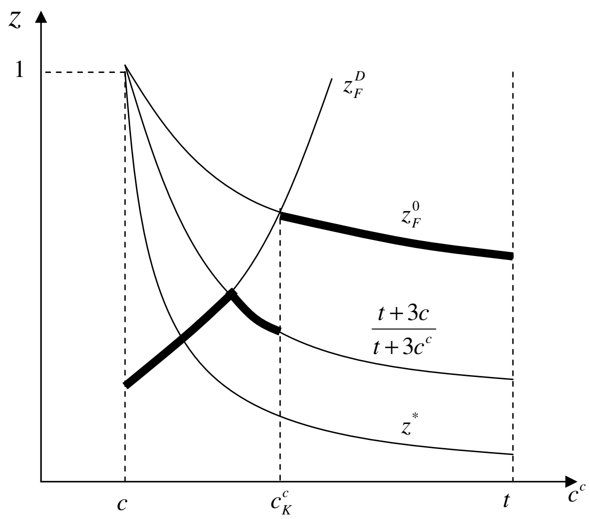

Fig. 4. The optimal fair use standard as a function of c^c.

In the graph, z_F^0, $(t+3c)/(t+3c^c)$, z^* as well as z_F^D are shown as functions of c^c for the case when $\frac{t+3c}{t+3c^c} < z_F^0$ holds.[9] When c^c is high enough so that $K \leqslant \pi_{II}$ is satisfied, which occurs for $c^c \geqslant c_K^c$, the optimal level is z_F^0. When c^c becomes lower so that $\frac{t+3c}{t+3c^c} < z_F^D < z_F^0$ holds, the optimal level is $\frac{t+3c}{t+3c^c}$. When c^c is further lowered so that $z_F^D \leqslant \frac{t+3c}{t+3c^c}$ holds, the optimal level is z_F^D. Note that this is yet another representation of what we have just discussed. To restate, the second-best level of fair use is always higher than the first-best level unless the development cost is binding. Moreover, the former is different from the latter even when the development cost is binding.

The results in this subsection are quite different from those in MA. In particular, while MA assert that the first-best outcome can sometimes be achieved, we correct their analysis and show that this is not true. On the other hand, our result is consistent with that in MA's work in that the second-best level is lower than the first-best level when the dynamic incentive of development becomes binding. In this regard, our results largely support MA's interpretations of the court decisions[10] that the consideration of static social welfare is important so far as technological advances do not endanger the incentives to create the original.

3. Discussion

The current characterization of the optimal fair use standard differs from that in MA. In particular, the standard is high enough to induce the copying outcome (Regime 2). Moreover, it is always higher than the first-best level of fair use unless the dynamic incentive is binding.

We want to mention that this result is obtained in the particular model of MA; hence, the insight may not be generally applicable to the issue of fair use. Landes and Posner (2003) classify fair use into three cases. The first is "the high transaction cost, no harm case." In cases when the transaction costs of a voluntary exchange are so high relative to the potential benefits that no exchange is feasible between the users and the owner of a copyrighted work, the fair use privilege confers a clear benefit to users but does not harm the owner. The second is "the negative harm, implied consent case." This includes the case of reviews of a copyrighted work, and it may benefit the producer by increasing the demand for the original. The third case is "the positive harm, productive use case." This is the case when copying does harm the producer, but it is beneficial for the society as a whole. In terms of this classification, we would say that the MA model mainly focuses on the third case. Further works that may explain other cases, especially those that incorporate the first-case elements, may produce different implications for the social welfare.

[9] It is straightforward to draw a similar graph for the case when $(t+3c)/(t+3c^c) \geqslant z_F^0$ holds.

[10] MA discuss several court rulings including *Williams & Wilkins Co. v. United States*, *Sony Corp. v. Universal City Studios*, and *A&M Records, Inc. v. Napster, Inc.*

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