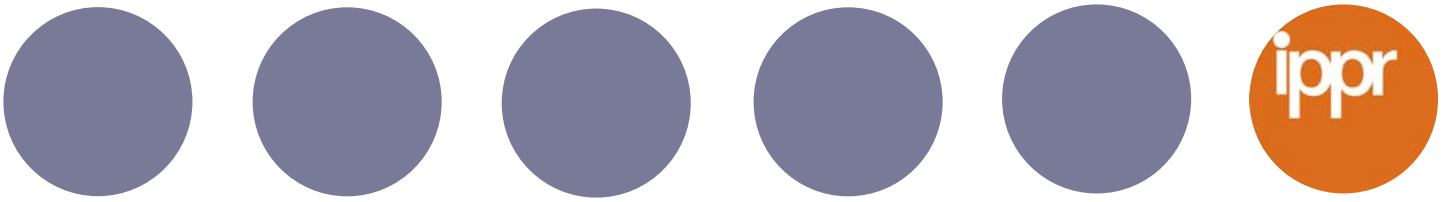


# The Value of the Public Domain

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JULY 2006



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## About the author

Following his graduation from Cambridge University with a first in Mathematics, Rufus Pollock worked for a period in software before returning to Cambridge to pursue a PhD in Economics, focusing on innovation and intellectual property policy. In addition to his academic work he is Director of the Open Knowledge Foundation and a country coordinator for the Foundation for a Free Information Infrastructure.

# 1. Introduction

Traditionally, the public domain has been defined as the set of intellectual works that can be copied, used and reused without restriction of any kind. For the purposes of this essay I wish to widen this a little and make the public domain synonymous with 'open' knowledge, that is, all ideas and information that can be freely used, redistributed and reused. The word 'freely' must be loosely interpreted – for example the requirement of attribution or even that derivative works be re-shared, does not render a work unfree.

This public domain is very large. It includes the contents of the traditional public domain such as works originally subject to monopoly protection but where the protection has expired, for example Shakespeare's plays, which were once subject to copyright, as well as items never subject to protection, for example the theory of relativity. It also includes open source software and work released under (some) Creative Commons licenses. As such, it consists of almost all of humanity's intellectual output up until the very recent present (for patented ideas it excludes approximately the last 20 years and for copyrighted works approximately the last 100 years).

## An age-old but evolving concept

One of the first printed texts of which we have record is a copy of the Buddhist Diamond Sutra, produced in China around 868AD. In it can be found the dedication: 'for universal free distribution'. Clearly, the idea of public domain, that is, open access to knowledge, has been present since humanity first began to formally transmit and share ideas. It is also likely that the urge to keep ideas secret, particularly those that had 'commercial' value, is equally old.

With the development of trade and technology, particularly during the Renaissance in Europe, these parallel approaches of openness and secrecy continued to evolve but the tension between them also increased. With the introduction of formal monopoly rights such as patents and copyrights during the sixteenth and seventeenth century, there was now a halfway house of sorts whereby the monopoly (and the associated profits) of secrecy was combined with openness in the form of the disclosure of the work.

These alternatives of openness, secrecy and state-sanctioned monopoly have stayed with us down to the present day. While most of our ideas, particularly cultural ones, are 'public domain', free for anyone to use and reuse, a significant portion of the intellectual works and products created by the economies of the world are protected either by some form of intellectual property rights or by secrecy – or by both, as is the case with most proprietary computer software, for example.

However, there have also been considerable changes. On the one hand there has been a large increase, particularly over the last 30 to 40 years, in the scope and duration of intellectual property rights. On the other hand, and at the same time, especially in recent years, we have seen the rise of self-consciously open models of innovation, particularly in software where the 'copyleft' approach to knowledge licensing first arose in the 1980s. (This is the system whereby copyright is inverted to sustain shared access to, and prevent proprietisation of, information by requiring, as a condition of access, that those who reuse the shared resource contribute back their modifications.)

However the most significant of all changes underlies these others, for it is the change in the role of knowledge in society and the economy. Terms such as the 'information age' or the 'knowledge economy' are now commonplace and hard statistics point to the fact that in most western economies the information-based service sector is now more important than manufacturing. These changes in turn result from, or at least depend upon, a revolution in communication and computer technologies that has greatly reduced the cost of production, distribution and manipulation of knowledge. Whole industries that neither existed nor were imagined 50, and possibly even 20, years ago have grown up that exploit these new-found possibilities.

What do these vast changes mean for the production and dissemination of knowledge, as well as for their regulation and support by government? These are large questions and not ones that can be answered adequately here. Instead, this paper shall address a small part of this large picture by focusing on the public domain and its value to society, concentrating in particular on the way in which open, 'public domain', approaches can generate commercial as well as societal value.

Too often this value has been unarticulated and thereby left vulnerable. While those who promote stronger intellectual property rights point to the tangible benefits that these offer their businesses, the corresponding

costs to the public domain and its users are invisible or ignored. This paper seeks to redress the imbalance and, in doing so, to spur a re-orientation of innovation and information policy. Our current paradigm represents a form of monomania in which monopoly rights, in the form of intellectual property, displace all else from our thinking on this subject. It binds us to a narrow, and erroneous, viewpoint in which innovation is central but access is peripheral. The system it has engendered is now so distorted that its social and commercial costs in several key areas have become large. It is therefore high time to restore balance, in particular by taking proper account of the public domain and open approaches to knowledge production. It is only by doing so that we will be able to take full advantage of the possibilities offered by this digital age.

