

A TAXONOMY OF EMPIRICAL RESEARCH ON COPYRIGHT – HOW DO WE INFORM POLICY?

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ABSTRACT. This paper summarizes key results in the empirical literature on unauthorized copying and copyright, and puts them into context. Casting the net more widely than previous surveys, it highlights noteworthy gaps and contradictions in the literature. There is initial evidence, for example, that the economic effects of digital copying vary between different industries, but these differences are not yet well understood. Most importantly, the empirical literature is unbalanced. The bulk of econometric research has focused on unauthorized copying and rights holder revenues. Little is known about the implications for user welfare, for the supply of copyright works, or about the costs of running a copyright system – and the preliminary evidence is often quite surprising. Much work on these issues remains to arrive at reasonable implications for copyright policy.

1. INTRODUCTION

With the diffusion of digital information and communication technology, copyright policy has become more contentious. There is considerable interest from policy-makers and stakeholders in related academic research, and the economic literature on unauthorized copying and copyright is expanding quickly. By now, there have also been quite a few surveys of the economic

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literature on copyright that summarize key results and put them into context.¹

This paper does more than to provide an update. It also advances a relatively elaborate taxonomy of empirical studies on the economic consequences of unauthorized copying and copyright. The classification and overview presented here yields an important insight: the empirical literature is unbalanced. The bulk of econometric research has focused on rights holders, and in particular on the extent to which unauthorized copying harms rights holders. In order to inform copyright policy, it will also be necessary to make progress on several other topics. Little is known about the implications in real markets for user welfare, for the supply of copyright works, or about the costs of running a copyright system. As shall be seen below, the preliminary evidence on these issues is often quite surprising.

2. THEORY – THE COSTS AND BENEFITS OF COPYRIGHT

Basic economic theory suggests that the supply of reproducible creative works will fall below its socially desirable level in competitive markets. That is because important aspects of such works have characteristics similar to those of a public good (Demsetz, 1970; Liebowitz and Watt, 2006). The typical cost structure of copyright industries – with substantial upfront development costs and very low costs of reproduction – aggravates this problem (Pethig, 1988; Landes and Posner, 1989).

For many purposes, copyright can be studied as a costly measure to inhibit unauthorized copying and thus unauthorized use. Effective copyright endows creators with temporary exclusive rights to their original creations. This allows copyrights holders to raise prices and revenues in comparison to

¹On theory, see for example Watt (2000), Peitz and Waelbroeck (2006), Liebowitz and Watt (2006), or Towse et al. (2008). An application to digitization is offered in Handke (2010b). Regarding the empirical literature, a relatively broadly minded and concise survey is Png (2006). On the impact of file-sharing on rights holder revenues in the record industry see the specific sections in Liebowitz (2005a), Liebowitz and Watt (2006), and Oberholzer-Gee and Strumpf (2009).

a situation in which they would have to compete with suppliers of identical copies (Plant, 1934). The economic literature on copyright disentangles the various consequences of copyright, and table 1 gives an overview of costs and benefits.

Table 1: Costs and benefits of a copyright system

	Benefits	Costs
Short run	Greater revenue to rights holders	Access costs to users, administration costs, transaction costs in trading rights
Long run	Greater incentives to supply copyright works for prospective rights holders	User innovation is obstructed by the costs of compliance

An essential distinction in order to make the economic case for copyright is that between the immediate, short-run effects of unauthorized copying and its long-run effects concerning the future supply of creative works (Johnson, 1985). In the short run, a rational copyright policy trades off rights holder interests (maximizing returns) against user interests (maximizing access to the existing stock of copyright works). The higher prices charged by rights holders generate access cost to users. There seems to be no copyright policy that improves the situation for rights holders and users simultaneously in the short run. What is more, like any type of state intervention, copyright entails administration costs, defined here as the public expenditure associated with a copyright system. Therefore, the short-run case for copyright is weak.²

Like other types of intellectual property (IP), copyright systems may also affect transaction costs in the regulated markets (Levin et al., 1987: 788; Landes and Posner, 2003: 16). Assuming that transaction costs will usually

²This was first pointed out to me by Richard Watt and Rufus Pollock.

be lower where users do not need to clear rights, this will further inflate production costs, prices and access costs.

In the long run, the situation may be quite different. That is because unauthorized use can undermine incentives to invest in the creation and diffusion of copyright works. If rights holders find it hard to recoup the costs of creation, creative supply may dry up. The short-run benefits of unauthorized copying to users could thus be unsustainable. It would then be possible that a reasonably efficient copyright system increases both rights holder and user welfare in the long run. This long-run assessment is the standard, economic argument in favor of public investments into a copyright system.

