

Copyright Protection Standards and Authors' Time Allocation

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Abstract

For centuries, it was necessary for performers to be present in 'real time' in order to supply their services, such as music, dance or drama. Labour time and human skill and capital were inextricably related. 'Reproducibility' – the ability to make copies of human services that are adequate substitutes for 'live' performance – has meant performers need not be present to supply their services, which can be recorded and supplied with economies of scale. Consumers do not need the live performer to be present in order to obtain her services. Demand for performers has therefore fallen. The same is, of course, true for non-performing authors.

Such a scenario must have altered the balance of incentives for authors for how they ultimately decide to spend their time. The choices between working on producing copyrighted material (which will earn them income through royalties over the duration of the copyright), working for 'spot' wages (either in related or unrelated activities), or to take leisure, must be closely related to the ability of copyright law to guarantee future income from copyrights. The paper considers this situation in terms of a formal model of time allocation.

Keywords: copyright, time allocation, leisure, creativity

1. Introduction

The evolution of copyright law is inextricably connected to the ability to make mechanical (and now digital) copies that began with the invention of the printing press. The development of recording technologies – sound recording, motion picture making, photocopiers, home recording equipment (VCRs, CD burners) and the internet – that duplicate a work from a master copy (a performance, a book, a photograph) has vastly extended reproducibility. These inventions have had a fundamental effect on the way consumers access the arts and other cultural products and have vastly altered the labour market for creative artists and performers.

The exploitation of work embodied in reproducible form has a double-sided effect: it ‘alienates’ the author’s creative input from her labour, as the work can now reach the market without the necessity of her presence; and, through copyright law, the copyright holder acquires a durable asset, which can be exploited independently of the author (who may even be dead since the copyright term is life plus 70 years¹).

One effect of the combination of copyright law and ‘reproducibility’ on authors’ labour markets that does not seem to have been explored in the literatures of either the economics of copyright or cultural economics is how this combination affects authors’ supply decisions (for an early treatment of the topic of reproducibility, see Benjamin 1936. For more recent accounts, see Peacock and Weir 1975, and Ehrlich 1985). For centuries, it was necessary for creators (performers, artists – in general, “authors”) to be present in ‘real time’ in order to supply their services, such as music, dance or drama. Labour time and human skill and capital were inextricably related. ‘Reproducibility’ – the ability to make copies of human services that are adequate substitutes for ‘live’ performance – has meant performers need not be present to supply their services, which can be recorded and supplied in conditions in which there are economies of scale in the use of authors’ time. And as consumers no longer needed the author to be physically present in order to obtain their services, demand for physical presence of authors has fallen dramatically over the 20th century with considerable implications for artists’ labour markets.² However, the durability of the recorded asset, protected by copyright, enables the author to earn royalties over the life of the work.

Due to these features, the author faces a labour supply decision that involves allocation decisions over time. She can decide to allocate her time to leisure, to earning a spot wage now or to creating a future return.³ Moreover, royalties keep coming in while the author is occupied with other work or leisure, so the author can earn more cumulatively in a given period of time. In addition to dividing their time between arts and non-arts work (a feature of artists’ labour markets that has been well

¹ It is often forgotten that an author’s work is protected for a longer period than the copyright term. Say an author creates a work at the age of 25 and she lives to the age of 75, that work is protected for 120 years. However, performers’ work is protected for 50 years from the date of fixation. A singer-songwriter has the authors’ copyright and the performers’ neighbouring rights. For a simple introduction to copyright law, see the information on the web page of the World Intellectual Property Organization (http://www.wipo.int/copyright/en/faq/faqs.htm#P39_5114).

² This topic is dealt with in detail in Towse (forthcoming).

³ For example, a singer may choose between doing a sound recording in preference to a concert; the concert pays a fee and the sound recording a royalty.

established – see, for example, Towse, 2001), authors can optimise a portfolio of copyrights that form part of an inter-temporal decision about present and future earnings. Taking this into account, and ignoring the opportunity cost of the non-arts wages, an author's earnings at any point in time depend upon wages and fees for the hours of work done in that period plus copyright royalty income (the royalty rate times the number of copyrights the author holds). The ensuing relationship between the amount of royalty income and the choice of time allocation in any given period could be tested using data from surveys of creative individuals that asked for separate information on fees and wages and for royalties.

The author time allocation problem is closely linked to the very basic fundamentals of the economics of intellectual property, as originally spelled out in the seminal papers of Nelson (1959) and Arrow (1962). In the Nelson-Arrow paradigm, it is considered that the production of intellectual property is likely to be inefficiently low, since the ease of appropriation implies that the financial returns that authors end up with may be insufficient to provide the appropriate incentive for creation in the first place. A certain degree of legal protection is required to attempt to turn the balance back into the author's favour. Thus, there is an assumption, often implicit, that greater protection leads to greater creative effort and output, something that the current paper attempts to address within a model of labour and time allocation.