## 2. Setting the scene

We begin by making some general remarks, which form a background for the set of case-studies and research that follow.

### The concept of (social) value

When we talk of 'value' it is important to be clear about what we mean. In this paper when the term value is used it should be taken as social value (or welfare), which is the usual meaning attributed to the term value by economists. This value, be it of an apple or a piece of software, is the value derived by a user from its employment or enjoyment – often approximated in monetary terms by willingness-to-pay (WTP) (the maximum value the user would have paid for the good) – net of the costs of producing the good. For goods with an associated price, social value may in turn be divided into 'user value' (consumer surplus) – defined as the value to the user of the good, net the price paid for it – and 'commercial value' (producer surplus) – defined as the price minus the cost of producing the good (the seller's profit).

Thus the value of a good may be quite different from the price paid for it. This is an important distinction to keep in mind, for it is not unusual to see the value of an activity being equated to its revenue rather than to the utility generated for society. To illustrate this difference, consider the case of a novel that goes out of copyright and enters the public domain. Suppose before this occurred the novel was sold for £10 in bookshops but afterwards it is sold for £5 and is also available for free on the internet. Sometimes it is suggested that this results in a reduction in the value of that work for society since before the work was 'worth' £10 but now is 'worth' only £5 or even nothing.

From the above this can be seen to be completely false. The value of the work has not changed at all. All that has happened is that the price has dropped. A consumer who previously valued the book at, say, £15 and who paid £10 and was left with £5 of 'consumer surplus', now pays £5 (or £0) and is left with £10 (or £15) of 'surplus'.

Furthermore, the reduction in price means that consumers who valued the work at less than £10, and therefore did not buy at the original price, will now be able to purchase it. For each such consumer, society gains the entire value the consumer puts upon the good (net of costs). Aggregating the valuations of all of these individuals who only get access at the lower price gives the total value to society of having this lower price. Conversely, when a monopoly – or some other regulation – restricts access to a good, there is a consequential loss to society (termed the 'deadweight loss').

To give a concrete example, consider the case of pharmaceuticals in India. Since 1973 India has not had patents for pharmaceutical products. However, under the TRIPs (Agreement on Trade-Related Aspects of Intellectual Property Rights) agreement – to which India is a signatory – patent protection must be provided for pharmaceuticals. Patents are monopolies and therefore their introduction will result in a deadweight loss to society. A recent study (Chaudhuri *et al* 2003) sought to determine the magnitude of this loss. It estimated that this change will cost Indian society, via its effect on consumers and local manufacturers, between US$350 and 500 million a year, but that the gain to the owners of the patents will be only US$50 million a year. This implies a deadweight cost for these monopolies of US$300 to 450 million a year, a very significant sum.

Moreover, in the case of monopolies for knowledge we must also take account of the costs arising not just from the loss of access but from the loss of reuse. Just as some users are restricted from getting the good, so will some innovators be prevented from building upon the original to make new products. If the monopoly acts as a significant bar in this respect, the result will most likely be a large loss to society. A classic example of exactly this outcome is afforded by Watt and his improvement to the steam engine. Watt in partnership with Boulton vigorously enforced his patent against both infringers and improvers. This held up new developments and it was only with the expiry of his patent in 1799 that the flood of pent-up innovation was released (Jacob 2002).

Another example is provided by photography. In France the invention of the camera was bought by the government and made freely available, resulting in the development of a large number of improvements. In England, by contrast, it remained proprietary, inhibiting further research and development (Scotchmer 2003).

## The special nature of knowledge

Knowledge is different from many 'normal' physical goods. It is different in being, at least approximately, costless to reproduce once the first 'copy' is made. This has profound consequences. If I share a pair of shoes with you we don't create a new pair of shoes – in fact, I now only have my shoes half the time. However, if I share a piece of knowledge with you, you have gained something and I have lost nothing. As Jefferson eloquently phrased it: 'He who receives an idea from me, receives instruction himself without lessening mine; as he who lights his taper at mine, receives light without darkening me' (Jefferson 1813).

In the economist's terminology this feature is known as nonrivalry. It makes knowledge a good similar to traditional public goods such as national defence, the road network, or even the BBC, and it fundamentally alters how we approach its distribution: from the viewpoint of society, once a piece of knowledge is in existence the best thing to do is distribute it at cost (which may be zero or very close to zero).

So why do we not always distribute knowledge at its marginal cost? The answer is simple: we need to pay for the first 'copy', which unlike subsequent copies may be (very) costly. For example, developing and testing a new pharmaceutical may run into the hundreds of millions of pounds. Thus, some way must be found to pay for or fund this first 'copy', and the possibilities can be summarised in four categories:

1. Up-front funding either by the state or by other entities – such as charities – followed by free (or marginal cost) distribution. This is how the majority of basic scientific research is done today and it is similar to the funding of the BBC via a licence fee. It also accounts for a large proportion of the production of software, much of which is bespoke and therefore commissioned[1].

2. Donations or self-financing with free distribution. This covers examples such as Wikipedia, blogs and many open source projects where the 'knowledge' is produced by people in their spare time.

3. The grant of monopoly rights in relation to the copying or use of the knowledge in the form of intellectual property such as copyright and patents. Here the intent is that the grant of a monopoly will enable the creator to charge higher prices for the use of the good and thereby to earn sufficient monies to cover the initial costs of producing it.

4. Using imperfections of the market to obtain profit from being the creator of knowledge but without using monopoly rights. Such methods include secrecy, first-mover advantages, marketing and the sale of complementary goods that are rivals but for which an advantage is conferred by the production of the original knowledge. This area probably accounts for the majority of funding, both at present and in history[2] .

