1. The basic economic theory of copyright

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One way to describe ‘economics’ is as the study of how incentives can curb behaviour. And clearly one of the greatest incentive mechanisms that is present in all modern societies is the legal system, where the general rules of acceptable human conduct are spelled out along with (at least a perception of) the possible repercussions if that conduct is violated. In that sense, then, it is hardly surprising that economists have a strong tradition of studying the law, addressing such questions as;

What are the final consequences of particular laws?
Are the consequences of laws actually those that were intended?
How can the law be altered so as to better address the intended consequences?1

This general research agenda has come to be known as the subject area of ‘law and economics’, and within that subject area, the study of copyright law has held a prominent position.2 Economists have been interested in studying the very justifications and purpose of copyright law, in terms of the outcomes of copyright protection. In short, copyright protection is seen as a means by which a greater number of better quality, creative works will be produced. Specifically, it is argued that copyright law is justified as a way in which creative individuals are able to receive payment in exchange for their efforts in creating useful works, and that without this promise of payment, there is a risk that creative individuals would defect to other employment and society would be worse off by the loss of potential useful creative works. However, there is a flip-side to the argument. The way in which copyright is supposed to compensate authors is often seen to have many of the same pitfalls as monopoly situations, in which final consumption is lower and prices are higher than otherwise. Furthermore, copyright is often argued to place a barrier in the process of incremental creativity (where a new work is based upon an already existing one), thereby reducing rather than increasing the overall amount of creative works that are produced.

In this short chapter I will give a theoretical account of the standard economics incentives-based theory of copyright, highlighting (as best I can) both its virtues and its more problematic points.
ECONOMICS AND THE CONSEQUENTIALIST THEORY OF COPYRIGHT

As we have just noted, there exists an argument in favour of copyright protection of works of expression that is based upon a theory of incentives designed to incite behaviour that in turn results in some sort of overall social benefit (as compared to the alternative of no copyright protection). This idea is even inscribed within the United States Constitution (in its Article 1, section 8, clause 8), in which Congress is authorised to ‘promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries’. Among other things, note that this allows for both copyright protection (of ‘writings’) and patent protection (of ‘discoveries’), although it does not make any attempt to differentiate between the two in terms of the type of protection to be given. It also clearly indicates that the rights involved should be ‘limited’ along a time dimension. Other exceptions and limitations have since been enshrined in the US Copyright Act (Sections 107–20), including ‘fair use’.3

Of particular note is that the Constitution gives no guidance at all as to exactly how much protection is to be given for copyright, outside of the rather vague idea that it should be enough protection such that the progress of the arts is promoted. Economists have, however, taken a very concrete perspective on how much protection should be given – exactly enough so that the original creator is indifferent between dedicating his/her time to creating a new copyrighted work or not.

A Simple Example

To begin with a very simple example, suppose an author spends his/her time writing a novel. Suppose further, that doing so involves costs (including the foregone wages that would have been earned in the best alternative use of the author’s time) of $10,000. Outside of any intrinsic motivation for writing the book (such as, for example, it being simply something that the author really would like to do purely for its own sake), we can fairly safely assume that the author will only set to work to write the book if by doing so he/she expects to earn at least $10,000 in royalty payments once it is published.4

For this example, assume that the demand curve for the published book is given by the linear inverse demand relationship

\[ p = 20 - (6/100)n \]
where $x$ is the number of units sold, $p$ is the retail price per unit, and $n$ is the number of periods (for example, years) of copyright protection that is given. Under this demand formulation, notice that the greater is the level of copyright protection, the flatter is the demand curve although the vertical intercept remains at 20. In essence, the assumption here is that in each period a new cohort of consumers is born, and the aggregate demand curve here is just the horizontal sum of the individual per-period demand curves. Thus an increase in copyright protection is a non-parallel outward shift of the aggregate demand curve. We should therefore understand this demand curve as being the total demand for the published book over the entire $n$ periods of copyright protection during which the seller of the book is a monopolist, and an increase in $n$ implies a more favourable overall demand curve. By assuming (for simplicity) a single demand curve for the entire copyright protected period, we are effectively assuming here that the book must be sold at a common price in each of the periods of copyright protection (that is, we are restricting the seller to not be able to change the price from one period to the next).

