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Economics of Creative Commons

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Economics of Creative Commons*

Abstract

Creative Commons (CC) licensing facilitates free distribution of copyright works. An Author can CC license some or all of his output to increase consumer awareness and thus his revenue from performances. The Publisher receives only a share of the revenue of the remaining copyright work. We analyse the Author's actions and the bargaining between Author and Publisher. The Publisher voluntarily gives in in the bargaining. Either the optimal share to the Author is such that the level of CC licensing maximizes the Publisher's profit. Or even higher so that the Author is deterred from CC licensing. We also discuss a joint decision on CC and welfare issues.

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Introduction

The Creative Commons (CC) (Creative Commons 2010) community offers an increasingly popular menu of licenses for copyrightable works. We present an economic analysis of the consequences of such licensing options to negotiations between Authors of works and Publishers who market and distribute the works. There exists scant previous work on the economics of CC, so we compare our results mainly to the literature on piracy and copying of works. CC licensing retains the connection between the Author and his work. The outcome is different from free distribution, shareware or piracy (Ramello 2004, Hietanen 2008). The Author chooses attributes to his license in a way he finds optimal. Such licensing is considered to be helpful in getting new unknown artistic output to market (Lessig 2003). Like Open Source programming, the Creative Commons licensing has its roots in ideological movements. However it is a new instrument in the market for copyright works. It retains some of the Author's rights but gives out the Publisher's rights. With mere copyright there was no separation of benefits of Author and Publisher.

We ask: When does the Author find it profitable to utilize a CC license for a portion of his work and what share does he CC license? How does the introduction of the CC licensing affect the negotiations between the Author and Publisher over the sharing of the profit from the copyright work? Does the introduction of the option to utilize CC licensing affect welfare? We consider a set-up where an Author creates a work, the Publisher distributes it and oversees the copyright. Consumers in turn decide whether to buy the work. Both the Author and Publisher receive revenue from the sales of the work under copyright. Importantly, the Author receives additional revenue from eg. live performances. Our key assumption is that the level of that revenue depends on the number of consumers that are aware of the Author's works (have for example heard recordings etc.). From an economics point of view, the CC licenses seem interesting since they allow the Author to decide over the level of protection over portions of his works.

The Author may CC license a portion of his work and this may increase the number of consumers acquiring his work. The trade-off is that this portion cannot be sold through the Publisher as copyright work. Should the preferences of the Author and Publisher differ, it is the Author that determines the level of protection by CC licensing.

We find that given the value of publicity and the distribution cost we find the optimal level of CC licensing. It is increasing in value of publicity, cost and decreasing in the share of copyright revenue to author. Without CC licenses, bargaining is straightforward. Author and Publisher gain monotonically in shares of the copyright revenue. If CC licenses are available, the negotiation setup changes. To the Author the bargaining remains similar. But to the Publisher, there is a dramatic change. He voluntarily concedes a share of the revenue to the Author. Either the Author's share is such that the Author CC licenses a portion of his work and the Publisher, taking into account this, is willing to set the Author's share optimally to maximize his profit from the copyright work. Or, if the profit from deterring the Author from CC licensing is higher, the Publisher gives the Author a share that makes it optimal for the author not to CC license at all. The author may prefer CC licensing, for the publisher it is not desirable. The effect of CC licensing to bargaining does not have effect to an Author that is strong in bargaining, since his share is always larger than any of the concession points described. The CC licensing improves the position of weak Authors. If the Author and Publisher can agree on sharing the Author's outside revenue too, they will do that. Given a bargaining outcome it is always possible to increase profits to both parties by setting another sharing rule that includes the outside revenue and optimizing the portion of work to be CC licensed. CC licensing may or may not increase welfare. The CC licensed portion of the work increases welfare. Some consumers that would not buy the copyright work, acquire the CC licensed work. Also the profit from a larger audience increases welfare. However, the surplus to the consumers with high willingness to pay decreases as the copyright work is now of lesser value.