These different methods are not always exclusive and usually several may be employed at once. For example, musicians may sell their music under copyright (monopoly rights) but also sell tickets to concerts (complementary rival goods) (Connolly and Krueger 2005). The New York Times and The Guardian both give free access to their online edition but feature advertising as well as selling a corresponding print edition (complementary goods). Oberholzer and Strumpf (2004: 5) show that provision of a free online edition does not appear to harm, and may even help, sales of the related print edition. And Yagan (2005) recounts his extremely successfully experience of 'giving away' content in the form of online textbooks first at SparkNotes and then, subsequent to its acquisition, at Barnes and Noble.

Thus while making *existing* knowledge open is optimal, such a strategy may not be compatible with ensuring its creation in the first place. When the first-best solution of up-front funding is impractical or inefficient we may have to make difficult trade-offs between the costs of restricting access and the benefits of providing creators with greater incentives to produce work. This tension poses difficult question for policymakers and is also central to how to value the public domain, the topic to which we now turn.

1. An interesting piece of indirect evidence in this regard comes from Regner and Barria (2005) who study the Magnatune music label. Magnatune, as well as allowing free downloads of low quality versions of songs, permits users to choose how much to pay (between US$5 and 18) to download a high quality album. Surprisingly, the average payment is US$8.20, well above the minimum of US$5 and even higher than the recommended price of US$8.

2. See Cohen et al (2000), Levin et al (1987) and Arundel (2005) for extensive survey evidence that firms appropriate returns from innovation using a variety of methods such as secrecy, lead time, marketing and sales, learning curve advantages and patents. Patents in most industries are usually relatively low on the list – as Hall (2003: 9) summarises: 'In both the United States and Europe, firms rate superior sales and service, lead time, and secrecy as far more important than patents in securing the returns to innovation. Patents are usually reported to be important primarily for blocking and defensive purposes.'

## Valuing the public domain (in theory)

There are two possible methods by which we might value the public domain. The first is the simplest and consists of setting the value of the public domain as equal to the social value of all the works that make it up. The second, slightly more complex, approach is to calculate what might be termed the net value of the public domain: that is, the social value generated by the contents of the public domain being public as opposed to private (either secret or covered by monopoly rights of some form) and with creation costs deducted (for example, the cost of publicly funded research).

To put this in concrete terms let us consider the works of Shakespeare, which are in the public domain. Under the first approach we would take the value to be the full societal benefit gained from Shakespeare's work as it stands with free access for all. Under the second approach we would need to imagine a world in which Shakespeare's work was still covered by copyright and to subtract the value generated in that situation from that obtained in the first.

In general this paper will use the second, 'net value', approach. One final point remains, namely to take account of the effect on the production of knowledge were the public domain 'privatised' (or conversely if some of the private domain were made public). Remember that the very purpose of private monopoly rights in this area is to increase the remuneration of creators so that more works are created. Conversely, opening up knowledge may have a positive effect on creativity by reducing transactions costs and the barriers to reuse for future creators.

If these 'production' effects are large it is important that they be taken into account. There are two ways to do this. One approach is to subtract the total social value of the extra works that would have been created with a 'private' public domain[3]. Under the second we subtract the cost of those works under the assumption that it would be possible for society to find some way to fund them in an alternative manner (for example, through government grants or using a levy). Let us term these the uncompensated and compensated value. In general, and unless otherwise stated, this paper uses the compensated value.

3. It is, of course, possible for this to be the other way around: that is, there are works that exist under a public domain scenario but not under the private one (for example, as a result of transaction cost and hold-up problems). In fact, when considering the case of works subject to copyright we can be certain that, at least at the moment, the production effects of privatising the public domain would be negative. This is because extending copyright to an infinite term would provide no extra incentives for creators – copyright is already so long (life plus 70 years) that the difference in income provided by the two terms is essentially zero – but would inhibit those who seek to build upon and reuse the works of the past.

## 3. Valuing the public domain in practice

In this section and the following we shall attempt to gauge the value of the public domain by examining it from several different perspectives and with several different pieces of data. No one of these perspectives is the only, or the correct, one but together they deliver a coherent picture of the social and commercial value of the public domain.

### The broad public domain

In the most basic sense, a broad and deep public domain is essential to our cultural, intellectual and commercial lives. Imagine the situation if each time a teacher wished to tell her pupils about freedom of speech, or the history of the parliamentary system she needed to seek out the owner(s) of this piece of intellectual property and purchase the right to make the 25 copies required for her class.[4] Not only teaching, but most of our cultural and intellectual lives would grind to a halt.

This vast 'public domain' of ideas, as well as much of the language in which we clothe them, is so omnipresent that we are often in danger of taking it for granted, especially when we start to discuss intellectual property. Yet this public domain is the sea in which all else subsists, including those islands that represent works formally protected by one intellectual property right or another. As Isaac Newton said: 'If I have seen further than others it is because I have stood upon the shoulders of giants', and it is no empty cliché that all work builds upon the past. Even a brief survey in any given area can find endless examples of direct or indirect borrowing from earlier works, and a broad and deep public domain that allows for free use and reuse is essential to this process.

Can we quantify the extent of this benefit? The answer, at least with present data and modelling tools, is no. The public domain in this broad sense is simply too big. Trying to calculate the counterfactual as to what would occur should all of it be proprietary – each individual idea with an individual owner from whom one must seek a licence for each reproduction, each alteration – is simply too far from common experience for us to conjecture even a rough estimate. Nevertheless, there are three pieces of evidence that indicate that this value is large.