It is often stated that the fundamental objective of copyright protection is to balance the incentives of creators with the access that the consuming public has to the final creations. A stronger protection implies a greater final monopoly power over how access to creations is priced in the market place, generally leading to higher prices and thus less equilibrium access. On the other hand, it is very often argued that stronger protection affords a greater incentive for creation in the first place, since it implies greater profitability from the ensuing market transactions as creations are accessed by users. Assuming that neither of the extremes is optimal (i.e. neither total nor totally absent protection is optimal), copyright law attempts to locate an intermediate degree of protection such that the incentive to create is balanced at the margin with market access. In principle, the very existence of such an equilibrium is based on the implicit understanding that access is decreasing in protection, and the amount of creative effort is increasing in protection.⁴

⁴ Of course, these are sufficient but not necessary ingredients to the existence of an equilibrium.

However, the monotone relationship between degree of protection and the incentive to create is at best shaky, and has been challenged on several occasions with specific theoretical settings in which some type of wedge is introduced between the strengthening of protection and the incentive to create. Such arguments include the non-monetary motive for creation (even though stronger protection may imply greater earnings, it could be the case that authors are not ultimately motivated by monetary gain but rather by more esoteric objectives; see for example Throsby, 1994⁵), indirect appropriability (stronger protection, and thus less copying, decreases the willingness to pay for originals as less can be done with them, see Liebowitz 1985 for the seminal discussion of indirect appropriability), the existence of network effects (stronger protection may decrease the total user base, and with a network effect in place, this can decrease the willingness to pay for originals, see Takeyama 1994), the fact that copyright protection increases the costs of subsequent creation and may thus decrease overall creativity (Landes and Posner 1989), and the “greedy record company” theory (current royalty contracts do not always provide for a link between increased copyright protection and the revenue of authors, but rather the fruits of increased protection are retained by publishers and distributors⁶).

It appears, however, that there could be a far more fundamental reason why we should question the monotone relationship between copyright protection and the financial incentive to create, based on the simple economics of time allocation between creative efforts and alternative activities. In this paper we attempt to provide a first analysis of this effect. In order to only study the labour market effect, we assume non-existence of all of the other reasons mentioned in the previous paragraph (indirect appropriability, network effects, greedy record companies, etc.).

It is not difficult to see that the choice faced by an author about how to best spend her time between the two activities is very closely related to a model of financial portfolio theory in which there exist two assets – a short term certain return

⁵ Throsby (1994) has suggested a work preference model of artists’ labour supply, in which the artist gains utility from devoting time to her art.

⁶ For example, in a recent book on copyright piracy, John Gantz and Jack Rochester (see Gantz and Rochester 2005) quote evidence presented by recording artist Courtney Love that suggests that even a successful recording and a 20% royalty can leave an artist with no earnings, due to the record company charging costs to the recording income (Gantz and Rochester 2005, pg. 86-88). Apparently Love attests that piracy of music is “... the act of stealing an artist’s work without any intention of paying for it. I’m not talking about Napster-type software. I’m talking about major label recording companies.” Even such a popular artist as Joni Michell is quoted as saying “I’ve never really had a good deal in the business.” (Gantz and Rochester 2005, pg. 81).

asset (akin to the spot wage option of the author), and a long term perpetuity asset (akin to the ‘copyright’ activity of our author). There are, however, some differences that we can at least mention here, although full and formal consideration of them will make the model that follows too complex.

Firstly, for the case of the author, the choice of what to do is really more complex than is the financial portfolio choice. The author is considering how to spend her time, and so there is always the third option of leisure. In the financial choice counterpart, ‘leisure’ would be similar to holding money in a non-interest rate generating account⁷, something that is normally assumed to be strongly dominated by the certain return (i.e. riskless) asset. Thus the ‘leisure’ equivalent in the finance model is normally not included, and the problem there is often cast as that of sharing wealth over two options, one risky and one safe. We know, however, from the very basics of undergraduate economics, that the choice between leisure and paid employment is not a simple one, and the interplay between wealth and substitution effects may imply that the supply of labour is backward bending (see, for example, Gravelle and Rees 2004, pg.77-81).

Secondly, we could also allow the artist the option of saving (either positive or negative) from one period to the next. Doing so would again increase the dimensionality of the choice, and thus complicate things excessively.

Thirdly, there are clear spillovers from one activity to the other that we will not take into account formally. Specifically, one would expect that the perceived quality of the output of different employment activities would affect the payoffs from the other; indeed, they may even be regarded as joint products. For example, a singer with a very successful stage show can expect to generate a larger fan base, and is thereby likely to earn more on record sales (copyright income). The opposite is also true – popular singers in record sales terms are likely to earn more revenues from live concerts. These interactions are just too complex to introduce in a simple way into the analysis of the present paper.

Fourthly, in a financial portfolio setting, the investor at any period may decide to either add to or subtract from the investment in the perpetuity asset. In the setting considered here, that would imply that the author is able to either add to or subtract from her copyright portfolio. Now clearly it is simple to add to it, by recording new

⁷ Such an account may still generate utility, primarily due to the consumption opportunities that it opens up.

material and making that material available for distribution, but subtracting from the copyright portfolio may be more difficult. There are some rights included under copyright that simply cannot be traded away (e.g. moral rights, although these are not economic rights), although in principle the author could sell off part of her copyright portfolio in the market.⁸ The problem here is, of course, that it is not really true that all elements in the copyright portfolio are equal, and so the choice of which elements to retain and which to sell is complex. We avoid the problem entirely, by only considering additions to the copyright portfolio, and abstracting away entirely from the option of selling off parts of this portfolio.