One important clarification is that follow-up creators are also users of copyrighted works, who are affected by the access costs generated by a copyright system. Suppliers of new copyrights works have to clear rights held by others or work around them. Copyright can thus increase the revenues from supplying creative works and the costs of supplying them. Therefore, it is not a given that stronger copyright increases the supply of new creative works (Landes and Posner, 1989).

While there are various ways to conceptualize the welfare implications of copyright, a dominant theme is the notion of a trade-off. What is more, many aspects of copyright policy are scalable, the duration of rights being a case in point. The question whether copyright can in principle increase social welfare is thus not of great practical importance (the answer being: ‘yes, but ...’). The question for rational policy is under what exact circumstances copyright will provide a net benefit and how copyright arrangements can be shaped to maximize this benefit. Finding a reasonable answer requires (1) a comprehensive, balanced analysis that takes all substantial costs and benefits

into consideration equally, and (2) reasonably precise empirical estimates of the various costs and benefits.

3. A TAXONOMY OF THE LITERATURE

3.1. Empirical studies on the costs and benefits of copyright. Based on this initial analysis, we develop a taxonomy of empirical topics related to the economic effects of copyright. Table 2 provides an overview of contributions,³ classified into a more elaborate system.⁴

As discussed above, it is useful to distinguish between short-run and long-run effects of variations in copyright strength, as well as between effects on rights holders and users. Empirical studies can also be classified according to type of indicator used for copyright strength: unauthorized copying, copyright law, or copyright enforcement. This distinction is important because enforcement of copyright laws is typically incomplete, and because unauthorized copying may change due to other reasons than law and its enforcement, for example changes in copying technology.

Furthermore, the literature mostly examines the effects of unauthorized copying or whether the intended benefits of copyright transpire – say greater rights holder revenues or greater innovation. The costs of copyright do also merit attention. Public investments in the copyright system, for example,

³The Appendix lists the actual references counted in Tables 2 and 3.

⁴A few words on the selection criteria seem in order: this report focuses on the quantitative-empirical literature that is based on economic theory. The net is cast widely in the sense that some papers from closely related academic disciplines such as a business and management are included. The same holds for research published in leading journals on computing and IT, as long as it is based on economic theory and applies essentially the same research methods. (In practice, some authors have published in publications specialized on several of these different academic fields). Perfect coverage is hard to achieve, and the use of the literature from ‘related fields’ is less comprehensive than for the economic literature in a narrow sense.

Like any survey of academic literature, this report covers peer-reviewed and published articles. Markets for copyright works and copyright policy have been changing rapidly over recent years. Therefore, recent results are of particular interest and several articles are included that have not been peer-reviewed and published. The extent to which colleagues have already cited such working papers was considered as an indication of quality. In any case, some working papers may change considerably over time after corrections and additions so that they should be considered with particular caution. Furthermore, studies were more likely to be included if they make more original contributions – covering relatively empty cells in table 2, for example.

may not show up in assessments of rights holder and user welfare. The economic literature on copyright also contains some evidence that copyright may have unintended consequences regarding the contestability of markets for copyright works or technological innovation related to the sector. The Appendix lists a handful of studies that have addressed these costs of copyright systems.

Table 2 and the more detailed overview in the Appendix illustrate an important point: some issues have received more attention than others. By far the greatest number of studies addresses the impact of unauthorized copying on rights holder revenues. Results scatter somewhat and work remains to be done on this topic. Nevertheless, in order to inform policy, there is probably even greater need for studies addressing other consequences of copyright.

The Tables deliberately do not include information on the type of finding, for example whether unauthorized copying was found to have a significant effect on rights holder revenues or not. The main reason is that results are often quite nuanced.⁵

The various topics apparent in the Tables are dealt with in four different chapters. Chapter 4 addresses the economic effects of unauthorized copying. Chapter 5 deals with empirical studies on the effects of copyright law. There are no studies on the effects of copyright enforcement on the various costs and benefits of copyright. Chapter 6 discusses the limited empirical work on administration costs, transaction costs, and some unintended consequences of copyright.

⁵Furthermore, not all studies are of equal quality so that a decision by majority is not necessarily adequate. There may also be a bias in the selection criteria of journals, even though it is not clear in which direction this would work in the case of research on unauthorized copying. Typically, academic journals tend to favor studies that do find statistically significant results. On the other hand, results that find no effect of copying on rights holder revenues may be more likely to get published because they are counterintuitive and may be expected to get more attention.