The Creative Commons licensing (Creative Commons 2010) was first established in 2001. As a starting point, the founders used licensing agreements that are related to open

source software, for example Gnu GPL, General Public License. The CC licenses offer a menu of choices to the author. He can select a combination of Attribution, Share Alike, Noncommercial and No Derivative Works. Attribution means that you “let others copy, distribute, display, and perform your copyrighted work --- and derivative works based upon it --- but only if they give credit the way you request”. With Share Alike in turn “You allow others to distribute derivative works only under a license identical to the license that governs your work”. Noncommercial stipulates that “You let others copy, distribute, display, and perform your work --- and derivative works based upon it --- but for noncommercial purposes only”. And No Derivative Works in turn means that “You let others copy, distribute, display, and perform only verbatim copies of your work, not derivative works based upon it.” These items can be combined to best suit the authors needs for the protection and dissemination of the work, For example, “Attribution Non-Commercial No Derivatives”. In the following analysis we do not distinguish between the combinations. It is sufficient to not that the licenses offer suitable combinations for a variety of unique works. For us the key property is that the cost to consumers of the licensed work cannot contain a rent from property rights. The Creative Commons movement has its background in mostly ideological aspirations. Lessig (2003) described the ways in which the standard copyright combined with present technologies, seemed to provide too much protection for works. According to the CC (creativecommons.org) website, more than 130 million works are already licensed using these agreements. There are large undertakings, such as, influential blogs, for example John Quiggin’s (Quiggin 2010), and also commercial works, for example the financial tabloid Taloussanomat (Taloussanomat 2010). The license agreements are presently ported (translated and formatted to local legislation) to some 50 jurisdictions.

The contractual relationships between Authors and Publishers were described by Caves (2003). He asserts the bilateral nature of such contracts and also that the contracts are signed well before actual sales. Towse (2006) further pointed out the weak position of the Authors in bargaining and the Authors rights to decide over their work even after contracting. Krueger (2005) and Connolly and Krueger (2006) have researched performance revenues of artists. They found that performance revenue is significant and

that it has grown faster than revenue from copyright works. Our approach has similarities with economic literature of piracy, illegal copying of works (for a survey, see Peitz and Waelbroek 2003). The CC licensed share of work has also a zero price and can be distributed freely. In piracy, the copier faces a cost of getting caught and Authors and possible Publishers lose revenue. With CC licensing the cost is lost revenue. The benefits of piracy accrue to the consumers (copiers) and, as in some models (Takayama 1994, 1997), also to copyright holders, if there are network effects. In the case of CC licensing, the Author and consumers benefit. The Author receives higher performance revenues and poor consumers can acquire a share of the work for free. Gayer and Shy (2006) considered piracy in a setting where an Author and a Publisher share the revenue from copyright works but where the Author receives all revenue from performances. They found that the Author may accept illegal copying since it enlarges the potential audience for performances. Our approach builds on this analysis. We, however, model the Author's decision to optimal CC licensing and consider the consequences of such decisions to the bargaining between parties. CC licensing and sampling have similarities. Peitz and Waelbroek (2006) considered a scenario where a monopolist may allow partial free downloading ("sampling") of works. The idea is that this increases the precision of consumers' demand and thus benefits the monopolist.

In the following we analyze the optimal CC decision of the Author and given that, the bargaining between the Author and Publisher. Joint decisions over CC and welfare issues are discussed.

The model

We present a model to analyze how the introduction of CC licensing affects the relations between the Publisher and Author of a work under copyright. The Publisher receives a share of $1-s$ and The Author a share of s of the profits from the sales of the Author's copyright output. The Publisher's objective is profit maximization from the sales of work

under copyright. The Author's objective is to maximize profits from two sources. First, he receives a share of the copyright revenue and second, key to our model, he receives outside revenue from public appearances (see gayer shy concerts...). There is a market for the copyright work. The potential consumers are heterogeneous in their willingness to pay for the work. They are indexed on real line by $x \in [0,1]$ according to a linearly declining willingness to pay. Willingness to pay for the good is on the interval $[0,1]$. We assume that there exists a unit cost $c > 0$ for distributing the work. Let N to be the total number of consumers that are aware of the Author through buying or acquiring his work. We model the outside revenue to depend on the awareness linearly, $\pi_o = \delta N$.

The timing in our model is the following. At stage 1, the Publisher and Author bargain over the revenue from the sales of the copyright output of the Author. At stage 2, if the CC licenses are available, the Author decides whether to and what share k^* of his work to license under the CC license. At stage 3, the remaining $1 - k^*$ copyright work is sold to consumers and if available, the consumers may acquire the output that is CC licensed. Consumers that are aware of the Author may attend occasions where he performs. Copyright revenues accrue to the Publisher and Author according to the bargaining outcome and the Author receives the outside revenue.