Finally, we recall that we assume away completely all effects related to indirect appropriation, network externalities, greedy record companies, and non-monetary motives for creation, in order that our model concentrates entirely upon the effect of copyright protection, and changes in copyright protection, upon the time allocation choice of the author.

2. The Model

The following discussion is presented in as much of an intuitive guise as possible, with the only formal element being simple undergraduate indifference curve analysis. Naturally, the model itself permits a formal (i.e. mathematical) expression as well, and in that alternative presentation more specific results (especially of the comparative statics type) can be established. However, it is our intention in the present paper to make the general model as clear as possible, and to show how the simplest of economic reasoning is sufficient to achieve a reasonable understanding of the effects of the existence of copyright, and alterations in the strength of copyright protection, upon the labour supply decision of authors.

The basic question that is to be addressed is the following: how will an increase in the strength of copyright protection affect the time allocation decision of an author?⁹ Note that as a special case of this query, we can also consider the effect of introducing some copyright protection into a system that initially had none. Indeed, in

⁸ Notably, David Bowie has sold bonds entitling the holder to a share of his future royalty income from his past recordings.

⁹ This is a much different question from asking how a stronger protection standard affects the utility of authors. If we assume, as is logical, that any protection standard at or below that imposed by law can be

what follows we shall concentrate mainly on the case of the introduction of a positive copyright protection standard to a system that initially has no protection, as it provides the easiest mode of introduction for the more general case of a strengthening of protection from one standard to another. The model in which this question will be analysed is the standard undergraduate setting in which a person decides an optimal time allocation between work and leisure.

Assume that the author has T units of time at her disposal (i.e. her life-time is T), each of which is normalised to a duration of 1, and each period must be split between three activities – paid ‘spot’ employment in some activity the output of which is not a copyrighted product,¹⁰ royalty generating activities,¹¹ and leisure. The first two activities generate income, the third (leisure) does not. Since we are assuming that there are no financial markets for savings or loans, all the income that is received from the first two activities must be completely used up as consumption during the same period in which they are received.

Let the amount of leisure taken in period i be indicated by L_i , so that once leisure has been decided, the author has $1-L_i$ units of time to dedicate to wealth generating activities in that period. Assume that a proportion c_i of this non-leisure time is spent working on generating copyrights, and a proportion $1-c_i$ is dedicated to other income generating activities. Assume that each unit of time spent generating copyrights in any period i yields a wage payment of r in that period i (a royalty payment in the same period in which the copyright is generated), and that the per-unit time wage for the alternative employment option is w . We shall simply assume that c_i is given, and is not a decision variable, although we shall mention from time to time the complexities that are introduced by allowing this to be a choice variable. Thus, we set $c_i = c$ for all periods.

In any given period i the author earns $w(1-c)(1-L_i)$ from non-royalty income and $rc(1-L_i)$ from royalties generated in the same period. Now, *past* activities in copyright generation (i.e. time spent creating in periods previous to i) are still remunerated in period i , just as the copyrights created in period i will still generate

implicitly evoked by non-enforcement, then any increase in the legal protection standard can never decrease the utility of authors.

¹⁰ This could be a live performance by a singer, or any non-artistic type of employment at all.

some income in periods after i . We assume that in period i the royalty income that the author receives due to existing copyrights is some amount W_i . Clearly, this is independent of her current period's activities. Over all, the income that is received in period i is $x_i = (1 - L_i)z + W_i$, where $z \equiv rc + w(1 - c)$ is the average wage per unit time not spent as leisure. Finally, we assume that the author's utility function for money, x_i , and leisure, L_i , in period i is $u(x_i, L_i)$, which is assumed to satisfy standard decreasing and convex indifference curves in (x, L) space.

The author's problem is to choose L_i in each period so as to maximise the overall present discounted value of utility. This is quite a complex problem, but we can get a good idea of its solution quite easily if we begin by assuming that there is no copyright protection at all. In such a world, there is no link between periods – the time spent in creative activities will be remunerated at the rate r during the period in question, and then forgotten from then on. A world without copyright implies that each period can be considered as a separate entity from all others. In this world we would have $W_i = 0$ in all periods.

Consider Figure 1, in which we have drawn an indifference curve graph in (x, L) space. The sloped line acts as the budget constraint for the author, and she searches for a tangency with her indifference curve map. The optimal solution is shown as point A . Because we assume that the utility function itself is time independent, then whatever is the period being assumed here, the solution is the same, and so in a copyright-less world, the author will spend the same amount of time in each of the activities in each period, so long as no parameter values change over time.