First, the fact that most societies have, at the very least, firmly excluded general ideas (that is, those without 'industrial application'), as well as mathematical algorithms and business processes[5] from patentability indicates that the social costs involved in privatising these types of knowledge outweigh the benefits. Second is the fact that in all countries non-private sources (such as governments and charitable foundations) account for a substantial – and in some cases a majority – of expenditure on research and development[6] (OECD 2005). Combined with the extensive evidence on spillovers from public to private R&D, such figures clearly indicate that all societies identify significant benefits in maintaining a system of public R&D and open science, not only for its own sake but also to act as a complement to, and input into, private, commercial activities[7].

Third is the growing body of evidence of the difficulties caused by the proprietisation of science, particularly basic biomedical science, in the United States[8]. For example, Cockburn (2005: 7) concludes that:

> '[T]he extension of exclusionary intellectual property rights into basic research has unleashed a surge of entrepreneurial energy and risk taking in commercial science, with potentially very significant benefits

4. This possibility is no longer in the realm of fantasy, as exemplified by the experiences with trademarks in the United States, where there have been successful attempts, both spoof and serious, to register trademarks in terms such as 'Freedom of Expression' or 'Stealth' (see www.boingboing.net/2005/07/23/copyfighter_to_trade.html). See also St Clair (2005: 15).

5. With due respect to the United States, which has recently (1998) introduced, via a judicial decision, monopoly protection for everything 'under the sun, made by man'.

6. OECD figures indicate that in 2004 private firms accounted for approximately 53 per cent of total expenditure R&D with the remainder coming from public sources. In the US and Japan the private share is higher at 63 and 74 per cent respectively. In Latin American, by contrast, the public share is the majority (National Science Foundation 2000).

7. See Jaffe (1989), Acs et al (1992), Mansfield (1995), and Toole (1999) for evidence of large spillover effect from public to private R&D. David et al (1999) summarise the literature on the complement vs. substitute role of public and private R&D. Dasgupta and David (1994) provide a more theoretical perspective on open science and its benefits both publicly and privately.

8. See also: Mowery et al (1998), which looks at the Bayh-Dole act and the increases in university patenting, raising concerns that not enough attention has been paid to the potential to increase the excludability of academic research. Finally, an excellent summary of this area can be found in Foray (2004: 225 ff).

> to society once the technology reaches end-users. But these benefits carry with them substantial costs: the patent-driven vertical struggle for rents within the biomedical innovation system may have generated important inefficiencies, waste, and misallocation of resources [...] Restrictions on access to research tools and data are likely to prove very costly in the long run, and stronger protection of the public domain may be a prerequisite for the future health of basic biomedical science.' (emphasis added).

The situation has likely not been worse than it is only because of liberal licensing due to invent-around threats and the fact that many researchers, especially those in academia, have simply infringed on patents over research tools (Walsh *et al* 2003: 322ff).

The combined effect of this evidence, tentative though some of it still is, makes a strong qualitative case for the commercial as well as social value of this 'broad' public domain. In the following sections we will be able to examine particular examples of open, public domain, approaches to knowledge, so as to form some quantitative, as well as qualitative, conclusions about its importance. Nevertheless, this should not make us forget that it is this broad public domain that is undoubtedly the most significant to us as a society, socially, culturally and commercially.

## Online file-sharing

Over the last five years a significant amount of economic research has been done on the effects of online file-sharing over peer-to-peer networks. Almost all such file-sharing has been illegal, and so it provides an interesting real-world experiment in the consequences of a partial suspension of copyright (at least in relation to music). This experiment gives us an opportunity to estimate, with 'live' data, both the potential gains to society in terms of increased access, and the potential costs in terms of a reduction in the production of new works consequent upon a diminishment in the remuneration of creators. Putting these two results together will then give us, albeit indirectly, some sense of the value of a public domain approach in this area.

This larger question is best addressed by dividing it into several smaller ones. First, does (illegal) online file-sharing increase or decrease legal sales? It has long been thought that there are two possible effects operating in this regard but in different directions. On the one hand there is a substitution effect whereby cheaper, but often lower quality, copies obtained via a file-sharing network 'substitute' for purchases of legal copies. On the other hand there is the 'sampling' effect, whereby the greater exposure to music resulting from the cheaper access via file-sharing increases purchases of legal copies.

Second, what consequence would a decline in sales have on the output of creative works? Here there are several more factors to consider. Increased exposure (the sampling effect again) may increase attendance at concerts and help to build a fan-base that in turn expands artists' revenue (a traditional reason why new bands often give their records away, exemplified recently by the Arctic Monkeys who got to number one in 2005 after giving away their single for free on their website). And losses in sales do not translate one to one into changes in income for artists – or changes in label profit used to fund other artists: figures suggest that approximately 16 per cent of the value of an average CD goes in payments to artists while approximately 10 per cent is label profit, with the rest being used up in paying for various overheads (Cohen 2004). (However, these figures may be on the high side. Regner and Barria (2005) citing Krasilovsky and Shemel estimates only that only three per cent goes to artists.)

Third, and this is the fundamental question for a policymaker, what is the overall result of online file-sharing for society's welfare? On the one hand there is the increase in access because downloading from file-sharing networks is free or nearly free. This benefits society in that people gain access to, and get value from, works that they would not have purchased legally. These are the sales that would *not* have happened in the absence of downloading, so they represent no loss to the music industry (the production of these copies being virtually costless since it just involves the copying of bits – a fact that is the main reason why illegal downloading is fundamentally different from going into a shop and stealing something). On the other hand where downloads do displace legal sales there may be a reduction in the production of musical works (though this loss must be offset against the gains in other areas as consumers spend their money elsewhere, for example on DVDs).