3rd stage: selling the goods

We solve the model by backward induction. Let us first assume that CC licensing is available and the Author CC licenses a share of his work, $k > 0$. At the third stage, the price p of the remaining copyright work $1 - k$, the price of the CC licensed work, $p_{cc} = c$ and the share of CC licensed output k are given. Consumers with a high willingness to pay buy the copyrighted work instead of acquiring the CC work. Consumers for whom the value of the CC licensed work exceeds the distribution cost c

acquire the CC work. Consumers whose valuation of the CC work is less than the distribution cost c acquire nothing. The utility of consumer indexed x is accordingly¹:

$$U_x = \begin{cases} (1-k)(1-x) - p - c \\ k(1-x) - c \\ 0 \end{cases}$$

We assume that the ratio of each consumer's valuations for the copyright work and the work that is CC licensed is constant $(1-k)/k$. The idea is that the consumers' valuation is linear in the volume of the work. The Author's total output is homogeneous and he offers some of it for free. Consumer j is indifferent between acquiring the CC licensed work and acquiring nothing. He in turn determines the total number of consumers that acquire any work from the author and are thus aware of his existence,

$k(1-j) - c = 0$ implying $j = N_{cc} = \frac{k-c}{k}$. Consumer i is indifferent between buying the

Copyright work for a given price p and acquiring the CC licensed work for a distribution cost c , $(1-k)(1-i) - p - c = k(1-i) - c$, implying $p = (1-2k)(1-x)$. The optimal sales

x^* is found through profit maximization given the share k . Maximization of profits,

$\max \pi_{cc} = [(1-2k)(1-i) - 2c]i$, yields $i^* = \frac{1}{2}$, $p^* = \frac{(1-2k)}{2}$. The profits from the

copyright work are $\pi_{cc} = \frac{1-2k}{4}$.

If the CC license is not available to the Author, we assume that he will not release any share of his work free. We motivate this assumption is that without the license contract

¹ We assume that the CC licensed work is not included in the distribution media of the copyright work. Furthermore, we assume that a consumer either acquires the CC licensed share or buys the remaining copyright work. An alternative specification is that also those consumers that buy the copyright work acquire the CC licensed share of work. See appendix.

² The same expression of profits obtains when consumers must exert an effort with cost c to acquire either good.

anyone can present the work as his own and the Author cannot benefit from increased awareness. This analysis covers also the situation where the CC license is available but the Author decides not to release any material under the CC license, ie. $k=0$. The utility of consumer indexed x when buying or not is:

$$U_x = \begin{cases} 1-x-p-c \\ 0 \end{cases}$$

Let consumer x to be indifferent between buying the Copyright work and acquiring nothing. Consumer x determines the quantity of copyright work sales given the price p and the total number of consumers that acquire any work from the author.

$\max \pi_{cr} = (1-x-c)x$, yielding $x^* = \frac{1-c}{2}$. Thus copyright profits are $\pi_{cr} = \frac{(1-c)^2}{4}$ and

the number of consumers aware of the Author is $x^* = N_{cr} = \frac{1-c}{2}$.

Besides the revenue from output the author receives revenue from other sources. This revenue depends on publicity based on the awareness of the consumers. We model it to depend linearly on the number of consumers that acquire any of the work. Let the marginal revenue of this income be δ . The author's revenue from other sources is

$$\pi_o = \delta N$$

The author's and Publisher's total revenues with CC licensing

$$\pi_{Acc}(s, c, k) = \pi_o + s\pi_{cc} = \delta \frac{k-c}{k} + s \frac{1-2k}{4} \quad (1a)$$

$$\pi_{Pcc}(s, k) = (1-s)\pi_{cc} = (1-s) \frac{1-2k}{4} \quad (1b)$$

And in the case of no CC licensing

$$\pi_{Acc}(s, c) = \pi_o + s\pi_{cr} = \delta \frac{1-c}{2} + s \frac{(1-c)^2}{4} \quad (2a)$$

$$\pi_{Pcr}(s, c) = (1-s)\pi_{cr} = (1-s)\frac{(1-c)^2}{4} \quad (2b)$$

2nd stage: The choice of utilizing the CC license

Let us consider the Author's optimal choice of the share of his output that he CC licenses, k^* . Given Author's share s , the outcome of the bargaining over the copyright profits, the Author faces a trade-off in (1a). A large k increases awareness but decreases copyright profits. The author's profit maximization of (1a) yields the following FOC:

$$\frac{d\pi_{Acc}}{dk} = \frac{\delta c}{k^2} - \frac{s}{2} = 0^3$$

Thus the optimal CC license share is $k^* = \min \left\{ \frac{1}{2}, \sqrt{\frac{2\delta c}{s}} \right\}$.

