Risk Sharing and the Distribution of Copyright Collective Income

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Abstract

Copyright collectives are groups of individual copyright holders who join together in order to save on the important transactions costs that exist in the market for their individual rights. However, transactions costs savings are not the only manner in which copyright holders can benefit from the collective administration of their copyrights. In particular, whenever there is uncertainty as to the final market value of individual copyrights, by joining together and offering a blanket license in the entire repertory, a copyright collective is able to offer a distribution of net income to the members that gives each one a better risk bearing situation than can be obtained by acting alone. Curiously, however, this aspect of collective administration of copyrights has been entirely ignored, both in the theoretical literature concerning copyright collectives, and in the way that real-life collectives distribute their income. The objective of this paper is to analyze the risk sharing benefits that copyright collectives can offer, but currently do not.

1. Introduction

Hollander (1984, p. 200) sums up the basic functions of copyright collectives as follows:

> Copyright collectives are associations to whom authors transfer copyrights for purposes of exploitation. In general, collectives are concerned with the following functions: (1) they grant licences for the use of works in their repertory, (2) they negotiate and collect royalties, and distribute them to their members, (3) they take legal action against those who infringe the copyrights to which they hold title.

Each of these three aspects of collective administration of copyrights (as well as the monopoly position that such collectives enjoy) has been subject to the analysis of economic theory. In particular, the literature asserts that the underlying reason for copyright collectives to form is naturally that by joining together and marketing a

blanket license to the entire repertory, each individual member can achieve a better utility position than by acting alone. In this paper, we shall consider the possible ways in which collective administration improves the welfare of its members.

In the above quote from Holander, it is clear that the principal idea is to share certain transactions costs over collective members (costs of negotiating, receiving payment for, and protecting license agreements). Clearly, then, the most obvious reason for collective administration is the welfare gains that the members can enjoy as transactions costs are diminished.

The Coase theorem implies that final resource allocations will, in general, be socially inefficient whenever transactions costs exist. When it comes to intellectual property markets, in which access to intellectual products between individuals is traded, transactions costs not only exist, but they may even be more significant than the final value of the object of the transaction. The reason for this is the fact that intellectual products are typically of a public good nature, and so there is a very low cost of free-riding associated with them. Once access has been granted to one user, it becomes very costly to then exclude access being taken by the entire set of potential users.

This problem is often overcome, at least partially, by collective administration. The example of copyright is perhaps the most prevalent case. When a copyrightable product is created, along with it are created an entire set of access rights, some of which can be transacted with low transactions costs, but others of which can only be transacted at a very high transactions cost. For example, consider the case of a musical composition. Once the composition has been fixed onto a physical support, say a CD Rom, it can easily be listened to by whoever has that CD Rom. When a consumer purchases the CD Rom from a recognised retailer, he automatically purchases the right to a limited set of access privaleges. Obviously, he has the right to listen to the music as often as he pleases, and he also has the right to sell the CD Rom to a third party. In most countries, the consumer has the right to make a copy of the CD Rom for his own use as well. However, with the purchase price of the CD Rom, the consumer will not acquire the right to make copies of the music on the disc and then sell those copies. Nor will he acquire the right to play the music to an audience, especially for economic gain. The problem for the owner of the copyright in the music is how to monitor the use that the consumer makes of the CD Rom, in the privacy of his own home, at least at a reasonable cost. One, partial, method lies in collective administration of the copyright.

Whenever the set of users of a particular type of intellectual product is common to many (say, n) copyright holders, by joining together and selling a licence to the entire repertory, they can (in principle) save on the transactions costs implied by $n - 1$ individual rounds of negotiation, and likewize they can also save on both the monitoring costs and the costs of litigation whenever such recourse is needed. In this way, the option of collective administration can make feasible a set of transactions that is unprofitable when carried out individually. In economic jargon, copyright collectives are the response to a situation of natural monopoly.