Table 2: Number of studies on the effects of copyright strength on rights holder welfare and user welfare⁶

	Measures of copyright strength		
	Copying	Copyright law	Enforcement
Rights holder welfare; short run	21	1	–
User welfare; short run	2	–	–
Rights holder welfare; long run	2	–	–
User welfare; long run	3	4	–

Note: Studies are counted several times if aspects of them fall into various categories; the sign “–” indicates that no studies were found; to have some exclusion criterion, only papers reporting statistical significance levels for the relevant findings are included.

Within specific chapters, results are further classified by: (1) copyright industry; (2) research design; and (3) the type of data used. The first of these classifications deserves particular attention. All copyright industries supply products that have some public good attributes. However, the various industries differ substantially, for example in terms of size and growth, cost structure, and relevant demand conditions such as the substitutability of unauthorized and authorized copies. As Table 3 illustrates, the bulk of the empirical-economic literature on unauthorized, digital copying has studied

⁶The distinction between short-run and long-run studies of rights holder welfare is difficult to make, because the time needed for complete adaptation is not known. In this table, only studies that deliberately address copyright industry adaptation to unauthorized copying are classified as covering long-term effects on rights holder welfare. Short run rights holder welfare is measured terms of revenues or unit sales, and short run user welfare is measured in terms of access. Long run rights holder welfare is measured in terms of profits after indirect effects and adaptation. Long run user welfare is measured in terms of quantity or quality of works supplied or innovation. The four studies on copyright law and long run user welfare all deal with extensions in the duration of copyright and find no effect on supply. While there are no papers on copyright enforcement and short-run rights holder welfare. However, there are a number of studies on the impact of enforcement measures on unauthorized copying (for an overview see Handke (2011)). Such studies address the rights holder welfare indirectly, if the assumption is that unauthorized copying harms rights holders.

the record industry. It is uncertain, however, whether basic findings from the record industry generalize to other copyright industries. Unfortunately, there have been few attempts to systematically compare the way in which copyright affects different industries within its realm.⁷

Table 3: Number of studies on the effects of copyright strength on various copyright industries

Type of copyright work	Unauthorized copying	Copyright law
Recorded music	20	–
Movies	5	2
Software	1	–
Other/variou	2	3

3.1.1. *Software*. Of all suppliers of copyrightable works, suppliers of computer software generate by far the greatest added value. Markets for business software and entertainment software (for example video games) are much younger than other copyright industries and as a rule, they have grown rapidly over recent years.

Software is also unique because in contrast to literary texts, movies or sound recordings, software has been subject to unauthorized, digital copying for as long as it exists. Since 1980, software has enjoyed copyright protection in the USA, analogous to literary texts. In many other countries, software also falls in the realm of copyright law but enforcement varies. In contrast to other types of copyright works, machine-readable software can also be patented if it is accepted as non-obvious (or considered to constitute an ‘inventive step’ in many European countries). Suppliers of software thus have a choice. Copyright protection concerns the code itself, requires no

⁷Hong (2007) is a notable exception. He uses data from the Consumer Expenditure Survey to compare entertainment spending of Internet users and non-Internet users between 1996 and 2002. Results are mixed. Only demand for recorded music is consistently found to fall with Internet use. In contrast to many other studies, Hong (2007) does not explicitly interpret Internet use as an indicator of unauthorized copying.

registration fee, lasts longer and allows for the software itself to remain a trade secret. Patent protection prevents others from putting software with equivalent functions to use, requires complete disclosure, a test of non-obviousness and a registration fee.

3.1.2. *Recorded music.* By and large, markets for computer software have grown rapidly over recent decades in spite of extensive unauthorized copying. The experience of the record industry is rather different. Private copying of music seems to have increased quite suddenly and substantially with the rapid diffusion of digital copying technologies such as file-sharing networks as well as CD- and DVD-burners from the late 1990s. In the record industry, digital copying coincides quite precisely with falling rights holder revenues from the primary market in which authorized copies are sold to end consumers. This pattern is similar in all major markets, such as the US, Japan, the UK, France or Germany. The effect of digital copying on rights holder revenues in this market has received much attention, and many studies suggest that file-sharing contributed to falling revenues.

3.1.3. *Movies.* Movies are much more complex creative works than recorded music, which makes them more expensive to create and to copy. Studies on digital copying and file-sharing of movies suggest that the movie industry has been less vulnerable to file-sharing so far.

3.1.4. *Other copyright industries.* There are few empirical studies on other types of copyright industries, say suppliers of books, news publishing and periodicals or academic journals in particular.