RESULT 1: The optimal share of work to CC license is increasing in the value of publicity, δ and in distribution cost c but decreasing in the Author's share of the copyright revenue, s .

If the Author's profit is greater under CC licensing than without it, given the result of the bargaining s , $\pi_{Acc}(s, k^*(s)) > \pi_{Acr}(s)$, the author CC licenses k^* portion of his work.

The condition for this is $\delta \frac{k^* - c}{k^*} + s \frac{(1-2k^*)}{4} > \delta \frac{1-c}{2} + s \frac{(1-c)^2}{4}$, yielding

³ SOC: $\frac{-2\delta c}{k^3} < 0$

$s < s_{cr}(c, \delta) = \delta \frac{k^*(2+2c)-4c}{k^*(c^2-2c+2k^*)}$. If $s \geq s_{cr}$, the Author finds it more profitable to

copyright all his output and thus set $k^* = 0$, even if CC is available.

If the Author does not CC license ($k^* = 0$), the copyright work has a quantity of $\frac{1-c}{2}$.

For the CC licensing to increase awareness, we require that $\frac{k^*-c}{k^*} > \frac{1-c}{2}$, implying

$k^* > \frac{2}{1+c}c$. So if $s < s_1 = \frac{\delta}{c}(1+c)^2$, some consumers beside the buyers of the copyright

work acquire the CC licensed work. If this does not hold, it is more profitable for the Author not to CC license, since it does not increase N and lowers revenue from sales.

From the condition $k^* \leq \frac{1}{2}$ we find that if $s < s_k = 8\delta c$, it is optimal for the Author to CC

license the whole work, $k^* = 1$, and receive revenue only from sources based on awareness. Note that for $k^* = 1$, the Author's profit is $\pi_{Acc} = (1-c)\delta$.

Thus, given s , low value of performance δ relative to cost c implies that the optimal CC licensing cannot increase the number of consumers aware of the Author. In contrast, a large δ implies that it is optimal to rely only on revenue that is based on awareness. For a small distribution cost, c , a small share of CC licensing is optimal.

1st stage: contract negotiation

At the first stage the Publisher and the Author bargain over the division of the profits from the copyright work. If the CC license is not available, the analysis is straightforward. The Author's profit is monotonically increasing in s and the Publisher's profit decreases monotonically in s . It is in the Publisher's interest to give as low a share of the profits to the Author, s , as possible. If CC licensing is available, three outcomes

are possible. If $s < s_k$, the Author CC licenses all of his output and receives a profit of $\delta(1-c)$. If $s_k \leq s \leq s_{cr}$, the Author CC licenses the share k^* of his output. If $s > s_{cr}$, the Author abstains from CC licensing. These thresholds change the Publisher's incentives in the bargaining compared to no CC licensing.

Either through bargaining or by the Publisher's choice, we may have $s < s_{cr}$, and the author CC licenses his output. The Publisher's optimal bargaining outcome is s^* , which maximizes the Publisher's profit under CC licensing.

$$\max \pi_{Pcc} = (1-s) \frac{1 - \sqrt{\frac{2\delta c}{s}}}{4}$$

The first order condition reads $\frac{1}{8}\sqrt{2\delta c}s^{-\frac{3}{2}} - \frac{1}{4} + \frac{1}{8}\sqrt{2\delta c}s^{-\frac{1}{2}} = 0$ ⁴. Solving the maximization problem yields $s^*(\delta, c)$, which is the solution to $s^{\frac{3}{2}} + s^{\frac{1}{2}} = \frac{4}{\sqrt{2\delta c}}$.