However, saving on transactions costs is not the only manner in which collective administration can benefit individual copyright holders. If we assume, as is indeed very natural, that the final market value of each copyright is a random variable (that is, there is uncertainty as to its final value), then a copyright collective is able to alleviate the risk bearing situation of its members. If the members are risk averse (again, a very natural assumption), then an improved risk situation provides for expected utility gains, which are just as important as the gains that the transactions costs savings provide for. It is curious to note that this aspect of collective administration seems to have been entirely ignored, both in theoretical contributions and in real-life cases.

Given the diversity in the market value of each composition in a copyright collective's repertory, it is quite common for copyright collectives to take great pains in analyzing the markets in which their repertories are used, in order to monitor how much use is made of each particular composition in the repertory. This is puzzling since it goes quite against the idea that the songs are bundled in the first place, in a blanket license, in order to save on such transactions costs. The reason why this is done is simply to be able to base the final distribution of net income on the use made of each individual copyright. In this way, the copyright holders of the songs that are most played can be given a proportionately greater share of the collective's surplus. Abstracting from the fact that monitoring the market use of individual songs increases the transactions costs of running the collective, there are important reasons that are strongly rooted in the economic theory of risk bearing, that suggest that doing this is inconsistent with the best interests of the pool of members, thereby making current copyright collective activity rather inefficient.

In this paper, we think of a copyright collective as a simple coalition, in the sence of traditional game theory. Each potential individual member has the opportunity to join the coalition, or to act alone. In such a setting, it is very clear that the decision on

whether or not to join the coalition is affected by both how much of the coalition's income is distributed among the members, and by exactly how that income is distributed. Therefore, the distribution rule will affect the number of members that the coalition has (in equilibrium) as well as total social welfare of all individuals. We shall investigate two basic requirements of the distribution mechanism of a coalition's net income. Firstly, we will require that the distribution method be such that individual copyright holders prefer to become members of the coaltion rather than acting alone (we refer to this as the "participation condition"). Secondly, we require that the distribution method that attracts new members to the coalition is also "incentive compatible" in the sence that existing members of the coalition prefer new members to join.[1] Given these two requisites, we ask if a distribution method that consists in learning the true market value of each composition and then paying each individual member accordingly will satisfy the first two requirements? Finally, we then search for another distribution mechanism that satisfies the two requirements, and that is also preferred by all individuals to the "learn then distribute" option.

2. A simple model of a copyright collective

Let us assume that there is a set of n individuals, each of which can create a composition that has strictly non-negative market value, but where the market value of the composition is a random variable. Here, we make the simplest possible assumption, namely that all composition lotteries are identical. Indeed, the assumption that all compositions are identical, all-be-it deterministic, is a habitual assumption in the literature (see, for example, Besen, Kirby and Salop (1989)).

Moreover, we will assume that each composition is not only identically distributed, but that they are also independent.[2] Concretely, we assume that each composition can be either a "success", in which case it's market value is $x = 1$, or a "flop", in which case it's market value is $x = 0$. We assume that the probability of success is p, which is assumed strictly between 1 and 0, and we denote the true

[1] In the copyright setting, the existence of transactions costs implies certain special features of the coalition formation process. In absence of transactions costs, Deneckere and Davidson (1985) show that when competition is in prices rather than in quantities (which naturally will be the case of compositions), then mergers of any size are profitable (i.e., they satisfy both participation and incentive compatability).

[2] In the conclusions we shall mention, all-be-it briefly, the implications of relaxing the identical and independent lottery assumption.

outcome of composition *i* by x_i, which will be either 1 or 0.

Now, assume that the (monetary equivalent) costs of creation of each composition are constant and equal to c, and that if the composition is indeed marketed by the copyright holder (acting alone), then there exist transactions costs (costs of negotiation, monitoring, and litigation), denoted by t.