The research suggests several interesting answers to these questions. First, and most important, that the benefits of free access (or nearly free access) are very significant. Rob and Waldfogel (2004) – the only

researchers to examine this question directly[9] – find that by allowing 'public-domain' type access to music there would be net gains to society of around US$45 per person – a very large sum indeed (average annual sales per person are US$126 so this represents around a third of curent gross sales).

Of course, we must bear in mind that these gains are quoted 'net' on the assumption that creators have been compensated for any lost revenue. Thus we need to make some adjustments if we are to arrive at a true estimate of a public domain approach in this area. There are two points to make. First, even if this assumption is untenable it is likely that the value of a more open, public domain, approach yields a positive value for society, since the impact on the production of new works, at least in present circumstances, seems likely to be quite small, for two reasons: though debate continues it would appear that the impact of peer-to-peer downloading on sales does not seem to be that high (Oberholzer and Strumpf 2004)[10]; and the impact of file-sharing on actual creators – and therefore on creativity – is likely to be far smaller than the impact on sales, and may, in fact, be positive.[11]

Second, and more importantly, it *is* plausible to assume that creators could be compensated for any loss in revenue by means of some form of 'up-front' funding system. For example, Canada already has a broad private copying exception, which covers downloading from peer-to-peer networks, combined with a levy on items such as blank CDs, with the resulting revenue going to artists (Geist 2005). For Finland, Oksanen and Valimaki (2005) estimate that a 5-Euro-per-month charge on broadband would be sufficient, and in the UK (as in much of the rest of the world) collecting societies are already operating similar schemes for the collection of copyright income in other areas. The French parliament has also recently introduced a broad private copy exception covering peer-to-peer along with a levy, though it appears likely that this will be reversed before the legislation becomes law. For more on alternative compensation schemes see Fisher (2004).

Thus these large 'net' gains of a public domain approach reflect real, realisable value. Furthermore, these gains can, and should, be used to *increase* the remuneration of artists and funding for artistic works. The result would be a win-win situation of increased access *and* increased creativity, delivering social and commercial value as well as a freer and more dynamic creative industry.

## Access to older works

In addition to the data provided by file sharing, we can also refer to that supplied by a recent report commissioned by the Library of Congress on reissues of sound recordings in the United States (Brooks 2005). The report is interesting because it studies a simple natural experiment. In the United States, pre-1972 sound recordings are protected under state law until 2067. Thus the vast majority of recordings from that era are still protected by copyright. However, in Europe, because of a shorter term for copyright protection of sound recordings, many earlier works are not protected. Thus there are two sets of people who can make US works available: rights-holders and others (either European firms who may legally do so or small US firms operating beneath the radar). According to theory we should see more reissues from rights-holders than others because they have easier access to the originals (unless they destroyed them – as many did) and a greater incentive to reissue recordings than non-rights-holders due to their monopoly position.

The evidence, however, as uncovered by the Brooks study, is to the opposite. Comparing reissues of older recordings by rights-holders and non-rights-holders, the study finds that non-rights-holders have reissued

9. LeGuel and Rochelandet (2005) estimated willingness to pay at an average of 0.30 Euros (substantially below current retail prices) but without distributional data it is difficult to infer social welfare from this.

10. This study is one of the most comprehensive to date, and finds no overall impact on sales, as with Le Guel and Rochelandet (2005) with their French dataset. At the other end of the spectrum Blackburn (2004) finds very large negative effects of up to 100 per cent of the sales decline in past years (though there are reasons to suspect upwards bias in his results due to the methodology used). Several other studies – Rob and Waldfogel (2004), Hong (2004), and Zentner (2003) – find intermediate effects. Finally, there is the fact that world-wide music sales increased substantially in 2005 while the number of users on peer-to-peer networks had continued to increase (at double the level in 2003).

11. As already mentioned, the majority of the price of a piece of music goes into 'overheads' and does not flow directly or indirectly to creators. Furthermore, the impact of changes in sales may be asymmetric, for example Blackburn (2004) while estimating the largest overall loss also found that the bottom three quarters of artists (measured by income from music sales only) gained from online file-sharing. Finally, most artists in the music industry earn the majority of their income from non-copyright sources such as live performance or commissions (Connolly and Krueger 2005, Kretschmer 2005). These facts are reflected in the surveys of artists themselves, which indicate fairly divided views regarding the impact of file-sharing with almost equal numbers of artists seeing it as positive and negative (Madden 2004).

more historical recordings than rights-holders for every five-year period prior to 1945 (for every period prior to 1940 the ratio is over two to one). Furthermore, for every period up to 1964 (the end-date of the study) the majority (and usually the vast majority) of works had not been reissued by anyone and therefore are, to all intents and purposes, unavailable to the public. And while we do not have the same comparative data for other fields such as textual works we do know that the vast majority of in copyright works are not commercially available (see, for example, Rappaport (1998) and Mulligan *et al* (2002)).

This data provides powerful evidence of the social and commercial value of the public domain. Public domain works are *more* likely to be made available to the public. Furthermore, this access to older works generates value not only for the consumer but also revenue for the firms involved in re-issuing historical recordings, such as Naxos and Document Records. Older works gathering dust in vaults or even rotting away (as has occurred with a large amount of early film in the United States (Lutzker *et al* 2002)) generate no revenue or value for society, and represent a tragedy for any nation's cultural heritage.