Second, we assume that the marginal production cost for each unit sold is $7, while the publishing contract dictates that the publisher must pay the author $1 for each unit sold, so the overall marginal cost for the publisher is $8.

The optimal pricing strategy can be found by maximising the profits of the seller over the entire copyright protected period. From standard intermediate microeconomics, this optimum occurs where the marginal revenue is equal to the marginal cost. The total revenue curve is

$$p \cdot x = 20x - \frac{6}{100}nx^2$$

Therefore, the marginal revenue curve (the derivative of total revenue) is

$$20 - \frac{12}{100}nx,$$

and marginal revenue is equal to marginal cost at the $x^*$ that satisfies

$$20 - \frac{12}{100}nx^* = 8$$

It is a simple matter of algebra to then discover that the optimal sale over the protected period is

$$x^* = 100n$$
So the longer the copyright duration period becomes, the more copies are sold.

Finally, substitute the optimal quantity back into the demand curve to find that the profit-maximising price is $p = 14$. Clearly the example corresponds to a rather special case, in which the profit-maximising price turns out to be independent of the copyright duration period.

Now, we started off by assuming that the author would only write the book in the first place if he/she earns at least $10,000 in royalty fees. The per-unit royalty fee has been assumed to be $1$, and the optimal strategy of the publisher is to sell $100n$ units, so the total royalty that will be paid to the author is $100n$. This is equal to $10,000$ when $n = 100$. So, if the copyright protection period is set at any $n$ greater than or equal to $100$, the author will earn enough money to persuade them to write the book. If the period is set less than $100$ the author will decide not to write the book.

The social welfare generated while the book is copyright protected is just the sum of consumer surplus, publisher profit and author royalty fees. Consumer surplus is just the area of a triangle with height $6$ (equal to $20$ less $14$) and base equal to $100n$, that is an area equal to $300n$. The royalty fees are $100n$, and the profit from sales is equal to $100n$ times the difference between price and marginal cost, which is $6$ ($14$ minus $8$), or a further $600n$. So the total social welfare generated during the copyright period is $1000n$. In particular, an increase in $n$ by one period generates an additional $1000$ units of social welfare. In order to then consider what the optimal level of copyright protection actually is, we need to consider what happens in the market once the copyright protection has expired. When that happens (after period $n$), the book is no longer controlled by a monopoly seller and falls into the public domain. When this happens, there are no barriers to entry to the market for selling the book, and anyone who does set up as a seller has no need to pay royalties to the author. The market price will be bid down to marginal cost (which will now be equal to seven). At that price, the amount sold during the new period will be given by the $x$ that satisfies

$$7 = 20 - (6/100)x$$

that is, $x = 1300/6$.

There will be no publisher profits or author royalties, and the entire amount of social welfare will be made up of consumer surplus. In each of the periods beyond expiration of the copyright term, consumer surplus will be equal to one-half times the height from marginal cost of $7$ up to the vertical intercept of the new demand curve of $20$, times the quantity sold of $1300/6$, so a total amount of per-period welfare of
The basic economic theory of copyright

Thus we see that each extension of the copyright term by 1 period will add 1000 units of social welfare by extending the monopoly situation, but at the expense of 1408 units of social welfare from the foregone competitive situation. It is clearly not a good idea to extend copyright for a day longer than the period of time required to ensure that the author actually writes the book.

So, in short, it is fairly easy to see how a properly enforced copyright law is beneficial to society in general, since it helps valuable works of authorship to come into existence, and also why this particular policy lever should be limited in time.

While we are on the topic of how copyright protection can be beneficial, it is probably timely to say a few words on the debate that rages on the evils of protection. In a nutshell, copyright protection creates a barrier to entry into a specific market that then allows the market to function as a monopoly, at least for a limited period of time. When a market is serviced by a monopoly supplier, the good in question is priced higher and there is correspondingly less consumption than if the market were to be organised more competitively. So by allowing copyright protection, the protected creation is in a sense ‘under-consumed’ relative to a market that is serviced more competitively because some consumers with a willingness-to-pay that exceeds the cost of supplying them (marginal cost) are nevertheless excluded from consuming because the monopoly price (which is what needs to be paid to gain consumption) exceeds marginal cost. This under-consumption, in turn, leads to what economists have called ‘deadweight losses’, which are effectively social welfare amounts that are lost, and that would not be lost under a model of competitive supply. The question is; does the existence of these deadweight losses imply in any logical way that copyright harbours a negative element, that is harmful to social welfare? Some have argued that this is the case, others have argued the opposite.