Previously we found that by allowing the Author a share $s \geq s_{cr}$, the Publisher deters the CC licensing, since now it is profitable for the Author not to CC license. The Publisher's profit is decreasing in s when there is no CC licensing. His profit is maximized for $s = s_{cr}$, as CC is just deterred. The publisher concedes either to $s_{cr}(c, \delta)$ or to $s^*(c, \delta)$, whichever provides larger profit. In both cases they are the 'threat points' of the Publisher. We can show that $s^* < s_{cr}$ holds always. Comparative statics reveal that

$\frac{d\pi_{Pcc}}{dc} < 0$ and $\frac{d\pi_{Pcc}}{d\delta} < 0$, as can be expected. Increased costs and stronger threat from the performance revenue to the Author decrease the Publisher's profits. The optimal

⁴ SOC: $-\frac{3}{16}\sqrt{2\delta c}s^{-\frac{5}{2}} - \frac{1}{16}\sqrt{2\delta c}s^{-\frac{3}{2}} < 0$

bargaining outcome becomes worse for the Publisher as performance revenue to the Author increases, $\frac{ds^*(\delta, c)}{d\delta} > 0$ and as costs increase, $\frac{ds^*(\delta, c)}{dc} > 0$. The Publisher must compensate in bargaining for the Author's increased willingness to CC license his work.

Consider examples in figures 1, 2, 3. In Figure 1, when the value of publicity is high ($\bar{\delta} = 0,45$) it is profitable to the Publisher to allow CC licensing and target the bargaining to share $1-s^*$, in figure 2, the Publisher is indifferent between $1-s^*$ and $1-s_{cr}$ (but the Author would naturally prefer s_{cr} to s^*). In Figure 3, for a low value of publicity ($\bar{\delta} = 0,3$), the Publisher's profit is maximized when he deters CC licensing by targeting to $1-s_{cr}$ in bargaining.

Figure 1: The Publisher's profit ($\bar{\delta} = 0,45, c = 0,1$)

Figure 2: The Publisher's profit ($\delta = 0.41, c = 0.1$)

Figure 3: The Publisher's profit ($\delta = 0.3, c = 0.1$)

The Publisher is indifferent between $s_{cr}(c, \delta)$ and $s^*(c, \delta)$ when $\pi_{Pcr}(s_{cr}(c, \delta)) = \pi_{Pcc}(s^*(c, \delta))$, like in figure 2. Thus for a given marginal value of publicity, δ , we can find the critical value of distribution cost $c_{cr-cc}(\delta)$ for which the equality holds. If the distribution cost is below this value, $c \leq c_{cr-cc}(\delta)$, the Publisher accommodates CC licensing and targets in bargaining to exactly $1-s^*$ share of the revenue from the copyright output. If $c > c_{cr-cc}(\delta)$, the Publisher deters CC licensing and targets to the highest share of revenue, for which the Author does not CC license his output, $1-s_{cr}$. In Figure 4, combinations of δ and c to the left of the line lead the Publisher to allow CC licensing and target to s^* , and to the right of the line he will deter CC licensing by allowing the smallest share to the Author that accomplishes that, s_{cr} .

Figure 4: Publisher's choice of share in bargaining

For the Publisher, the set-up is quite different from the situation with no CC licensing available. His profits depend still directly from the result of bargaining, $1-s$, but also

from the indirect effect of bargaining to the level of CC licensing, $k^*(s)$, and to the choice of the Author whether to CC license or not. The Author wants as large a share as possible since his profit is always non-decreasing in the share, $\frac{d\pi_{Acc}}{ds} > 0$. The Publisher instead voluntarily gives a share of copyright profits to the Author. The limit to this voluntary capitulation is either s_{cr} or s^* .

RESULT 2: Under CC licensing the Publisher voluntarily gives a share of copyright profits to the Author. The limit to this voluntary capitulation is for low distribution cost the optimal share under CC, s^* , and for high distribution cost the share that deters CC, s_{cr} .

Based on the previous, we can ask: when does the introduction of CC licensing have an impact to the relations between the Publisher and Author? First of all, it is evident that if, given δ, c , the Author has a strong position in the bargaining in the absence of CC, $s \geq s_{cr}$, the appearance of CC licensing does not alter profit sharing. So only if potentially the share s is small, the Publisher recognizes the threat of CC license and reneges in the bargaining. The potential new audience that CC licensing can provide depends strongly on the level of the distribution cost, c . In the extreme, for $c = 0$, even CC licensing a very small share of output disseminates awareness of the Author to all consumers. The implication is that the existence of CC licensing acts as threat to the Publisher who is hurt from its use - the author loses copyright revenue but gains revenue from performances.