3.2. **Mitigating mechanisms.** The two final chapters fall outside of the structure presented in table 2. Theoretical work on the economics of copyright suggests that due to three mechanisms, adverse effects of unauthorized copying on rights holders could be mitigated (or even reversed): (1) indirect

appropriability; (2) network effects; and (3) sampling or exposure effects. Chapter 7 addresses the empirical evidence.

3.3. Topics not addressed. Finally, some noteworthy topics are not dealt with. First, by now there are many empirical studies regarding the factors influencing unauthorized copying and related consumer behavior. Second, research on copyright might benefit from drawing more systematically on the extensive literature on patents. On both these topics see the more extensive report by Handke (2011). Third, alternatives to copyright in order to foster innovation and creativity are not addressed (see Handke, 2010b). Furthermore, much of the political economy of copyright policy – concerning lobbying, rent-seeking, and the finer points of interaction between stakeholders – falls beyond the scope of this report.⁸

4. DIRECT EFFECTS OF UNAUTHORIZED COPYING

The effects of unauthorized copying are the most fundamental issue regarding copyright policy.⁹ This topic has received relatively much attention by empirically minded economic researchers.

The effects of unauthorized copying fall into three areas: first, the short-run benefits to users (without which unauthorized copying would not occur); second, the impact on rights holder revenues; third, the more distant effect of unauthorized copying on innovation and the supply of copyright works. This survey starts with discussing the second area because it encompasses the bulk of the literature published to date.

⁸For one of the rare quantitative-empirical studies of this type see Huang and Png's (2010) discussion of copyright levies, and how they might reflect the interaction between rights holders and consumers.

⁹To illustrate this point, let's imagine that unauthorized copying were found to entail no adverse consequences under specific market conditions. In such a case, there would be no point in discussing the adequate level and type of costly countermeasures such as copyright.

The effects of unauthorized copying have nearly always been studied for specific copyright industries. The record industry has received most attention. Lately, a handful of studies address movies. There is hardly any econometric research regarding other copyright industries.

For many copyright industries, a useful distinction is that between studies dealing with file-sharing of digital downloads and studies dealing with other types of unauthorized copying.¹⁰ With the exception of the literature on software, almost all studies covering the period after 1999 focus on file-sharing. (Napster started to operate in June 1999.) Copying hardware for CD-Rs and DVD-Rs started to diffuse widely among private households at roughly the same time and might have had an impact in particular in some European countries. At this point, digital copying and file-sharing is of greater interest than unauthorized copying through other means.

However, for software piracy a distinction into a period before and after a massive diffusion of unauthorized copies through the Internet may make least sense. In any case, the literature does not make this distinction.

4.1. Software. Empirical studies concerned with so-called ‘piracy’ of computer software often deal with copyright and patent infringements at the same time and without discriminating between these two types of IP. Many empirical studies on software piracy precede the current interest in copying of other types of copyright works. Most this literature takes a business and management perspective. It is less concerned with social welfare and implications for public policy but with the interests of private business, in particular suppliers of software. In contrast to economic research on patents, there is little interest in the impact of IP protection/unauthorized copying on innovation or macroeconomic growth.

¹⁰Another useful distinction would be between (1) commercial piracy with the intention to sell unauthorized copies, and (2) private copying that entails no direct pecuniary reward. Few empirical studies discuss the difference between these two types of unauthorized copying.

In contrast to research on unauthorized, digital copying of recorded music or movies, the extensive literature on software ‘piracy’ features no specific assessments of the impact on sales and rights holder revenues. Estimates of lost sales due to piracy come from software suppliers and their representatives. The academic literature mostly discusses piracy rates (the ratio of users utilizing legitimate software and users of pirated software) but does not quantify the likely impact on rights holder revenues.

There may be several reasons why academic researchers hesitate to forward estimates of lost sales due to software piracy. The rapid rate of product innovation in the industry makes it hard to isolate the effect of unauthorized use on sales. There may have been few sudden and substantial changes in the de facto level of copyright protection for software, which could have been analyzed as natural experiments. Furthermore, the rapid growth of the market for computer software could reduce the concern for sales displacement from piracy. The coincidence of rapid revenue growth, great innovation intensity and extensive piracy seems to have motivated many studies on how network effects may mitigate any adverse effects of piracy, see chapter 6.