All copyright holders are assumed to be strictly wealth loving and strictly risk averse. In order to avoid the need for formally considering utility, instead we take the approach of mean-variance analysis. Concretely, we shall assume that all copyright holders have a strict preference for greater expected wealth, and a strict preference for lower variance of wealth. If copyright holder *i* goes ahead with the creation and marketing of the composition on an individual basis, then the expected value of his final wealth (assuming that he has no wealth outside of what the composition generates) is given by

$$E(x-c-t) = p(1-c-t)+(1-p)(0-c-t) = p-(c+t) \tag{1}$$

On the other hand, the variance of his wealth is given by

$$E(E(x-c-t)-(x-c-t))^2 = E(p-x)^2 = p(1-p) \tag{2}$$

Now, consider the situation of the coalition. Assuming that the coalition has *m* members (where clearly $m \le n$), then the final market value of the blanket licence follows a binomial distribution. It can take on any of the discrete values 0, 1, 2, 3, …, *m*, depending on exactly how many of the *m* member compositions are sucesses. Using the well known formula for the binomial distribution, the probability that exactly *h* of the *m* compositions will be successful is given by

$$\frac{m!}{(m-h)!h!}p^h(1-p)^{m-h}$$

We shall denote the final market value of the coalition's repertory by $X(m)$.

True to the public good assumption of the compositions in question, and to the fact that each composition has the same user set, we assume that the total cost of marketing the blanket licence to all the compositions in it's repertory is the same as for any particular individual, that is, the entire repertory can be marketed at a (transactions) cost of *t*. Given this, the coalition (with *m* members) earns a net income, that can then be distributed to the members, of $X(m)-t$.

Now assume that the collective can learn the true outcome of each individual composition lottery at some cost, which we fix at k, and then it can give individual member i a payment of

$$x_i - \frac{t+k}{m}$$

Under such a system, member i gets an expected wealth of

$$E\left(x - c - \frac{t+k}{m}\right) = p\left(1 - c - \frac{t+k}{m}\right) + (1-p)\left(0 - c - \frac{t+k}{m}\right) = p - c - \frac{t+k}{m} \qquad (3)$$

On the other hand, the variance of member i's final wealth is

$$E\left(E\left(x - c - \frac{t+k}{m}\right) - \left(x - c - \frac{t+k}{m}\right)\right)^2 = E(p-x)^2 = p(1-p) \qquad (4)$$

Clearly, under such a distribution rule, all members get a final wealth lottery with the same variance as acting alone, and so the only useful comparison is with respect to the expected value of final wealth. Firstly, it is clear from (3) that the expected wealth of each collective member is strictly increasing in m, that is, all collective members will welcome new members to the coalition (coalition membership is incentive compatible). However, it is not clear that the participation constraint is satisfied. Comparing the expected wealth in (3) with that in (1), participation (that is, all individuals prefer to become members of the coalition) can be guaranteed when (this is both necessary and sufficient)

$$\frac{t+k}{m} < t$$

Clearly, this requirement is more easily satisfied when k is small, when t is large, or when m is large, each of which is intuatively understandable.

In short, for any given values of t and k, we have

Proposition 1: *A distribution rule under which a collective learns (at a cost of k) the final result of each independent composition in its repertory, and distributes final income accordingly, is incentive compatible. There is a minimum membership, given by* $m^* = (t+k)/t$, *beyond which the distribution rule also satisfies the participation constraint.*

Assuming that the coalition has sufficient members, then the fact that a distribution rule corresponding to firstly learning each individual outcome and then

paying creators accordingly is both incentive compatible and satisfies participation is due entirely to the transactions costs savings that the coalition offers. However, the risk bearing situation of each coalition member has not changed, since the coalition offers the same variance of the final wealth lottery. Hence, while the coalition increases the expected value of income (by saving on transactions costs) it does nothing at all to alleviate the risk situation of the members. Given that the creators are risk averse, certainly it is welfare enhancing if the coalition could offer a better risk situation as well as transactions costs savings. We now go on to consider if this is indeed possible.