The Author and the Publisher contract to share all revenue

Let us compare the previous set-up where the Author determines the share k^* that he will CC license to a situation where the Author and the Publisher bargain over total revenue, both from copyright and performances. As a first step we ask: given a bargaining outcome s_A when the Author determines CC licensing, is there a contract s_{AP} over total revenue that is preferred by both parties? The level of CC licensing that maximizes total profits, $\pi_{coll} = \pi_{Acc} + \pi_{Pcc} = \delta \frac{k-c}{k} + \frac{1-2k}{4}$, is $k_{coll}^* = \min \left\{ \frac{1}{2}, \sqrt{2\delta c} \right\}$.

Under the Author's rule, CC licensing occurs when $s_A < s_{cr}$. Then contracting over total revenue is preferred if

$$\pi_{Pcc} = (1-s_A) \frac{1-2\sqrt{\frac{2\delta c}{s_A}}}{4} < \pi_{Pcoll} = (1-s_{AP}) \left(\delta \frac{\sqrt{2\delta c} - c}{\sqrt{2\delta c}} + \frac{1-2\sqrt{2\delta c}}{4} \right) \text{ and}$$

$$\pi_{Acc} = \delta \frac{\sqrt{\frac{2\delta c}{s_A}} - c}{\sqrt{\frac{2\delta c}{s_A}}} + s_A \frac{1-2\sqrt{\frac{2\delta c}{s_A}}}{4} < \pi_{Accoll} = s_{AP} \left(\delta \frac{\sqrt{2\delta c} - c}{\sqrt{2\delta c}} + \frac{1-2\sqrt{2\delta c}}{4} \right).$$

If $s_A \geq s_{cr}$, the Author does not CC license. Then the conditions for preferring contracting over total revenue read

$$\pi_{Pcr} = (1-s_A) \frac{(1-c)^2}{4} < \pi_{Pcoll} = (1-s_{AP}) \left(\delta \frac{\sqrt{2\delta c} - c}{\sqrt{2\delta c}} + \frac{1-2\sqrt{2\delta c}}{4} \right) \text{ and}$$

$$\pi_{Acr} = \delta \frac{1-c}{2} + s_A \frac{(1-c)^2}{4} < \pi_{Accoll} = s_{AP} \left(\delta \frac{\sqrt{2\delta c} - c}{\sqrt{2\delta c}} + \frac{1-2\sqrt{2\delta c}}{4} \right).$$

RESULT 3: If contracting over joint total revenue is possible, both the Author and the Publisher will do so. An Author that is weak in bargaining is more motivated to contract over total revenue.

For $s_A < s_{cr}$, if $\pi_{totcc}(s_A) = \pi_{Acc}(s_A) + \pi_{Pcc}(s_A) < \pi_{Acoll} + \pi_{Pcoll} = \pi_{coll}(k_{coll}^*)$ contracting over total revenue is profitable since there is surplus to be divided between the author and Publisher. s_{AP} can then be set in a fashion that satisfies both conditions above. We see immediately that the above condition holds always since $\pi_{coll}(k_{coll}^*)$ is the maximal profit from the market. We can ask: is collusion more likely when the Author's bargaining power is small or when it is moderate, yet so small that the Author CC decides to license ($s_A < s_{cr}$)? Differentiation yields $\frac{d(\pi_{Acc} + \pi_{Pcc})}{ds_A} = \frac{1}{2\delta} s_1^{-\frac{1}{2}} + \frac{3\delta c}{8} s_1^{-\frac{3}{2}} > 0$ and we know that joint profit $\pi_{coll}(k_{coll}^*)$ is constant in bargaining outcome. Thus contracting over total revenue is more likely if the Author is weak in bargaining.

Second, for $s_A \geq s_{cr}$, if $\pi_{Acr} + \pi_{Pcr} < \pi_{Acoll} + \pi_{Pcoll} = \pi_{coll}(k_{coll}^*)$ holds always for the same reason as above. Contracting over joint revenue is profitable regardless of the bargaining outcome and the motivation for contracting over joint revenue is independent of the bargaining outcome, s_A .