4.2. The effects of file-sharing on record industry revenues. Unauthorized copying of recorded music has increased quite suddenly and substantially around the millennium. For users of widely available ICTs, the costs of generating, accessing and disseminating high-quality copies have fallen rapidly due to a combination of more numerous and faster Internet connections, file-compression technologies and peer-to-peer file-sharing networks. So far, recorded music has been the most popular type of files disseminated online in this manner. The impact of file-sharing of mp3-files on record industry revenues has drawn a lot of attention, probably because in several major markets for sound recordings – including the USA – the

explosive growth of file-sharing since 1999 has coincided with substantial reductions in sales of authorized copies.

Much of the research on unauthorized, digital copying is concentrated on how record industry revenues are affected. Other surveys of this specific literature are found in Peitz and Waelbroeck (2004a), Michel (2006), Liebowitz (2005a), Liebowitz and Watt (2006), Oberholzer-Gee and Strumpf (2009), and Liebowitz (2011). To leave space for some more original points, this topic is dealt with in a concise manner here. Unless otherwise stated, the studies refer to US data.

4.2.1. *Studies based on accumulated, secondary data.* In a cross-section study of 16 countries between 1998 and 2002, Peitz and Waelbroeck (2004b) find a significant correlation between measures of downloading and falling CD sales. In a similar study of 65 countries between 1997 and 2002, Zentner (2005) found that music sales fell more in countries with wide Internet usage.

Liebowitz (2008) worked with U.S. census data from the years 1998 to 2003 on Internet use, record sales and other demographic variables to compare the impact of file-sharing in 99 American cities. He concludes: “file-sharing appears to have caused the entire decline in record sales and appears to have vitiated what otherwise would have been growth in the industry”.¹¹

Mortimer et al. (2012) study the effect of file-sharing on two aspects of the music industry. They find that album sales fell and revenues from live performances increased due to file-sharing. In a recent working paper on the Swedish market, Adermon and Liang (2010) adopt an event study

¹¹In a similar study, Boorstin (2004) had come to the different conclusion that file-sharing was not the cause of declining sales. Liebowitz (2008) made technical improvements. An earlier version of this paper (Liebowitz, 2005b) and an ‘e-companion’ to Liebowitz (2008) also presents an analysis of the different impact of file-sharing on various musical genres in the US. The results allow no firm conclusion regarding the impact of file-sharing, but sales for some genres that are popular with young listeners – who are more likely to download unauthorized copies – seem to have decreased relatively much with the diffusion of file-sharing. In a panel study of various countries, Zentner (2005) finds that sales of international repertoire falls more due to Internet usage, which would be consistent with an adverse impact of file-sharing on sales if audiences for domestic music are older and thus less likely to use file-sharing.

approach, assessing the impact of a substantial change in copyright strength in 2009 on Internet traffic and sales of authorized copies. They use data from the Norwegian and Finnish market in order to control for other factors that might have influenced sales of copyright works at the time. Regarding recorded music, they find that due to increased copyright protection, sales on physical sound carriers increased by 27% and sales of digital music increased by 48%.

4.2.2. *Studies based on sales figures for individual recordings.* Blackburn (2004) used weekly data on album sales to assess the effect of file-sharing on 197 specific albums between 2002 and 2003. He emphasizes differential effects for sales of more or less well-known recordings artists (see section 6.2). Regarding total sales, he finds that file-sharing has had a significant negative effect.

Oberholzer-Gee and Strumpf (2007) used primary data on file-sharing and weekly album sales of albums. They compared various recordings and studied the effects of changes in downloading on sales of authorized copies. The number of file-sharing downloads and album sales could have a common cause, the popularity of the recording artist. To isolate the effect of file-sharing on legitimate sales, the authors use presumed variations in the number of active file-sharers over German school holidays, which should affect the availability of uploads in the US. Oberholzer-Gee and Strumpf (2007:1) famously conclude that “downloads have an effect which is statistically indistinguishable from zero”. Liebowitz (2007a; 2007b; 2010) has thoroughly criticized this paper and the validity of this result.

4.2.3. *Studies based on consumer surveys.* Michel (2006) made use of data from the U.S. Consumer Expenditure Survey. Treating computer ownership as a proxy for downloading, he finds that file-sharing may explain a reduction in sales by up to 13% between 1999 and 2003. Hong (2011) used data

from the same survey, using Internet access as a proxy for downloading. For the period between 1998 and 2002, the estimated contribution of “Napster” in total sales reductions is 20%. In both studies, file-sharing seems to explain a substantial part in total sales reductions but it provides no complete explanation.