Unless some other incentive mechanism can be used to entice the author to actually create the work in question, then it is only by offering the property right in it, and the subsequent monopoly operation of the market, that the work will actually exist and therefore be able to be subject to market transactions. It is therefore fallacious to argue that a competitive market for the work is preferred from a social welfare perspective, since if the market were run competitively the author would have no obvious incentive to create the work in the first place, and there would be nothing at all to offer consumers. One should not look at the comparison of social welfare under a monopoly and social welfare under competitive supply, but rather social welfare under monopoly and the number 0, which is the social welfare if the work is not created.
SOME OPEN QUESTIONS REGARDING COPYRIGHT LAW

Optimal Copyright Term

Assuming that it is agreed that, in order for authors to have the incentive to expend their efforts in creating valuable works, copyright protection is required, then it becomes pertinent to consider what the actual optimal structure of copyright law should be. Reduced to its most basic fundamentals, we have already looked at a simple model that throws some light on this issue, at least as far as duration of protection goes. In most countries copyright protection for authors lasts for the life of the author plus an additional 70 years. Thus the period of protection (i) is significantly longer than the life of the author, and (ii) is not a definite time period (as was the case in the simplified model above) but rather depends on how long the author lives. Whether or not either of these are desirable features is a matter of debate. Many authors have argued that life plus 70 years is just too long (see, for example, Akerlof et al., 2002), as when time discounting is taken into account, any copyright term above about 20 or 30 years adds an insignificantly small incentive in terms of present value money earned. Second, making the term depend on the life of the author introduces a fair amount of uncertainty. If it were a set number of years, then just by looking at the date of publication of the original work, one knows when the copyright protection of the work expires. But when the protection is linked to the date of the author’s death, then it becomes quite a bit more costly to find out whether or not the work is in the public domain. In general, artificially adding costs is not a productive thing. So, exactly what is the optimal copyright term, and whether or not it should be linked to the author’s lifespan, is still a very open question.

Optimal Copyright Scope

While there is a very large literature on the optimal copyright term, the other dimensions along which copyright law provides protection have been far less studied. Since copyright does not protect the entire body of a work for the protection term (for example, fair use limits the protection, as does the idea of independent creation), copyright not only has a time dimension, it also has a scope dimension. The scope of protection defines which particular acts would be deemed to be illegal (for example, recording a cover version of an existing song without permission from the copyright owner would be illegal, but recording a parody version of the same
song might not be), and which particular aspects of the original work are protected (for example, copyright only protects the expression in a novel, and not the idea expressed). If the scope is set too narrowly, then the law provides hardly any useful protection, and the time dimension becomes basically irrelevant. The two dimensions must be considered together. But this then opens the question of how should duration be traded-off against scope in order to arrive at an optimal configuration of copyright law. This is a particularly difficult question to answer, mainly because 'scope' cannot easily be measured, but also because it is likely that there is not a unique solution. To see this, let's consider again a simple example.

Say the per-period inverse demand for access to a work, once that work is created, is given by

\[ p = m - bx \]

where \( x \) is the level of access granted measured in some relevant units. As always, this inverse demand curve ranks consumers according to their willingness-to-pay for units of access.

Now, assume that copyright law defines both a time duration in terms of a number of periods \( n \) during which the work is protected, and a scope parameter, \( s \). Let's assume that, when scope is set at \( s \), the per-period inverse demand that is available to the copyright holder is

\[ p = m - \left( \frac{b}{s} \right)x \]

So when scope is set at 1 (full protection), the entire inverse demand curve is available, but when scope is set below 1 (partial protection), the inverse demand curve that is available swivels inward, becoming steeper while retaining its vertical intercept. It is, therefore, a less profitable demand curve for the copyright holder.