It is also worthwhile to note the effect of our assumption that c is not a choice variable in Figure 1. The (absolute value of the) slope of the budget constraint is just the average wage per unit time, $z = rc + w(1 - c)$. Setting $c = 1$ we see that this line would have a slope of r , while setting $c = 0$ gives us a slope of w . Intermediate values of c give intermediate slopes. Now, whatever value of c is used, the budget constraint passes through the point at which all time is spent as leisure. Thus, the author is always benefitted by a steeper sloped budget constraint. This clearly indicates the importance to our simple model of not allowing c to be a choice variable. In a nutshell, in this simplified world without copyright, if c were a choice variable the

¹¹ Any activity that contributes to the generation of royalties; i.e. writing music and songs, recording

author would simply choose either $c = 1$ or $c = 0$, depending on whether r was greater than or less than w . That is, in a ‘copyright-less’ world in which the author is given a full choice of time allocation over the different labour alternatives, we can expect a radical solution with respect to employment choice – either all employment would be in creative activities, or none would, depending upon which activity gives the greatest per-unit time wage rate.¹²

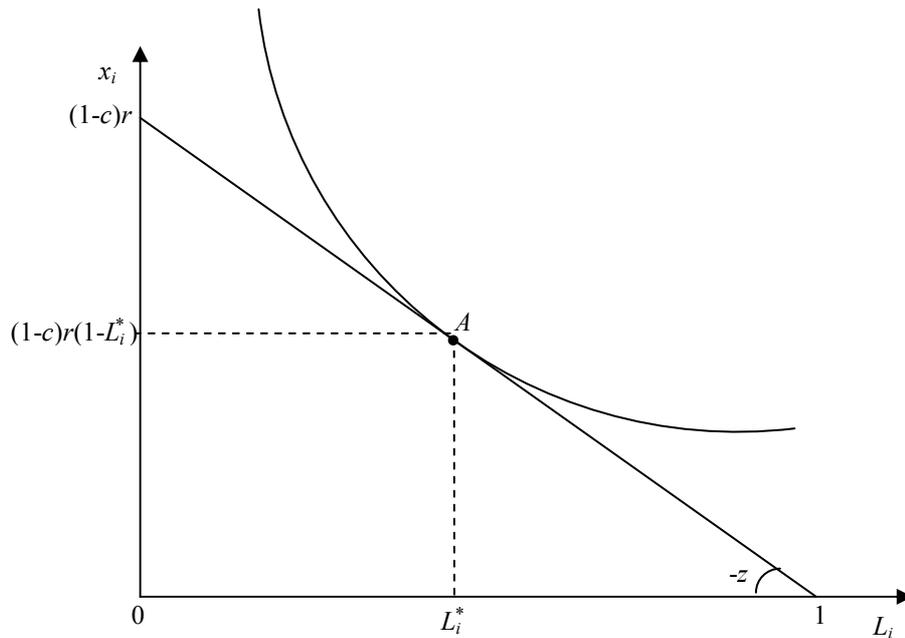


Figure 1: Optimal Time Allocation Without Copyright

Now let us consider the introduction of some amount of copyright protection onto the situation described in Figure 1. Here, we need to continue to restrain from allowing c to be a choice variable, for reasons that will be described below. When there is some copyright protection, we have two changes in the graph. Firstly, clearly W_i goes above zero so long as not *all* time is spent in pure leisure in *every* period previous to i . This has the effect of causing a parallel displacement outwards of the budget constraint in each period beyond the first. The first period is different, since by definition in that period there can be no existing copyrights that provide for wealth.

them, etc.

¹² Of course, over time we would expect that in such a model general equilibrium effects would end up equating the two wage rates; $w = r$.

Secondly, at any given point in any given period, (x_i, L_i) , the indifference curve must get ‘flatter’. To see why, recall that the slope of an indifference curve in period i is the trade-off between money and leisure in that period that leaves the creator equally well off in utility terms. Take, for example, a decrease in the amount of leisure of some given amount, say b , from a particular point, like point B in Figure 2. In a copyright-less world, this requires a given increase in money to compensate the creator. Call that amount of money $k(B, b)$. Now, reformulate the same question, from the same point exactly, but in a world in which some copyright protection exists. The effect of copyright protection is to allow any given amount of time spent working to pay off not only in the current period, but in all future periods as well. Thus now, when leisure is decreased by b from point B in Figure 2, the author will require a smaller amount of income in period i to compensate her, since she will also be rewarded with income generated in all future periods as well. This is shown as the dotted indifference curve in Figure 2. Thus, in a world with copyright, the compensation that is required in period i is some amount that is strictly less than $k(B, b)$. This causes the indifference curve in period i to become somewhat flatter as copyright protection is introduced.