## Open source

In 2005 venture capitalists in Silicon Valley directed more than US$150 million into open source companies (LaMonica 2005). This was more than double the amount in 2004 and ten times the amount of 2003. Major players in the industry such as IBM, Sun Microsystems, and Hewlett Packard actively use, support, and develop open source software and projects. At the same time, surveys indicate that companies are looking to dramatically increase their usage of open source software in all areas from operating systems to productivity suites (Shankland 2005) and each week brings new announcements of the adoption of open source software at major institutions[12].

But how is it possible that software supplied 'free' can be of such interest to commercial firms? A large part of the answer is supplied by the two-century-old example of John Rennie, one of the most famous engineers of the industrial revolution. In 1789 he worked on the Albion Mills for Watt and Boulton. To Watt's horror, upon completion, Rennie, rather than patenting his new design, was eager to demonstrate it to others. Far from ruining Rennie, as Watt had feared, the move established his reputation and led to numerous commissions (Macleod 1998). The moral of the story is clear: asserting monopoly rights in a new work either via patent or copyright is not the only – or even necessarily the best – way to gain returns from it. A very large amount of software is bespoke, customised to its particular user's needs much in the same way as engineering projects were in Rennie's era. In these circumstances, just as in Rennie's day, open-sourcing your efforts does not threaten future work and may actively promote it.

There are other means by which firms and individuals appropriate returns from the development of open source software. Firms may offer complementary goods and services that are either rival (so priced normally like any other good) or proprietary. For example, IBM while supplying Linux (an open source operating system) for free, charges for the hardware on which it runs, as well as support and a range of consultancy services. Similarly, the UK's Clocksoft software's payroll system is open source but it charges for the updates necessary to keep abreast of the Inland Revenue's regulations.

Then there is the case of in-house open source development where the distinction between the user and producer has almost completely disappeared. While much of this work is in the form of improvements or alterations of existing packages rather than development from the beginning, it nevertheless represents a large part of the open source development that occurs. Since this kind of activity rarely generates direct sales from the originating firm, it represents less observable commercial value but in terms of what it facilitates it has major importance (consider, for example, work done on maintaining IT systems in a major bank)[13].

12. See, for example, http://insight.zdnet.co.uk/software/applications/0,39020466,39195518,00.htm (the roll out of the APLAWS content management system to over 40 UK local authorities); http://news.zdnet.co.uk/communications/0,39020336,39251266,00.htm (a South African response centre chooses an open source VoIP telephony system called Asterisk); http://news.zdnet.co.uk/software/linuxunix/0,39020390,39216736,00.htm (open source procurement in New South Wales); and the general overview in http://insight.zdnet.co.uk/software/0,39020463,39235707,00.htm. For a detailed survey of European government usage see FLOSSPOLS (2005).

13. There is now a large and growing literature on open source software, its production, funding and benefits. See, for example, Lerner and Tirole (2002), von Hippel (2002), Lakhani and von Hippel (2003), Bonaccorsi and Rossi (2004), Bessen (2005) and the survey in Rossi (2004).

These examples should make clear the commercial value of open source, but they do little to help understand what the advantages of open source are, and why it may be preferred over a proprietary approach. There are two main factors.

First, there are the benefits to the producer of a piece of software who gains the participation of a wider community when an open source approach is adopted. Proprietary code is normally secret and access is only permitted to the group of people directly working on it. With open source the code is open and anyone may look at it, run it and change it. Furthermore, since it is freely available others will be willing to contribute their time and effort to the project knowing that they won't see what they have done 'expropriated' by the owner. Finally, by allowing everyone, including end-users, direct access to the software, transaction costs, particularly of communication, may be substantially reduced. Together these features mean that an open source producer can reduce the costs – and improve the quality – of its software.

The second factor is the various advantages to the user of the software in terms of lower costs, greater flexibility, more competition and less lock-in. Code, let us not forget, is a nonrival good. Therefore for users it makes sense for the good to be distributed for free and for development to be funded up front. Of course if there is a large diffuse user base, up-front payments may be hard to coordinate, but where we are talking about governments or even large corporations the benefits of the open source model in terms of cost are large, even when free-riding is taken into account.

Added to the direct advantages of lower costs are the increased flexibility and competition experienced with open source. As Jean Marie-Lapeyre, chief technical officer at the French Tax Agency, explained in discussing the organisation's move towards open source software: 'We can have a contract with any player to support open source products ... We are not dependent on any vendor ... [furthermore] It's good that we can make a modification or fix software [ourselves]. For example, Nagios [an open source host, service and network monitoring program] had a bug in it and we didn't have support from anyone, so two of our engineers fixed it' (Marson 2005). As the software industry matures, these sorts of advantages will only grow in importance.

Open source software delivers the tools of the information economy without locking the user, or a society, into a single product or vendor. It allows competition to flourish, taking advantage of a globalised world to decentralise and localise innovation. Given its size, maturity and importance it is one of the most powerful examples of the benefits of an open, 'public domain', approach to the production of information goods, and any society wishing to succeed in the knowledge economy of the twenty-first century must heed the lessons it provides.