Now, recall what happens from our first example with respect to the number of years of copyright protection. That turns up also as a division on the slope parameter of the inverse demand curve. So, if there are \( n \) periods of protection given, with scope set at \( s \) in each period, then the aggregate inverse demand for the entire protected term is

\[ p = m - \left( \frac{b}{ns} \right)x \]

Now we can see that (at least in this simple formulation) an increase in duration, \( n \), swivels the inverse demand curve outwards, while a decrease in scope, \( s \), swivels it inwards. So for each possible duration, there is a level of scope that leaves the inverse demand curve untouched. If, as we have
already argued, the law should provide just enough protection such that the author is compensated (but not over-compensated) for the costs of creation, then all we need is that the \((n, s)\) pair that are chosen set the inverse demand curve to a particular position (the position that gives exactly enough royalty income to the author to compensate for creating), and this can clearly be done with any number of \((n, s)\) pairs. All that is important is the product of \(n\) and \(s\), and not the values of each of the two.

Again, while over-simplified, this analysis points to there being no unique solution to the problem of attempting to find a particular configuration of duration and scope that together define a socially optimal law. The different equivalent solutions, then, will have to be considered in light of objectives that fall outside of pure social welfare maximisation. This insight, perhaps, indicates to us the reason why copyright law in many countries has been shaped by non-economic forces, most notably lobby groups and political considerations.

**Protection and Enforcement**

Another interesting trade-off that is present in copyright law refers to the interplay between the level of protection and the degree to which it is enforced. Clearly, no matter how stringent the law is, if it is not enforced it becomes ineffective. Likewise, a very strongly enforced but very lax law is also ineffective. Given that line of thought, one is led to the question of whether it is better to strengthen the law, or to strengthen the enforcement of the law.

Since the idea of enforcement leads us naturally to the concept of a lottery, a consideration of enforcement can be most easily done using the economics of risk. Let us characterise the copyright law by a single parameter, \(f\), which represents the monetary fine that is charged if infringement is detected.\(^{11}\) Second, we characterise the level of enforcement by the probability, \(\pi\), with which an infringement (assuming it has occurred) is detected. To keep things simple, we analyse the case of a consumer who can choose between consuming an original at a price \(p_o\), and consuming an illegal copy at a price \(p_c\). Naturally, we assume \(p_c < p_o\). The consumer has utility defined by two goods, wealth and units of consumption of the protected good. Specifically, utility is \(u(z, n)\), where \(z\) is an amount of money, and \(n\) is the number of units of the protected good consumed. Of course utility is strictly increasing in both \(z\) and \(n\), and we also assume that utility is strictly concave in \(z\), so that the consumer is risk averse on wealth lotteries. We restrict \(n\) to be either zero (the good is not consumed) or 1 (a single unit is consumed). The consumer has, initially, wealth equal to \(w_0\), which we assume to be strictly greater than \(p_o\).
If the consumer chooses to purchase an original, he/she enjoys a certain level of utility equal to \( u(w_0 - p_o, 1) \). Utility in this case is risk-free as, when the consumption is original, the probability of being detected as infringing copyright law is 0. We assume that the consumer strictly prefers to purchase an original rather than not consume at all, that is,

\[
u(w_0 - p_o, 1) > u(w_0, 0)
\]

Now, if the consumer decides to purchase a copy, he/she enters into a lottery, since with probability \( \pi \) copyright infringement will be detected and the fine will be charged, while with probability \( 1 - \pi \) infringement is not detected (even though it occurred), and no fine is charged. In this case, the consumer has expected utility of

\[
\pi u(w_0 - p_c - f, 1) + (1 - \pi) u(w_0 - p_c, 1)
\]

In principle, the objective of the legal authorities might be to set the parameters \( (f, \pi) \) such that no infringements occur, that is the consumer always prefers to purchase an original rather than a copy. This would be the case if

\[
u(w_0 - p_o, 1) \geq \pi u(w_0 - p_c - f, 1) + (1 - \pi) u(w_0 - p_c, 1)
\]