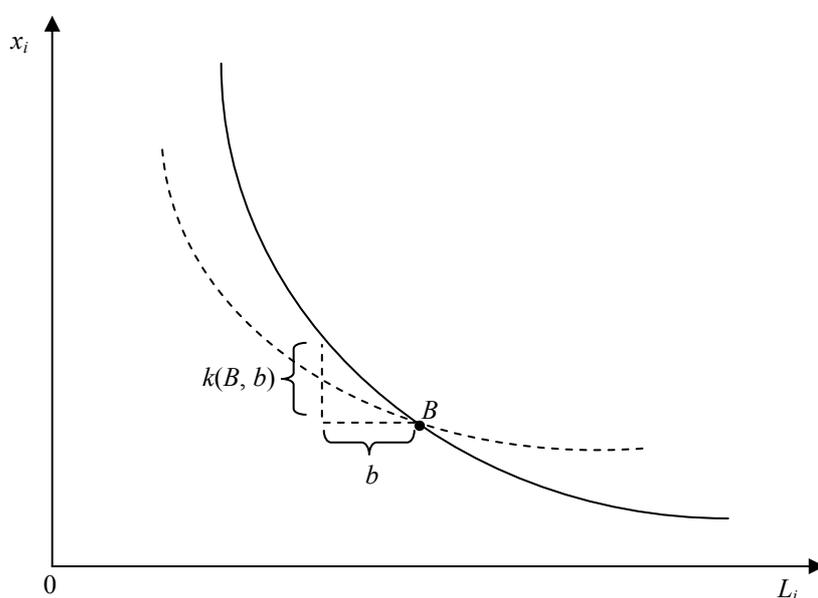


Figure 2: The Effect of Copyright on Indifference Curves

It is important to recognise that the argument of the preceding paragraph breaks down if we consider the final period, period T . Since, by definition, there is no future

when the author is at period T , the indifference curves of this period are the same, regardless of whether there is or there isn't any copyright protection.

To sum up what we now know, let us state;

1. In a world without copyright protection, the author will make the same time allocation decision in all periods. If given a choice of the relative time spent in the two employment alternatives, in a copyright-less world the author will spend all employment time in the alternative that provides the greater per-unit time wage rate.
2. Introducing some degree of copyright protection into an initial situation that has none, and not allowing the author a choice of time spent in the different income generating activities, we get the following alterations to the model. Firstly, in all periods beyond the first, the author receives an amount of income as copyright royalties from previous creations, that is independent of the current period's choice of time allocation. We refer to this income as 'inherited wealth' since it is wealth that is generated by activities in earlier periods but received later. Secondly, in all periods before the last, the map of indifference curves becomes flatter.

We shall identify the two effects of strengthening of copyright as the 'backward looking' effect (the effect of greater inherited wealth), and the 'forward looking' effect (the effect of the flattening of indifference curves).

Now, think for a moment about what happens if c is allowed to be a choice variable in each period. To capture this, let us go back to the use of c_i to denote the choice of c in period i . Again, the author is certainly interested in choosing c_i such that the budget constraint in period i is as high as possible. But a greater choice of c_i has more than one effect in a world in which copyright protection is present. It will alter the slope of the budget constraint in period i , and it may affect the height of the budget constraints in all periods after i by altering the amount of inherited wealth W in each of these periods.

To see a particularly simple case, assume that r is greater than w , *and* that as the budget constraint gets steeper (i.e. as the average wage increases), less time is spent in leisure (and correspondingly more time is spent working).¹³ In such a setting, the

¹³ Note that this is not at all evident in general. From undergraduate theory, we know that an increase in the wage for employment (which is what an increase in c leads to in the situation here assumed) has

author should set $c_i = 1$ in all periods – that is, the author would only work in copyright generating activities. This is because when r is greater than w an increase in c_i leads to both a steeper budget constraint in period i (and thus a more beneficial choice set in that period), as well as a higher budget constraint in all posterior periods as well, due to the greater amount of time spent creating in each period (i.e. W is greater in all periods beyond i).

However, the problem becomes very difficult for other options (r greater than w and an increase in the average wage decreases time spent in employment, or w is greater than r and any assumption on how the average wage affects the employment choice). In these options, there are opposing effects over periods that need to be weighed one against the other. For example, say w is greater than r , and that an increase in the average wage rate in any period leads to a smaller amount of time spent in employment. An increase in c_i will now decrease the slope of the budget constraint in period i , thus having a disfavoured effect on utility in that period, but this will still cause the author to spend more time in paid employment and less in leisure – in particular, more time in creative activities. The increase in creative activity in period i will then cause the inherited wealth W in all periods after i to grow, which is favourable to the utility in each of these periods. The author will go ahead with the increase in c_i if the present discounted value of the future favourable utility effects outweighs the current disfavoured effect.¹⁴ It is the complexity of this choice that leads us to hold c constant in all periods.

One final assumption needs to be in place before we can adequately study the author's time allocation problem under a regime of copyright protection. We should make an assumption regarding the normality of leisure. Recall that a 'normal good' is one for which the demand increases as disposable income increases. Goods that are not 'normal' are deemed to be 'inferior'. The logical choice of assumption for leisure

income and substitution effects that will likely work in opposite directions. Here we are assuming that the substitution effect outweighs the income effect, so that an increase in the employment wage rate leads to more time spent in employment.