Rob and Waldfogel (2006) conducted their own survey on the downloading and purchasing behavior of 500 U.S. college students in 2004. They found that downloads substituted for purchases of authorized copies at a rate of 0.2 or more – that is five works downloaded illegally substituted for one legitimate purchase. Waldfogel (2010) ran two similar student surveys in 2009 and 2010, after electronic retailing of authorized music files had become popular. He finds that between three and six unauthorized copies displace one authorized downloads, which is quite similar to the displacement effect calculated for CDs in Rob and Waldfogel (2006).¹²

Zentner (2006) used data from a European consumer mail survey and finds that “peer-to-peer usage reduces the probability of buying music by an average of 30%”. Conversely, Andersen and Frenz (2010) found no significant correlation between file-sharing and purchases of either CDs or authorized downloads in Canada.

4.3. Effects of digital copying on movie industry revenues.

4.3.1. *Survey results.* Bounie, Bourreau and Waelbroeck (2006) ran a survey of 620 French university students and staff in 2005. A third of all respondents acquired pirated copies at least monthly. Unauthorized copying has no significant effect on purchases of cinema tickets but video rentals and

¹²In a recent working paper, Bai and Waldfogel (2010) compare survey results on ‘movie piracy’ from China with those from the US. Unauthorized access seems to make up a much greater share of total consumption in China (“roughly three quarters rather than about 5 percent”). By contrast, the displacement effect in China appears to be much lower. This suggests that for now, Chinese consumers would not consume many more authorized goods and services if unauthorized access would be inhibited more effectively.

purchases are decreased significantly. A survey of US students by Rob and Waldfogel (2007) found that “unpaid consumption of movies” reduced “paid consumption” by 3.5%.

Hennig-Thurau et al. (2007) conducted a survey of 1,075 German individuals, with different responses being collected three times in 2006 and focusing on 25 specific films. Their results suggest that file-sharing significantly reduces cinema attendance, as well as DVD purchases and rentals. However, this impact explains only part of reductions in movie industry revenues in Germany at the time.

4.3.2. *Secondary data analysis.* Smith and Telang (2010) report that between 2000 and 2003, increased broadband Internet penetration seems to have increased DVD sales considerably according to their analysis of secondary data. Smith and Telang (2010) do not assume that unauthorized copying would increase DVD sales, however, but emphasize the role of more extensive information on movies online.

For Sweden, Adermon and Liang (2010) find that a substantial increase in copyright protection in 2009 has had no significant effect on either sales of cinema tickets or of DVDs featuring movies (in contrast to a strong positive effect on sales of recorded music).¹³

4.4. Unauthorized copying and music/movie industry revenues prior to file-sharing. The empirical literature on unauthorized copying has boomed with the diffusion of digital copying technology. A few studies cover sales displacement due to other types of ‘piracy’. On the basis of Euromonitor and IFPI statistics, Hui and Png (2003) conducted a panel study on ‘piracy’ and sales of authorized copies of recorded music in 28 countries, covering the years 1994 to 1998. They estimate that piracy decreased sales for authorized

¹³De Vany and Walls (2007) study the effects of unauthorized downloading on a single movie. They estimate that the movie lost US\$ 40 million in box office revenues due to downloading of unauthorized copies.

copies on CDs by about 6.6%, which is less than half of copyright industry estimates.¹⁴

Earlier, Widdows and McHugh (1984) discussed whether home taping contributed to a slump in sales of prerecorded music in the US between 1978 and 1981. Home taping seems to explain only a fraction of sales decreases at the time. Cameron (1988) found “tentative” evidence that the diffusion of video recorders in the UK displaced demand for cinema tickets, but he does not address the extent to which this is due to home-taping/Unauthorized copying. Marvasti’s (2000) results suggest that the diffusion of video recorders diminished the demand for movies through other channels and reduced US exports of these copyright works. If the current situation is fundamentally different from the past, for example because digital copying is much more potent, these studies are largely of historical value.

4.5. Summary and discussion regarding rights holder revenues.

The software industry has existed (and thrived) in the presence of extensive unauthorized use of their products and services. There has been surprisingly little interest by academic researchers in calculating lost sales due to piracy in this market. For the record industry, most studies to date suggest that file-sharing displaced demand, but that other, incompletely specified factors have played an important role in explaining falling sales after 1999.

Other copyright industries are likely to be affected by more extensive digital copying in the future. Findings for the movie industry are similarly diverse as those for the music industry. Some studies find a significant effects of digital copying on movie industry revenues, some don’t. Video rentals and video sales may be more vulnerable than cinema performances.