## Two examples of the indirect value of the public domain

*i) The internet and the world wide web*

The internet, and the world wide web built on top of it, have transformed the world. Their impact on industry has been immense, both in terms of the new commercial opportunities created and in the potential for traditional firms to improve and streamline their activities. Yet the underlying technologies were developed for non-commercial ends: the internet was funded by the Department of Defense in the US and the web was developed by Tim Berners-Lee while working on the IT staff at CERN (the European Particle Physics Laboratory), and both generated no direct revenue for their creators (though indirectly they have received numerous appointments and awards). Thus one of the pre-eminent commercial opportunities of the age resulted from work funded up-front by the Government, and which, as a result, was open – a feature that was of prime importance in their success (Berners-Lee 1999, Mowery and Simcoe 2001).

This example illustrates several important points. First, the wealth enabled by the internet (and the web) is immense. Second, the internet is open, and while it is possible to envisage a proprietary net, it is clear that it would have grown less quickly, and been far less valuable to society had it been so[14]. Third, much of the value of the internet is indirect, coming from what it enables in terms of other products, services and activities – think of a lawyer in London able to exchange emails with a colleague in Hong Kong, a scientist in London able to share her data with a collaborator in California, or a shop able to sell its goods online

14. Consider the original situation with companies such as Compuserve each providing their own fenced-in territory in cyber-space.

anywhere in the world. Fourth, innovation of the internet and the web has been phenomenally rapid, a fact that is again strongly associated with the openness of the underlying systems – and the associated process[15]. Fifth and finally, almost none of those who have contributed to the development of these technologies have derived benefit by trying to own part of them (by asserting intellectual property) though they have often gained significant rewards in other ways.

To summarise, this is a classic example of the value of the public domain in creating great *indirect* wealth, but doing so primarily in enabling activities that build upon or use the public domain material.

*ii) Google (et al)*

Google, the provider of the planet's most popular online search engine, is perhaps the best known internet company in the world. With a market valuation in the tens of billions of dollars it is also one of the most successful. It is therefore the largest and most commercially successful open content company in the world even though it does not, at least at present, own any content at all. For Google derives the vast bulk of its present revenue from advertising. The 'attention' that sells the advertising is itself generated from Google's role as a web search engine, the gatekeeper and organiser of the immense store of information that is the web. Without the web, Google, and the business model that supports it simply would not exist.

Thus Google has only been possible because the information on the web[16] is almost all open and anyone may freely access (and copy for their own purposes) the information posted on websites[17]. Imagine if right from the start the web had been 'closed', and each website had required payment as well as an agreement not to copy its contents[18]. Search engines, at least in their present form, would not exist and we would have seen neither the benefits of the services they provide nor the revenues they generate.

## Public sector information

Weather and geographical data – and public sector information (PSI) in general – may not be the first things that spring to mind when we think about the 'creative economy'. Nevertheless these areas raise similar issues and represent greater importance in terms of both national income and social value than, for example, the music industry. Furthermore, we are fortunate in being presented with several natural experiments in the form of the differing approaches to the availability of public sector information, the most prominent of which is the contrast between the United States and the countries of the European Union.

In the US, there is a strong tradition of placing public sector information in the public domain (Gellman 2004, Onsrud *et al* 1996). In Europe most countries restrict access to this data. For example, in the UK the records of parliamentary activity (Hansard) are under parliamentary copyright; government documents are under crown copyright; geographic data is owned by the Ordnance Survey, a trading fund, which prices on a cost-recovery (i.e. monopolistic) basis; weather data is controlled by the Met Office, which is another trading fund and therefore also prices at monopolistic rates.

By examining the resulting outcomes for both commerce and society under these different approaches we can gain some measure of the benefits, or costs, of a public domain approach. The results are stark: a multitude of studies and research demonstrate the value of a public domain approach over a proprietary (cost-recovery) one.

15. Much of the internet's development was hammered out in RFCs (literally Requests for Comments) and the web has been managed via open processes overseen by W3C (World Wide Web consortium).

16. This is not to suggest that most content on the web is not copyrighted, just that in practice, at least for access purposes, it is open (which is all that matters for Google's search activities).

17. Awareness of this dependence is now fully recognised not just by Google with its Google Print project (see following footnote) but by corporations such as Yahoo!, Microsoft and Adobe who have joined the Open Content Alliance, which seeks to digitise and make freely available large amounts of material. (As part of this effort Microsoft is working with the British Library to digitise one hundred thousand of their out-of-copyright books http://news.bbc.co.uk/1/hi/technology/4402442.stm)

18. Some idea of the problems that would have arisen is provided by the recent disputes surrounding the Google Print project. Google's plan was to digitise large numbers of books and then allow users of its search engine to search inside the books. The results of a search would only be small snippets around the keywords provided by the user and the search result would allow a user to 'click through' and purchase the book. However, the American Association of Publishers has opposed the move, seeking compensation for the 'copying' involved, and last October filed suit after negotiations broke down between the two parties.
http://publishers.org/press/releases.cfm?PressReleaseArticleID=292
http://news.com.com/Publishers+sue+Google+over+book+search+project/2100-1030_3-5902115.html

For example, the EU's own study, *Commercial Exploitation of Europe's Public Sector Information* (Pira International *et al* 2000), found that although US governmental expenditure was only approximately twice as much as for the EU (9.5 vs. 19 billion Euros) the economic value generated was more than ten times as much (750 billion vs. 68 billion Euros). Though a rough and ready calculation, and allowing for the benefits of a unified market, this suggests a net value of a public domain approach to public sector information in the region of tens or hundreds of billions of euros – an enormous sum. Furthermore, Pira International *et al* concluded that though government departments (or related agencies) would lose money from distributing data at marginal cost for unrestricted reuse, overall government income would grow due to increases in tax revenue[19].