¹⁴ Other options are even more complex. For example, $w > r$ and employment increasing in z . An increase in the proportion of time spent creating will now decrease the average wage in period i , and decrease employment in period i . But a greater proportion of the smaller amount of time employed is reserved for creative activities, and so exactly how the amount of creative time, and thus future royalty income, is affected is impossible to tell in general.

is that it is indeed normal, so that given an exogenous increase in disposable income in any period, more leisure will be taken.¹⁵

In Figure 3 we trace out the effects of introducing some amount of effective copyright protection to a world that initially had no protection at all. Recall that the choice of c has been eliminated, due to the complexities described above. The situation shown in Figure 3 is a particular period i that is neither the first nor the last. It is also assumed that at least one period previous to i some amount of creative time was employed – i.e. not all time was spent as leisure in all periods before i . We analyse the backward looking and the forward looking effects sequentially.

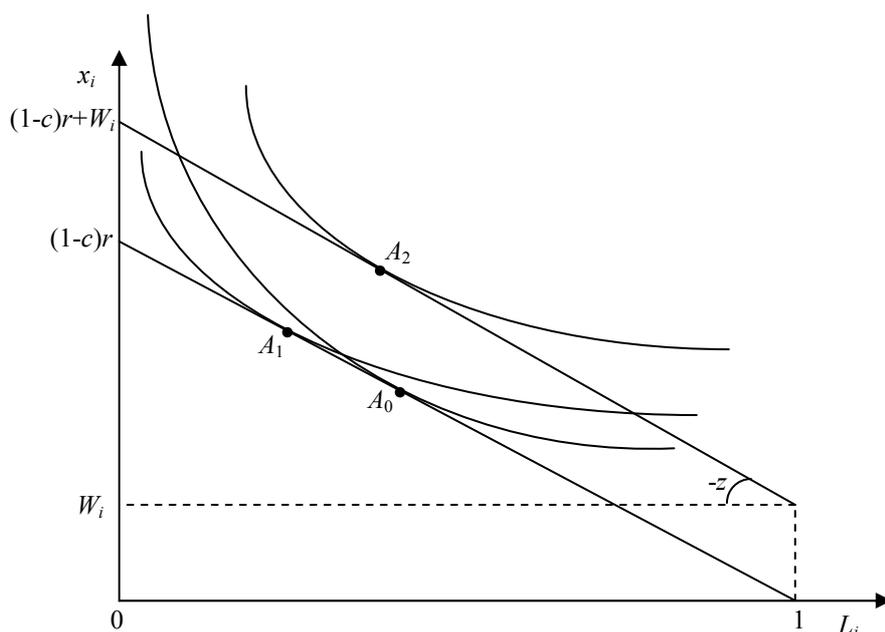


Figure 3: The Effect of Copyright On The Optimal Solution

Figure 3 begins with point A_0 , the optimal solution without copyright law. Let's begin with the forward looking effect (the flattening of the indifference curves). The introduction of copyright law causes a flattening of the indifference curves, and thus the author searches for a new tangency on her original budget line. This is achieved at the intermediary point A_1 , which involves a smaller amount of leisure than before, and correspondingly a greater amount of time spent creating. This is clearly the effect that creators in the real-world can often be heard alluding to. However, the

¹⁵ This is, of course, the assumption that is generally made in time allocation problems. It is what leads to the well known 'backward bending' supply curve of labour (see, for example, Gravelle and Rees 2004, pg. 77-81).

introduction of copyright law will also increase W_i from zero to something positive (the backward looking effect), which has the effect of shifting the budget constraint upwards in a parallel fashion. Thus the author shifts from point A_1 to search for a new tangency solution on the new budget constraint. Since we are assuming that leisure is a normal good, this has the effect of locating the tangency at some point with more leisure, and thus less time spent creating, than at A_1 . The final optimum is indicated at point A_2 .

Clearly, the forward looking effect is mitigated by, and perhaps even reversed by the backward looking effect. This will occur in all periods beyond the first and before the last. In the first period, there can be no backward looking effect (by definition), and so only the forward looking effect will ensue, and in that period we can expect that indeed the introduction of copyright law will lead to an increase in the time spent creating (and, at least in our model in which the choice of c is not allowed, an increase in time spent in alternative employment as well). On the other hand, in the very last period, there can be no forward looking effect, and so only the backward looking one is present. This implies that in the very last period, the author will certainly decrease the time spent creating (and in alternative employment) and will take more leisure when copyright protection is introduced.

It is logical, then, *that the older is the author, the more pronounced will be the backward looking effect relative to the forward looking one.*¹⁶ Thus, the introduction of copyright protection will have the effect of increasing creativity for a subset of authors only – those that are the youngest, and decreasing creativity for the rest (the older authors). Thus, there will be a particular age, say t , such that for authors aged below t the introduction of copyright protection will increase creativity, and for authors aged above t the introduction of copyright protection will decrease creativity. This is shown in Figure 4, where the time trajectory path of creativity for a case of ‘some copyright’ is graphed (the dotted curve) against that which would occur under ‘no copyright’ protection (the horizontal line).