However, whether or not this is actually a reasonable objective depends upon (among other things) how expensive enforcement is, and how feasible it is to fine infringers. Nevertheless, since enforcement is likely to be expensive, one would not want any more of it than is strictly necessary, so in fact the authorities might want to set the parameters \( (f, \pi) \) such that

\[
u(w_0 - p_o, 1) = \pi u(w_0 - p_c - f, 1) + (1 - \pi) u(w_0 - p_c, 1)
\]

However, for any lottery situation like that of the choice of consuming a copy, there exists what is known as the ‘certainty equivalent’ level of wealth, \( w^* \), which satisfies

\[
u(w^*, 1) = \pi u(w_0 - p_c - f, 1) + (1 - \pi) u(w_0 - p_c, 1)
\]

In our case, \( w^* \) is a function of \( f \) and \( \pi \), so we can write \( w^*(f, \pi) \). Joining our two previous equations together, we can see that what the copyright authorities might be interested in achieving is to set \( (f, \pi) \) such that

\[
w^*(f, \pi) = w_0 - p_o
\]
Again, however, we run into a problem. For each and every level of \( f \), there is a unique level of \( p \) such that \( w^*(f, \pi) = w_0 - p_o \) holds. Therefore, this little equation alone is insufficient to tie down a uniquely optimal pair of numbers for the fine and the enforcement probability such that no infringement occurs.

There are ways around that problem, however. For example, assume that it is costless to the authorities to increase the fine, but that there is a maximum fine that can be levied, say \( f_{\text{max}} \), so that draconian fines are not legally feasible. Second, assume that enforcement carries a per-unit cost of say \( e \). This price represents the additional resources that must be spent on policing and perhaps court costs for the enforcement probability to increase by 1 unit. Then, for any given fine \( f \leq f_{\text{max}} \), the system generates expected revenue of \( \pi f \), and costs of \( e \pi \). It would therefore seem reasonable to choose that pair \((f, \pi)\) that satisfies \( w^*(f, \pi) = w_0 - p_o \) and that minimises \( e \pi \) subject to \( e \pi \leq \pi f \). Of course, that last inequality is exactly the same as \( e \leq f \), so we would want to choose the fine and probability such that the consumer is indifferent between consuming an original or a copy, and such that \( f \) is as great as possible but not greater than \( e \).

Assuming that \( e < f_{\text{max}} \), the optimal solution is to set \( f^* = e \), and then to calculate the optimal level of the probability, \( \pi^* \), from \( w^*(f^* = e, \pi^*) = w_0 - p_o \) (and if \( e \geq f_{\text{max}} \), the solution would set \( f^* = f_{\text{max}} \)). Thus, a budget-neutral (self-financing) legal arrangement sets the fine as large as possible and minimises the enforcement probability, but all subject to the consumer being indifferent between consuming a copy or an original.

It may be of use to consider what we have just done graphically. Imagine the space \((f, \pi)\). We shall put \( f \) on the vertical axis and \( \pi \) on the horizontal. Through that space we can draw a level-curve of the function \( w^*(f, \pi) = w_0 - p_o \). This level-curve is just a function \( f(\pi) \) running through the space \((f, \pi)\). It can be shown (the reader can try to verify this for him/herself) that this function has strictly negative slope, and it may be concave or convex (or indeed linear), or any combination of these. Any point on the function is a \((f, \pi)\) pair that ensures that the consumer is indifferent between consuming a copy or an original. Now, for the sake of argument, assume that \( e < f_{\text{max}} \), and draw the horizontal line through the graph at height \( e \). If we are looking to design the law in a budget-neutral fashion, the optimal pair (which is now of course also unique) is the point at which the curve originally drawn intersects the horizontal line at height \( e \). This is all shown in Figure 1.1.
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Alternatives to copyright law

There is now quite a large literature dedicated to the topic of possible alternatives to copyright law, where an ‘alternative’ is a mechanism that would achieve largely the same outcome, but without using a legal property right. The reason why this literature has sprung up, of course, goes back to the argument that copyright law establishes a legal barrier to entry, and thus monopoly pricing ensues, at least for a limited period of time. This is necessary because we are assuming, following our first example, that we need to ensure that the author has some financial incentive to create the intellectual property in the first place. But what if there were other mechanisms that could also guarantee this incentive, but without the entry barrier that is an enforced property right on the intellectual property?