3. Risk sharing distribution mechanisms

Consider firstly the opportunity that the copyright collective has of offering full and fair insurance to all members. Since no learning is done as far as the final result of each individual lottery, the only costs of administering the set of copyrights is *t*. Now, assume that the collective pays each member the expected value of his composition with certainty. In this case, each creator would receive an expected wealth of

$$p - c - \frac{t}{m} \tag{5}$$

with zero variance. Clearly, this distribution rule satisfies both participation and incentive compatibility. But it also Pareto dominates the learning then distributing rule, since all members get a lower variance of wealth, and a higher expected final wealth. This "full insurance rule" has the additional benefit of allowing all members to be paid at the beginning of the period in question rather than at the end, something that will be of interest to any individual with a strictly positive time preference. This is summed up as:

Proposition 2: *A sharing rule that stipulates that each individual copyright holder recieves the expected value of his composition with certainty satisfies both participation by all individuals, and incentive compatibility. It also strongly Pareto dominates the learning then distributing rule.*

The fact that the welfare benefits of the full insurance mechanism are so obvious begs the question of why this system is not typically used. Perhaps the answer lies in the fact that, if the collective pays each member his expected value, then there is a strictly

positive probability that the final market value of the repertory will not cover the total outlay paid to the members as royalties. In short, it is quite possible that the collective will run into a problem of negative cash-flow. Formally, given that the total payout of the collective under the full insurance mechanism is $mp - t$, and since the final income of the collective is $X(m) - t$, there will be a cash-flow problem if it turns out that $X(m) < pm$. Since $X(m)$ follows a binomial distribution, the probability of this occurring is

$$prob\left(X(m) < pm\right) = \sum_{i=0}^{pm-1} \frac{m!\, p^i (1-p)^{m-i}}{(m-i)!\, i!}$$

Unfortunately, this probability is quite high. Indeed, a direct application of the Central Limit Theorem[3] tells us that as m increases, the probability that $X(m)$ will be less than pm approaches 0.5. It is, however, decreasing in p. For example, if we assume that m = 100, then the probability of bankruptcy is about 45% (it is just over 46% with p = 0.2, and just under 45% when p = 0.8).

Clearly, unless the collective has access to short-term financing from which to cover any shortfalls in collected income, the full and fair insurance option may not be feasible. However, there are intermediate options that still have full insurance, but that do not have fair insurance, and yet that do still satisfy both participation and incentive compatibility, and that still Pareto dominate the learning then distributing rule.

Imagine the following simple option. The collective distributes a fixed sum to each individual member such that the expected value of each member's income is the same as if the distribution rule had been learning then distributing. That is, each member is given a fixed payment of

$$p - \frac{t+k}{m} = p - \frac{t}{m} - \frac{k}{m}$$

Once again, this rule clearly satisfies both incentive compatibility, and participation under the same proviso as in proposition 1.[4] Since no learning is done, this rule implies that total royalty payments are $mp - t - k$, while the total net income of the collective is $X(m) - t$. Under this system, which is strictly preferred by all copyright holders to the learning then distributing rule (since it has the same expected value and a lower variance of final wealth), the probability that the collective runs into a bankrupcy

[3] The Central Limit Theorem (also known as the DeMoivre-Laplace Theorem) asserts that as m increases, the probability distribution of $X(m)$ approaches a standardized normal distribution. Since the standardized normal density is symmetric about it's mean, the probability of $X(m)$ being less than pm is about 0.5.

[4] Indeed, participation can be achieved with a lower membership than under the learn then distribute rule, since each member gets a better risk bearing situation. Exactly how the limit value of m is affected is impossible to determine unless we introduce an analysis based on utility functions.

problem is significantly reduced (although, naturally, the reduction depends on the size of k). For example, if we again assume that $m = 100$, and if we assume that $k = 10$, then the probability of bankruptcy is under 2%.[5] Naturally, one would expect that the accumulated but not distributed net incomes of the collective over time would, at certain times, be distributed to the members as operation profit (as opposed to strict royalty payments). Whether or not such a system is indeed feasible will depend on the true values of the parameters m, p and k, and on the access that the collective has to other financial products (short-term loans, third party insurance, etc.) but at least in principle, it would seem to be feasible in most modern societies.