It remains to be seen whether studies of other copyright industries – for example newspapers, literature, or video games – produce a more consistent

¹⁴Hui and Png (2003) emphasize that they do not completely cover potential increases in retail prices without piracy or indirect benefits of unauthorized copying for suppliers of copyright work.

pattern and whether the situation varies between different copyright industries. Another question is whether initial effects of digital copying on rights holder revenues will be stable over time. For a case of successful adaptation to increased copying by publishers of academic journals, see Liebowitz (1985).

Scattered results could indicate that the effects of digital copying on copy-rights holder revenues differ over the various time periods and populations studied. Another explanation would be that many results are distorted due to the numerous difficulties in gauging the effect of digital copying. As argued elsewhere (Towse et al., 2008), data limitations seem to be particularly cumbersome. For example, Liebowitz (2006) demonstrates how various measures of music file-sharing in the US diverge considerably.¹⁵ The use of proxies for file-sharing, such as Internet access or computer ownership, may also create problems.¹⁶ Measuring so-called ‘piracy’ and its consequences for consumption of authorized services in consumer surveys could introduce a downward bias as respondents might be reluctant to report illegal activities or may give strategic answers (Oberholzer-Gee and Strumpf, 2007). Some surveys also ask hypothetical question, say on willingness to pay. Specialized academic surveys of file-sharing, valuation of authorized copies and purchasing behavior have to date been of relatively modest size and even some of the most reputable surveys on the matter are based on convenience samples (e.g. Rob and Waldfogel, 2006).

Another fundamental challenge to any of these studies is to isolate the effect of unauthorized copying in mutable markets. Uncertain and fickle demand conditions are characteristic for many copyright industries (e.g. Caves, 2000). De Vany and Walls (2007) argue that standard approaches – in which

¹⁵Png (2010) identifies some inconsistency in software piracy statistics by the Business Software Alliance.

¹⁶Oberholzer-Gee and Strumpf (2007) used data on actual file-sharing activity but had to content themselves with a minuscule fraction of total interactions that went through a particular server.

researchers essentially compare observations with predictions of what things would have been otherwise – are inadequate in extremely volatile markets. On the other hand, the diffusion of digital ICT is associated with broad and substantial changes in the copyright industries and related markets. Under such circumstances it seems particularly difficult to gauge the effect of digital copying.

Empirical studies of the impact of file-sharing often conclude by pointing out factors that have not been covered fully in the quantitative analysis. One potential intervening factor is the growth of new information and entertainment services such as mobile telephony and video games. Many authors have also discussed the possibility that sales of authorized downloads may reinvigorate the record industry. It has further been argued that part of the sales decline could mark the end of replacement purchases of CDs for vinyl records. If that were the case, it would be misleading to use historical peak levels of sales preceding the emergence of file-sharing as a point of reference.

In any case, the effect of file-sharing on authorized sales remains contentious. Results and their interpretations vary considerably and none of the existing studies seems sufficiently conclusive as to settle the issue single-handedly.

4.6. Short-run user welfare. Besides the apparent difficulties in gauging the effect of digital copying on rights holder revenues, it is important to recognize the limitations of such studies as a guideline for copyright policy. Effects on user welfare also deserve some attention. In the short run, end-consumers will benefit from the availability of vast catalogues of works online at very low cost. So, indeed, might commercial users, including IT and telecommunication firms who sell the related technical infrastructure.

Rob and Waldfogel (2006) and Waldfogel (2010) produced two empirical studies that adopt a consistent short-run approach. Based on survey results,

the authors estimate that music consumers' short-run welfare gains from file-sharing are several times higher than the related losses for rights holders. They emphasize, however, that their study does not account for the long-run costs to consumers due to weaker incentives for creativity.

4.7. Digital copying and the supply of copyright works. Arguably, if one had to resort to just one empirical indicator to assess the welfare effect of unauthorized copying, it would be the effect on the supply of copyright works. Nevertheless, the issue has not received much systematic attention.

Oberholzer-Gee and Strumpf (2009) observe that the variety of copyright works supplied in the USA has not diminished in the presence of file-sharing. Handke (2010b; 2012) applies a simple time-series intervention analysis to study the impact of digital copying on the supply of sound-recordings in Germany. The starting point of the intervention is the emergence of Napster in June 1999, which coincided with the beginning of a severe recession in the primary market for sound-recordings. On the basis of IFPI data, he finds that the number of new titles released on physical sound-carriers in Germany and the overall number of different titles marketed expanded after 1998. There is no evidence for a significant change in the growth rate compared to the pre-Napster period. What is more, in Germany the consumption time of recorded music increased after 1998, which suggests there has been no great loss in the quality of supply as yet (Handke, 2012).