Here we will take a quick look at some of these options, without going into too much depth on any. The main point to bear in mind as you go through this is that invariably the alternative options also imply a departure from social optimality of some form or another, just as copyright law does. In essence, this is simply saying that there is no way to get something for nothing, so providing an incentive for creative individuals must come at a cost somewhere in the system. It remains an open question which of these alternatives, if any, are indeed able to achieve the desired outcome (that the work in question is produced by the author, and it is able to be accessed by consumers) at a cost that is no greater than that occasioned by copyright law.

\[ f_{\text{max}} \]

\[ f^* = e \]

\[ (f, \pi): w^*(f, \pi) = w_0 - p_0 \]

Figure 1.1 An optimal budget-neutral copyright law

ALTERNATIVES TO COPYRIGHT LAW

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Strategic Pricing

Clearly the lower we price an original, the more competitive it becomes in the market that is shared with copies, and so the less likely it is that copying will take place. How low the price of originals can go depends (mainly) on the price elasticity of demand for originals when copying occurs, a concept that is very closely related to the degree of substitutability between originals and copies. Of course, outside of any costs that are imposed upon copiers from copyright law, if the only real difference between an original and a copy is that the former pays a royalty back to the author and the latter does not, then copiers will always have a cost advantage over sellers of originals, and thus will be able to price lower. This is an issue in how best to structure the royalty contract so as to minimise the negative effect that the contract has upon the competitiveness of originals in the market (see Woodfield, 2006 for some insightful discussion).

Related to the topic of strategic pricing is the option of price discrimination. In terms of copyright goods, Liebowitz (1985) introduced what he called ‘indirect appropriability’ as an alternative mechanism under which creative individuals can appropriate benefits even when there is copying. If the creator can successfully identify who is going to copy, then that consumer can be charged more for access to the good, and will willingly pay more as the copier plans also to gain benefits in the copying market. Thus, by price discriminating, the original creator can indirectly appropriate the value from the copying market. This is what has happened in the market for journals, whereby a higher subscription price is charged to libraries than to individuals, because it was recognised that libraries allowed multiple access (and photocopying), and are thus willing to pay more to have the journals than are individuals.

Bundling

There are many examples of easily copied creative goods being bundled (that is, sold together, and not separately) with goods that cannot be easily copied. If this can be achieved, then the negative effects of copying are ameliorated as consumers are forced to purchase originals of the creative good when they make their purchase of the other good. An example is when computers (not easily copied) come with pre-installed software (easily copied), or when the easy-to-copy owner’s manual for a television can only be purchased with the impossible-to-copy television. Another good example is when authors sign original copies of their books or records at stores, thereby affixing a hard-to-copy good (the autograph) onto the easy-to-copy book (or record).
Bundling can also occur with advertising products so that rather than ameliorating the negative effects of copying, the effects become positive, since the more the good is copied the more valuable is the embedded advertising. As an example of this, consider the use of famous brands of automobiles in James Bond films, or the appearance of advertising on the field of play of major sporting events.

**Network Effects**

A network occurs when many individuals (the user base) are interconnected in some way. The larger the user base is, the more valuable it can become to join the network, as the same network services more individuals and so there exists more opportunities for valuable exchange between them. For the case of copyright protected goods, one can think of computer programmes as a good example of a network. The worldwide user base for Microsoft products, for example, is very large. It therefore becomes relatively more valuable to use Microsoft products, as the communication cost between any two users is lower on the Microsoft network than between a Microsoft user and a non-Microsoft user. In that case, the larger the user base is, the more value is placed upon the software that defines the network, and so a greater price can be charged for originals of this software. The point to note here is that if copying increases the user base (that is if many users are actually using illegal copies of the underlying programmes), then indirectly copying increases the value of purchasing and using original software, potentially a beneficial effect for the owners of the relevant copyrights.16

**Experience Effects and Versioning**

We often see copyright goods being given away for free, or perhaps a moratorium on controls for copying. For example, many software packages come in a ‘professional’ or ‘complete’ version, and a much cheaper ‘student’ version, or even a free ‘trial’ version. Even more radical, perhaps, copyright protected music can be accessed totally free of charge on the radio. The difference between versions is important – trial versions of software are often linked to a specific time dimension (they cease to work after a certain time) and/or they lack some important aspects of functionality that is included in the full version. The trial versions are therefore of lower quality. Likewise, accessing music for free on the radio is a lower quality experience than owning and accessing one’s own music, since there is far less choice about exactly which songs are accessed at which time.