Proposition 3: *A sharing rule that stipulates that each member of the collective recieves with certainty a payment equal to the expected value of the payment under the learn then distribute rule, satisfies incentive compatibility always, and satisfies participation under the same restriction on total collective membership as in proposition 1. However, this rule Pareto dominates the learn and distribute rule, since it sets the variance of each copyright owner's final wealth to 0. So long as the collective has access to short term financing or third party insurance, the probability that it will go bankrupt under this sharing rule is likely to be negligable.*

Even if the full but not fair insurance option were not feasible, there are other options that also Pareto dominate the learning then distributing rule and that never run into bankruptcy problems. To see someof these options, note that the expected value of the repertory is[6]

$$EX(m) = mp \tag{6}$$

and the variance of the market value of the repertory is

$$E(mp - X(m))^2 = mp(1-p) \tag{7}$$

Now, assume that the collective's net income is distributed according to pre-agreed shares, such that member i recieves a proportion λ_i of the final net income of the collective, where

$$\sum_{i=1}^{m} \lambda_i = 1$$

[5] Concretely, the probability is 1.76% if $p = 0.5$. This compares to the figure of 46.02% when fair insurance is offered.

[6] These results are not so easy to prove. See, for example, chapter 4 of Canavos (1989) for proofs.

in order to avoid all bankruptcy issues (that is, the collective will distribute exactly all of it's net income, whatever that turns out to be). Using this rule, the expected final wealth of member *i* is

$$E\left(\lambda_i\left(X(m)-\frac{t}{m}\right)-c\right)=E\lambda_i X(m)-c-\frac{t}{m}=\lambda_i EX(m)-c-\frac{t}{m}=\lambda_i mp-c-\frac{t}{m} \quad (8)$$

and the variance of his final wealth is

$$E\left(\lambda_i mp-c-\frac{t}{m}-\left(\lambda_i X(m)-c-\frac{t}{m}\right)\right)^2=E\left(\lambda_i\left(mp-X(m)\right)\right)^2=\lambda_i^2 E\left(mp-X(m)\right)^2$$

But, using (7), we have directly that the variance of final wealth under this distribution mechanism is

$$\lambda_i^2 mp(1-p) \quad (9)$$

Now, since each composition is, ex ante, identical, let us simply assume that $\lambda_i = 1/m \ \ \forall i$, in which case the expected value of final wealth of each copyright holder who is a member of the collective is

$$p-c-\frac{t}{m} \quad (10)$$

that is, the same as under the full and fair insurance mechanism, and greater than under the learn then distribute rule. On the other hand, the variance of the final wealth of each of the collective members is

$$\frac{p(1-p)}{m} \quad (11)$$

which is greater than any full insurance mechanism (under which variance is 0), but which is less than what the learn and distribute rule offers (which, from (4) is $p(1-p)$).

Finally, note that this sharing rule satisfies both incentive compatibility (expected value is increasing in *m* and variance is decreasing in *m*) and participation (expected value of being a collective member is strictly greater than acting alone because of the transactions costs savings, and the variance that being a member offers is strictly less than that corresponding to acting alone), and that it Pareto dominates the learn then distribute rule (since it offers both a greater expected value since the learning costs are saved, and a lower variance). This can be summed up as:

Proposition 4: *A sharing rule under which each collective member is paid an equal share of the final net income of the collective is both incentive compatible and satisfies*

participation. It also strictly Pareto dominates the learn then distribute rule.