As was mentioned above, it is relatively straightforward to see that nothing significant is changed in the analysis when we introduce a strengthening of copyright protection from an existing (positive) standard. Again, both the forward and the

¹⁶ Unless, of course, the author has a strong bequest motive.

backward looking effects will ensue, and the time trajectory will just become steeper still. In Figure 4, this is shown as a second copyright protected trajectory ('even more copyright protection'), with a stronger protection standard.¹⁷ Of course, the steeper the trajectory gets, the more likely it becomes that an extreme is reached in which either the author spends all time in employment, or all time in leisure (retirement). For example, this is shown in the steepest trajectory in Figure 4, where the youngest authors take no leisure and the oldest ones are retired.

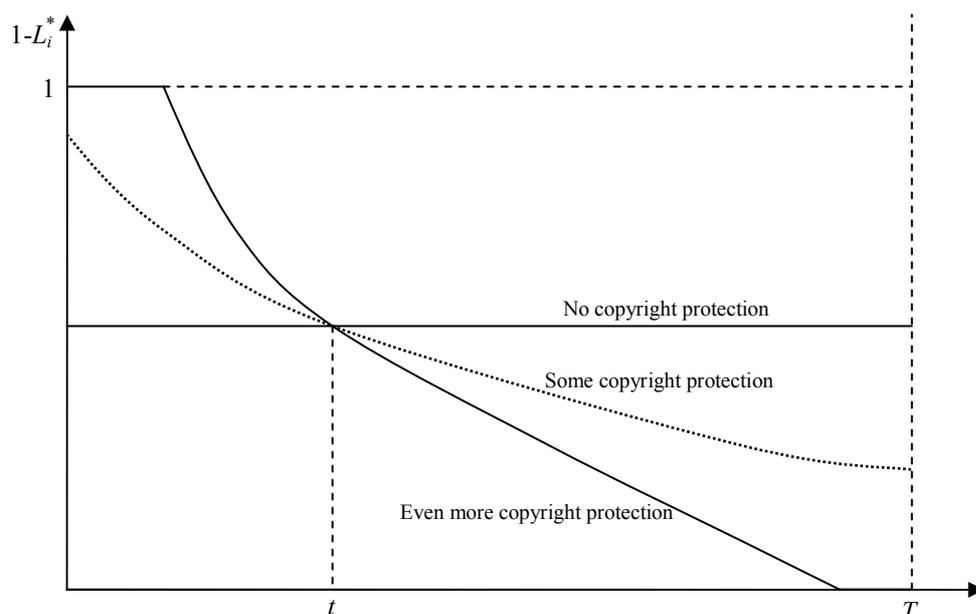


Figure 4: The Time Allocation Trajectories for 'No Copyright', 'Some Copyright', and 'Even More Copyright'.

Over all, how does an increase in the strength of copyright protection affect the total amount of creativity of an author? How does it affect the total amount of creativity of the entire set of authors in an economy? The answer is that it depends on author age, and on the age structure of the total population of authors. A strengthening of protection will likely increase creativity for young authors and decrease it for old authors. The overall effect on total creativity of the entire set of authors will therefore depend on whether they are predominantly young or old. In a population dominated by young authors, we would expect total creativity to increase, and in a population of old authors, we would expect it to decrease.

¹⁷ For simplicity, the two copyrighted trajectories are shown to cross the no copyright one at the same point. This need not be the case in general.

Actually, there are two caveats that are in order with respect to the previous paragraph. Firstly, if we were to add a quality dimension to creativity, and wonder how the total amount of quality adjusted creative output is affected by a strengthening of copyright protection, things would get even more complex. One would expect that the older authors are more likely to be those that come up with the best quality output.¹⁸ After all, they are the authors that have ‘stood the test of time’, while young authors are still testing the water to see if they can or cannot compete, and among them there will be a number of low-quality types that will end up being forced from the market (MacDonald, 1988). Thus, even if there were more young authors than old ones, an increase in the copyright protection standard could still end up decreasing an overall quality adjusted measure of creative output.

Secondly, all that we know about an increase in protection is that it will accentuate the downward sloping trajectory of creative time allocation of an author over his working life. However it is entirely possible that the increase by young authors is less than the decrease by older ones, or vice versa. Indeed, in the appendix we present a simple numerical simulation in which it is clear that the relative effects are different for the young and the old.

The downward-sloping trajectory of creative time allocation over an author’s life when copyright is introduced, and the more pronounced slope when copyright protection is strengthened, has a very interesting implication for the consumers of copyrighted products. We state it as follows:

As copyright protection is strengthened, for any given total amount of creativity over an author’s lifetime, more is produced earlier. Due to the non-exhaustibility feature of copyright products, this allows consumers a better set of consumption options. This is a sort of *invisible hand* result, since (presumably) a strengthening of copyright protection is designed to benefit creators, and not the consumers of the products of creative activity.

3. Conclusions

In this section we offer a summary of our findings, and we discuss the assumptions used.

¹⁸ Though this might not be true of some types of performers.