Welfare aspects

The total surplus from profits and consumer surplus (excluding possible consumer surplus from performances) is in the absence of CC licensing

$$W_{cr} = \frac{(3-c)(1-c)}{8} + \delta \frac{1-c}{2}.$$

With CC licensing total surplus reads

$$W_{cc} = \frac{3(1-k)-4c}{8} + \frac{(k-2c)^2}{4k} + \delta \frac{k-c}{k}.$$

The welfare maximizing level of CC licensing is found by setting the FOC to zero,

$$\frac{dW_{cc}}{dk} = -\frac{1}{8} - \frac{c^2}{k^2} + \frac{\delta c}{k^2} = 0^5. \text{ In the following we assume that } \delta > c. \text{ The optimal level of CC licensing is } k_{wcc}^* = 2\sqrt{2c(\delta - c)}.$$

As a first step we consider welfare issues in light of an example (figures 5, 6). The social planner's optimal level of CC licensing is for low distribution costs lower (for high costs higher) than the level that the Author chooses given the bargaining outcome that is optimal for the Publisher (figure 5). The intuition is that because increasing publicity is cheap for low costs, the loss to wealthy consumers has high weight. In figure 6 we see that that interestingly the Publisher's decision to allow or deter CC licensing matches approximately the preferences of the social planner. Point $c_{cr-cc}(\bar{\delta})$ (from figure 4) shows the level of distribution cost above which the Publisher would deter CC licensing. The level of welfare is close to the planner's choice in the market solution.

⁵ The SOC reads $\frac{d^2W_{cc}}{dk^2} = (-2)(-\frac{c^2}{k^3} + \frac{\delta c}{k^3})$. It negative provided that $\delta > c$.

Figure 5: Share of CC licensing ($\bar{\delta} = 0.4$)

Figure 6: Welfare with and without CC licensing ($\bar{\delta} = 0.4$)

Conclusions

Our analysis predicts that Authors who are weak in bargaining are more likely to CC license some of their work. The share increases in the distribution cost and the value of publicity and decreases in the Author's share of revenue. The Publisher's reaction to the possibility of a weak Author's CC licensing is either to accommodate it and yield a share of revenue that maximizes his revenue or yield a share that deters the Author from CC licensing. In either case the author benefits. The welfare effects of CC licensing are ambiguous. It increases surplus with poor consumers and the Author and reduces the Publisher's profits.

Appendix

All consumers acquire the CC licensed work

An alternative specification for the market interaction is that consumers for whom the value of the CC licensed work exceeds the distribution cost c acquire the CC work. Consumers with a high willingness to pay buy the copyrighted work and acquire the CC work. Finally consumers whose valuation of the CC work is less than the distribution cost c acquire nothing. We assume that the ratio of each consumer's valuations for the copyright work and the work that is CC licensed is constant $(1-k)/k$. The idea is that the consumers' valuation is linear in the volume of the work. The Author's total output is homogeneous and he offers some of it for free. Consumer j is indifferent between acquiring the CC licensed work and acquiring nothing. He in turn determines the total number of consumers that acquire any work from the author and are thus aware of his existence, $k(1-j)-c=0$ implying $j = N_{cc} = \frac{k-c}{k}$.

In addition to acquiring the CC licensed work at a cost c , consumer i buys the copyright work if for a given price p , $(1-k)(1-x)-p-2c \geq 0$, implying $p = (1-k)(1-x)-2c$.

The optimal sales x^* is found through profit maximization given the share k .

Maximization of profits, $\max \pi_{cc} = [(1-k)(1-x) - 2c]x$, yields $x^* = \frac{(1-k) - 2c}{2(1-k)}$,

$p^* = \frac{(1-k) - 2c}{2}$. The profits from the copyright work are $\pi_{cc} = \frac{[(1-k) - 2c]^2}{4(1-k)}$.⁶

The author's and Publisher's total revenues with CC licensing are then

$$\pi_{Acc}(s, c, k) = \pi_o + s\pi_{cc} = \delta \frac{k - c}{k} + s \frac{[(1-k) - 2c]^2}{4(1-k)} \quad (1)$$

$$\pi_{Pcc}(s, k) = (1-s)\pi_{cc} = (1-s) \frac{[(1-k) - 2c]^2}{4(1-k)}$$

In the paper we utilize the specification that a consumer acquires either the copyright work or the CC licensed work. Initial analysis shows that qualitative results are similar except for welfare analysis. It is my intention to include this specification in future to the welfare section.

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⁶ The same expression for profit obtains when consumers must exert cost c to acquire either good.

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