The argument behind having different versions of access available is
that consumers may gain some (perhaps limited) experience by using the restricted or low quality version that then translates into greater demand for the full version later on. In that way, free or cheap access to low quality versions can imply a potentially beneficial effect for copyright owners.

**Lead Time**

Outside of cases of pure espionage, it is impossible for a copy of a work of authorship to come into existence until the first original is sold. Indeed, there must be a certain time lag between the first sale of an original and the first sale of a copy, as producing a batch of copies of marketable size must take some time, and during that time the originals face no competition. Of course, this lead time can be made potentially much more valuable if consumers are well informed of exactly when and where they can go to get the first release of the original. That observation might be a good explanation for why the release date of many famous novels is advertised well in advance, and we see huge queues accumulate at the shop doors at the advertised release time. The same no doubt applies to software, where new updated versions are often advertised in advance of release in order to take advantage of early-bird customers.

**Digital Rights Management (DRM)**

Most copyright protected goods are characterised by being pure information goods. That is, they are able to be produced, accessed and stored in a digital format. This, of course, is what makes them vulnerable to copying, as copying a digital file is quite cheap and easy to do. One way around this is to embed onto the digital support containing the original some code that makes copying either impossible or at least much more complex and expensive. These sorts of protection measures are known as digital rights management. As an example of DRM, it is common that DVD movies are released with specific zoning restrictions on the disc, so that it can only be viewed on a play-back device from a specific geographical area of the world. So you may well find that a legally purchased DVD in Europe will not actually play on a play-back machine purchased in the USA. The idea behind this is that the movie owners, in seeking to maximise their profits, would like to differentiate the dates of release of the movies geographically. Music CDs can also be produced with code that makes them impossible to copy digitally. Some software packages also contain DRM features that restrict the number of times the package can be installed, or that limit the number of machines the package can be installed on.

Such measures may work, and they may not. Just as often as not, they
simply lead to an inefficient technology race, whereby hackers get around the DRM code, and so the code is strengthened, and the hackers go ahead and get around that too, and so on. DRM can also violate certain legal rights of consumers. For example, in most countries when one purchases a music CD, you have the right to make a copy for your own use (for example, in order to have a copy for your car stereo, and another in your home), so making the disc unable to be copied violates that right. Similarly, DVD zoning implies that a person who legally purchases a DVD movie is unable to enjoy it unless they also have the correct play-back device, which may violate certain basic consumer rights.  

**Taxes on Blank Supports and Copy Technologies**

In order to make a useable copy of a copyright protected good, one needs a physical support to hold the copy, and a physical machine to produce the copy. For example, to save a song from a CD to an MP3 player, one needs the MP3 player (the support) and a computer with the relevant software (the copy technology) to actually make the copy. In some countries a tax system has been set up under which a levy is imposed upon the purchase of blank supports (and some copy technologies), and the proceeds from these taxes is paid to copyright holders (via a copyright collective) in compensation for lost royalties from illegal copies.

There is more than one way to interpret taxes on blank supports, and they have sparked no end of debate as to whether or not they are legal, or even reasonable. In short, by taxing the blank supports, one is simply shifting a costly externality from the copyright holders to users of blank supports who do not copy any protected works. Seen in that way, there is little legal justification for such a system. But, others would argue that by having the taxes in place, the blank supports become more valuable to users (since now they can be used legally for more things), and so the higher price is justified.

Are these taxes likely to contribute to an increase in creative efforts? On the one hand, the taxes provide compensation for creators to expend their efforts, and so creativity is increased. But on the other, since many creators work in a digital environment, saving their own work onto blank supports, the costs for creative works is increased. Probably the taxes will displace some marginal creators, and total creativity is negatively affected. One might scoff that the creators who are displaced are of little social value (if they are displaced by an increase in costs of a few dollars), while the ones who are incentivised are of great social value (the ones who are likely to be copied), and so losing the former to retain the latter is a good deal. But we should also bear in mind that (a) the low-end marginal
creators comprise a population that is hugely greater in number than the top-end popular creators, and (b) most top-end creators were marginal when they started out, so losing marginal ones may turn out to be quite costly in the future.