Our principal finding is that a strengthening of copyright protection will have two opposing effects on the decision of authors to spend time in creative activities. Firstly, there is a forward looking effect (stronger protection implies a greater future payoff to current creative activities) that flattens indifference curves and leads to less leisure, and thus a greater willingness to spend time in employment, in any given period (before the last). Secondly, there is a backward looking effect (stronger protection implies greater present earnings from previous creative activities) that moves the budget constraint and that will increase leisure (assuming it is a normal good) and thus decrease employment in all periods (after the first). So the over-all effect of a change in the copyright protection standard is ambiguous, and depends on the relative sizes of each effect. But this reduces to noting that the final effect will depend upon the age of the author in question.

We have noted that an increase in the copyright protection standard will accentuate the downward sloped trend, or trajectory, of employment choices in the sequence of time periods available to an author over her lifetime. This has an invisible hand type of implication, as it implies that more creative activity, and thus more creative output, is shifted to the earlier periods from the latter ones. In other words, in the initial periods of an author's life, more time is spent setting up a royalty portfolio that then generates income for future periods. Assuming that the existence (and distribution) of copyrights is also socially desirable for consumption purposes, then a strategy in which the allocation of time dedicated to leisure is grows as periods go by is also socially desirable – such a situation implies more copyrights are generated earlier.

It is, of course, valid to ask how robust the final conclusions are to more realistic assumptions. Some of the most significant simplifications in our model are:

- we have not accounted for such effects as non-monetary motives for creation, indirect appropriability, network externalities, and the increased costs of creation that copyright implies for subsequent works,
- the quality of copyright output is assumed constant over all authors, irrespective of their age,
- the relative split of employment time between creative and non-creative activity has been held constant,
- the author has not been able to save or loan money from one period to another,

- we have not allowed for uncertainty as to the royalty income stream,
- we have ignored any reputation effects or spillovers on the two per-unit-time wage rates, and
- we have not differentiated between authors on a skills basis, that is, we have treated ‘bread-and-butter’ authors in the same way as superstars, although these different types of creator may make quite different decisions.

Taking any of these effects into account would, of course, imply a significant increase in the complexity of the model. The model would then require a fully formal (mathematical) expression to tackle such details, making it all the more demanding to follow. Of particular interest, perhaps, is the possibility of allowing creative activities themselves to be considered by the author as a type of leisure – an example of the introduction of non-monetary motives for creation. However we certainly hope that some of our assumptions can be relaxed in future extensions to the present model.

Finally, it remains to draw some conclusions for copyright policy-makers: what are the implications of this simple model for variables that law reform can control, such as the scope and duration of copyright. The present model throws only a very limited amount of light on duration choices. A duration of protection change has no backward looking effect, and so presumably it only has forward looking effects.¹⁹ Thus the model predicts that duration extensions will increase creativity. However, now that copyright lasts longer than the life of the author, if duration alterations are to have any positive effect on creativity, we must assume that the author places positive utility on periods in which she no longer lives – perhaps through a bequest motive. On the other hand, the present model does have something to say about strength of protection issues. It implies that before implementing alterations in scope or breadth of protection, assuming that the overall idea is to increase creativity, it would be best to check the demographic age structure of the population of authors. However, notwithstanding the possible negative effect on creativity by older authors, a strengthening of the protection standard will likely have the socially beneficial function of allowing more copyrights to be enjoyed earlier and for longer.

Appendix

Assume that there are three periods of life, and that the utility function of the author in period i is $u(x_i, L_i) = Ln(x_i) + Ln(L_i)$. Assume that all employment time is spent in creative activities (that is, $c_i = 1, i=1,2,3$), and that the royalty wage per unit time is $r = 0.1$. Assume that the author discounts time periods exponentially with a time discount factor of 0.9. To take copyright protection into account, assume that the royalty earnings suffer a further discount over time, due to say the probability of piracy or similar activities. Concretely, the amount of royalty earnings from previously created copyrights in period i are assumed to be

$$W_i = r \sum_{j=1}^{i-1} p^{i-j} (1 - L_j^*)$$

We take p to be the measure of copyright protection; $p=1$ implies that there is no loss to piracy over time at all (copyrights are fully protected) and $p=0$ implies that there is no protection at all as no copyright royalty income at all accrues over time.

The following table shows the optimal time allocation to leisure for three choices of copyright protection:

	$p = 0.5$	$p = 0.6$	$p = 0.7$
L_1	0.396	0.379	0.363
L_2	0.519	0.526	0.535
L_3	0.695	0.753	0.818
Sum	1.61	1.658	1.716

As the table shows, increases in the protection standard decreases the amount of leisure taken by young authors (those of age 1), and increases it for old authors (those of age 3). In this example, it also increases the amount of leisure taken by authors of age 2, but this result can be overturned by a simple change of parameters. The interesting point in this example is that the increase in leisure taken by the old authors outweighs the decrease by young authors, as is evidenced by the incline of the total summed dedication to leisure over the three age groups as protection increases. Thus, at least in this example, even if there are no quality issues over ages, a strengthening of copyright protection leads to less creativity over all.

¹⁹ Even when the copyright duration is increased in existing works – see Liebowitz and Margolis (2005).

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