Finally, although we have found a manner in which the net income of a copyright collective can be distributed that strictly Pareto dominates the currently used method, and that will not imply any bankruptcy issues, one wonders if this method can be improved upon. This type of question has been analyzed extensively in the literature on efficient risk sharing. Two main results of that literature are worthwhile mentioning here. Firstly, the so called "mutuality principle" of Karl Borch (see Borch (1960)) implies that if a group of risk averse agents each contribute a random variable to a common pool (known as a mutual), then a Pareto efficient risk sharing rule must make the final wealth of each individual member independent of the particular contribution that he made. In other words, the final wealth of each member of a copyright should depend only on the final value of $X(m)$, and not on the individual composition lotteries. This has been achieved in our proposal, where each individual receives an equal share of $X(m)$, but is clearly not achieved in the learn then distribute rule.

Secondly, the question naturally arises if the equal share rule can also be improved upon. Since this rule is Pareto efficient, any change in it will obviously not be Pareto improving, but one can imagine that it is possible that the collective members may want to enter into further contracts among themselves that would mutually improve their welfare. For example, since each member still bears risk (since $X(m)$ is still random), there is room for improvement if not all individuals are equally risk averse. Specifically, Wilson (1968) has proven that full efficiency will require that each member of a mutual should receive a fraction of the total pooled wealth (here $X(m)$) that is equal to his individual risk tolerance divided by the sum of the risk tolerances of all members.

The sharing rule based on risk tolerances would, almost certainly, imply that members who supply identically valued compositions to the repertory will get different shares of the final pooled wealth. Besen, Kirby and Salop (1992) note that discriminatory practices in the distribution of collective income are often frowned upon (to say the least) by regulatory authorities (see Besen, Kirby and Salop (1992) pp. 395–97).[7] Given this, it remains to be seen if the fully efficient sharing rule offered by Wilson is indeed feasible in the regulatory scenario of most copyright collectives.

[7] In spite of this, ASCAP in particular does discriminate. They distibute income in a way that discriminates according to how long an individual has been a member (see Besen and Kirby (1989) pp.

4. Conclusions and future research

In this paper we have proposed that copyright collectives do not offer their members as great a welfare benefit as they could. The reason is simple – collectives typically focus all of their attention upon the transactions costs savings aspect of their business, but they also have the opportuntity to offer members important risk sharing benefits that they currently do not. We have pointed out several methods under which the net income of copyright collectives could be distributed to members that Pareto dominate the status-quo method (the learn then distribute rule).

The model in this paper is necessarily over-simplified, especially with respect to the assumptions that the final market value of all compositions are identically and independently distributed, and that the probability of success of each composition is publicly known. However, none of the underlying results of the paper would be affected by making compositions non-identically distributed, and the results would be strengthened if we were to make a more realistic assumption concerning the interdependence of these distributions (with negative co-variances, hedging opportunites arise that have the final effect of reducing even further the variance of the market value of the collective's repertory). Therefore, the greatest impediment to the proposals suggested here is certainly the fact that the true probability density of the final market value of each composition is in fact unknown.

The second manner in which the analysis here has been simplified is that we have restricted out attention entirely to a mean-variance analysis. As is well known, this is only really relevant for a limited set of utility functions – concretely, utility functions with constant absolute risk aversion. This was done in order to keep the arguments simple and easily understandable. The paper could be easily extended to cater for expected utility, although the expected utility of the collective option would be a rather complex equation. Alternatively, and certainly more interestingly, several of the results obtained here can be analyzed using stochastic dominance techniques, which would significantly extend their generality. In any case, it is worth reiterating here that, under the Central Limit Theorem, so long as the number of members is sufficiently large (a very realistic assumption for most copyright collectives in the real-world), then the

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21). Also, Besen and Kirby (pg. 10) note that, when comparing copyright collectives over the world "… a

distribution of the collective's income will be normal. In this case, since the normal distribution depends only upon the first two moments, mean-variance analysis is absolutely sufficient.

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very wide range of methods are employed to distribute the proceeds of blanket licences …".