NOTES

1. Economics has generally taken what is known as a ‘consequentialist’ approach to the law, in which copyright is justified (or criticised) in terms of desirable outcomes. The underlying assumption within this approach is that the law should be designed so as to maximise some logical metric of social well-being. The consequentialist approach conflicts with the ‘deontological’ approach, which often forms the foundation of legal scholarship and which seeks to justify copyright as a matter of it being morally correct.

2. I will not be providing a survey here, as several excellent surveys already exist. The interested reader can consult, for example, Towse et al. (2008).

3. See Chapter 4 for a discussion of fair use.

4. Time preference would play a clear role here, since the royalty cheques will most likely come in over time. We can either assume that the author is perfectly patient (and so does not discount future income), or else we should say that the book will only be produced if the present value of the expected future flow of royalty payments exceeds $10,000. We are also assuming away any other income that the author might earn from having written the book. For example, if the author is a university professor, and the book is a textbook, not only will royalty money come in from book sales, but also there is feasibly some financial gain to the author indirectly through having a better CV, perhaps leading to a promotion at work.

5. The per-period inverse demand curves are each $p = 20 - (6/100)x_i$. Thus, the per-period demand functions are given by $x_i = (20 - p)(100/6)$. The horizontal sum of $n$ of these is $x = \sum x_i = (20 - p)(100n/6)$, which rearranges to the original inverse demand curve given in the text.

6. In essence, our assumption is that the new demand curve that comes into existence and is serviced in each new period of protection is exactly the same as the ones before, and so in our simplified model each period should generate the same optimal price. We could assume that there is some sort of depreciation of demand over time, in which case the optimal per-period price might be different over time. Such less restrictive assumptions may seem attractive for injecting more realism, but they involve a lot of messy math to find an optimal pricing strategy. Our simplified model still delivers the intuition that we are looking for.

7. In case you didn’t notice, it is the inclusion of the deadweight loss into social welfare once copyright protection expires that leads to the greater per-period social welfare post protection than during protection in the example given previously.

8. We shall look at some alternatives to copyright below.

9. The only reason why the copyright term might last longer than the author’s life is to be sure that something is left in inheritance. However, making the term a fixed number, such as say 100 years, would do the same for all authors outside of any who both live to a very old age, and who created a valuable work while still a small child. I know of no such cases.

10. There is plenty of literature on the issue, some of which is now rather dated. Many early studies even debated whether protection should exist at all (see Plant 1934; Hurt and Schuchman 1966; Breyer 1970). Other more recent studies have tried to find an ‘optimal’ protection term (see, for example, Koboldt 1995; Pollock 2009). Almost all studies argue for a shorter protection term (in some cases much shorter) than life of author plus 70 years.
11. We assume here, for simplicity, that the fine is a monetary amount. But it could also easily be thought of as the monetary equivalent of a jail sentence, or any other form of punishment.

12. Notice that the assumption is that even if consumption of an illegal copy is detected, the consumer still gets to enjoy the consumption value of the good. An alternative assumption could be that if infringement is detected the good is confiscated (aside from the fine), and $n$ is set to 0. Which is the better assumption is simply a question of whether or not infringement is detected before or after consumption actually occurs.

13. Interestingly, $w^*$ will also be a function of $w_0$, which suggests that what is an optimal law for any one consumer may not be optimal for another. We will not delve into this very interesting debate here.

14. For a survey of some of this literature, see Liebowitz and Watt (2006).

15. See Chapter 2 by Michael Waldman for more on this topic.

16. Of course, the value of using illegal copies also increases, and so it is still a debateable point if a larger user base actually ends up increasing the sales of originals or not.

17. This topic, as regards radio play of music, is addressed in somewhat greater detail in Chapter 7.

18. At the very least, the consumer should be clearly informed at the point of sale as to whether or not he/she will be able to play the movie once purchased.

19. See Legros and Ginsburgh (2013) for a recent paper on this very interesting topic.

REFERENCES