Consider the case of the commercial weather industry in the US and Europe. While the two economies are of roughly the same size, the US commercial weather industry is over ten times larger than Europe's while the nascent weather risk management industry is over a hundred times larger. A significant factor in these discrepancies is undoubtedly the fact that the US government makes a large amount of weather data available freely or at cost while most European governments do not. For example, in the US national daily observational data back to 1948 can be acquired at cost from the National Climatic Data Center. Furthermore, as Weiss points out, the 'weather risk management example also raises the question whether restrictive data policies can have 'ripple-on' effects on firms who could otherwise benefit from specialized services. The data generated by the weather risk management industry shows a sharp disparity in the value of risk instruments (primarily 'hedge' contracts, and increasingly insurance) between the US and the EU' (Weiss 2002).

More evidence is provided by a Dutch study conducted by the Netherlands Economic Institute (NEI) and commissioned by the Ministry of the Interior. It found that 'Prosperity effects will be maximized when data is sold at marginal cost. Marginal cost is defined as all costs related to the dissemination of public sector information ... Although NEI only researched four datasets, they suggest that by extrapolating their results to all public sector information, enormous additional economic activity can be expected' (Weiss 2002).

Another Dutch study performed by Dutch Federal Geographic Data Committee estimated that reducing the price of geographical data by 60 per cent would lead to a 40 per cent growth in annual turnover plus an increase in employment of 800 jobs. The study also concluded that consumers as well as businesses benefited, due to lower prices and new products and services (Bedrijvenplatform 2000).

Together, this and other work clearly demonstrate there are large losses from restricting access to public sector information both in terms of transactional costs and the direct impact because of higher prices. Furthermore, much public sector information is itself repurchased by the Government (for example, approximately 60 per cent of Ordnance Survey sales are back to UK local or national bodies and 50 per cent of Met Office sales are to the Ministry of Defence), and so monopoly pricing simply moves costs around within the government apparatus rather than being true 'cost-recovery'. In addition, free access and reuse of basic PSI data frees up downstream firms to innovate in both products and services, and thereby to create new markets and value for society.[20]

Taken as a whole the above points make a very strong case that the net value of a public domain approach is large. Moreover, the benefits accrue not just to citizens generally but also to businesses and government. Comparison with the US where such public domain policies already exist suggests that the long-run value to the UK alone of taking an open, public domain, approach to public sector information is likely to be substantial, running into the billions or even tens of billions of pounds (for Europe as a whole this is likely to be at least an order of magnitude higher).

19. Very similar conclusions are reached by KPMG's study in relation to Canada (KPMG 2001). See, for example, the recommendation on copyright and licensing (24ff.), which concludes 'Digital geospatial data should be licensed at no royalty cost to users with respect to use and redistribution. Use copyright and licensing within Canada to protect quality of geospatial data originating from all government agencies, particularly at the federal level, rather than to prevent use. Most digital geospatial data should be licensed at no cost to users.'

20. 'OS was the centre for mapping but initially they were appalling at digital mapping. When Margaret Thatcher became Prime Minister, she initiated cost recovery policies that affected the OS. This led to higher data costs at a time when GIS was just beginning to take off. This put a dead hand on software development in the UK. The US on the other hand supported development and inexpensive reproduction of geographic information.' Roger Tomlinson, the father of GIS, discussing the impact of 'cost-recovery' policies in Geo:Connexion (2005).

## 4. Conclusion

With the IT revolution of the last half-century it is now possible to distribute knowledge at costs that approach zero. At the same time, these technological changes have greatly reduced the barriers to active participation in the creation and reuse of knowledge goods. The consequences for the public domain are equally vast.

Today the print run of a scholarly monograph published by Cambridge University Press is still 750 copies, approximately the same as a first print run in 1800, yet the same book made available on the internet can reach millions. An entire encyclopedia (Wikipedia), more read than *The New York Times*, larger and better quality than *Britannica*, free to access and reuse, can be created entirely by volunteers. When the BBC made available its versions of the Beethoven symphonies last year, it recorded total downloads of around 1.7 million copies in the space of a few weeks, numbers that dwarf any conceivable level of sales at usual retail prices. Silicon Valley venture capitalists now frequently fund open source startups and companies such as Google have erected multi-billion dollar businesses on the basis of open access to content.

When formulating policy the key variable to consider should be social value, which is the sum of commercial value and user value, rather than commercial value alone (in economists' terminology: welfare rather than national income). The examples in this paper, as well as associated research, demonstrate that the value of the public domain, both actually and potentially is high.

This is not to disregard the role of monopoly rights such as copyright and patents in incentivising and coordinating a significant amount of cultural and industrial creativity. However, it does suggest that promoting and expanding the public domain in several key areas would yield large benefits for society in the form of increased access, greater development of complementary goods and services, and the ability to decentralise and widen the innovation process. When looking at the value of knowledge goods in general, and the public domain in particular, policymakers should take account of the value generated by complementary products and services.

It must be remembered that where feasible and reasonably efficient methods of up-front or indirect funding exist, an open approach to knowledge will always be superior to one based on monopoly rights. For some of the categories of works currently covered by copyright, for example music, the introduction of open access along with some form of alternative compensation system promises to deliver significant gains both to creators and to consumers. A further opportunity exists in the potential of providing open access to public sector information. This is one of the most direct, and straightforward actions governments can take in promoting the public domain, and it is one that the available evidence suggests will have large benefits both to industry and to the general public.

As we enter the information age, where all that glitters may just be bits, we must stand ready to expand the public domain and promote a more open approach to the use, reuse and distribution of knowledge.

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