A recent working paper by Waldfogel (2011) focuses entirely on the quality of supply. It investigates the share of music albums released in the presence of digital copying in 'best of all times lists' as a measure of quality, at least of the top hits. He finds a downward trend over time but no acceleration of this trend in the presence of file-sharing technology and decreasing record industry revenues.

These findings are certainly preliminary. They are also counterintuitive, but consistent with previous studies on copyright strength and the supply of creative works (see section 5.2). In any case, these observations conflict with claims by the record industry that file-sharing would threaten innovation and the supply of new creative works. The only evidence to the contrary comes from a study by Baker and Cunningham (2009; see section 5.2), which mostly dealt with the effects of legal arrangements on the number of copyright registrations in the US and Canada. Regarding the effects of Internet usage on registrations, they find a significant negative effect. The issue requires much more attention in debates on public copyright policy.

5. THE EFFECTS OF COPYRIGHT LAW ON THE MARKET FOR COPYRIGHT WORKS

As argued above, it is useful to distinguish between the impact of copyright law and the impact of unauthorized copying. Due to incomplete enforcement and changes in copying technology, unauthorized copying may sometimes change irrespective of the law.

For policy makers, studies on how specific legal arrangements affect markets might still be of particular interest. Copyright law has many different aspects, for example: (1) the depth of copyright (what aspects of creative works are protected); (2) the type and intensity of enforcement measures; (3) the duration of rights; (4) the extent of fair use exemptions; (5) legal arrangements regarding digital rights management (DRM) techniques; (6) or even moral rights. In principle, any aspect could be studied in detail. In practice, empirical research on copyright has mainly used unauthorized copying as an indication of copyright strength. With the exception of copyright duration, there is little empirical evidence regarding the effects of specific aspects of copyright law.

5.1. Copyright law and rights holder welfare.

5.1.1. *The value of copyright works over time.* Several authors assess indications of the commercial value of old copyright works over time. This may be useful information for debates on the adequate duration of copyrights.

Rappaport (1998) found that most copyright works are of very little commercial value at the end of their copyright term.¹⁷ Yet, a minority of old works still generates considerable revenues for rights holders, in particular books.

Similarly, Landes and Posner (2003) find that for the bulk of copyright works, US rights holders did not renew their registration with the US Copyright Office, which is associated with greater protection. This protection was apparently of little value for most copyright works at the end of the initial term.

The share of copyright renewed for all works is an imperfect measure of the expected value of longer copyright protection. That is because the market share and commercial value of a small minority of hits is very high. Liebowitz and Margolis (2005) find that of 236 bestselling titles from the 1920s, 41% were still in print after fifty-eight years. Considering the costs of reproduction and distribution and the opportunity costs of shelf-space, these works must still have had considerable commercial value.

This implies that setting a single, adequate duration of copyrights is tricky. A short duration will make rights holders worse off and might diminish investments in the supply of copyright works. A long duration will diminish the number of works in the public domain. If transaction costs are greater with copyright than without, this could generate many orphan works, for which rights holder have insufficient incentives to make them

¹⁷Rappaport (1998) precedes the discussion of the ‘long-tail hypothesis’ (Anderson 2004; Brynjolfson et al. 2007). Rappaport (1998) includes a discussion of optional copyright renewal against a fee.

available but that may still be worth something. Digital distribution lowers the costs of access to works in the public domain, which could aggravate the problem of orphan works.

5.1.2. *Copyright law and the stock value of suppliers.* A paper by Baker and Cunningham (2006) is exceptional in three ways. First, it studies a whole set of copyright industries simultaneously.¹⁸ Second, it studies the effect of changes in US copyright law rather than using direct measures of unauthorized copying. In this way, it is similar to a number of studies on patents using an index of patent strength (for example Ginarte and Park, 1997). Third, instead of direct indicators of rights holder revenues, the paper studies the impact on the stock-market valuation of firms that commercialize copyright works between 1986 and 1998. They find that greater copyright protection increases stock prices, either because existing copyright works become more valuable or because the expected returns from creating new works increases.

The authors see it as one advantage of their approach that it helps to identify lagged effects of copyright due to the “forward looking nature” of stock markets. The credibility of their results depends on the extent to which one accepts the hypothesis of rational (stock) markets. One problem with this study is that the measure of copyright strength through court decisions and legal initiatives is rough. Another problem is that those suppliers of copyright works that are listed in stock markets may not be representative of the total population of suppliers.

5.2. Copyright law and the supply of copyright works. Very few empirical studies have been published on the impact of (changes in) the copyright system on the supply of copyright works – or in other words the

¹⁸The industries included are newspapers, periodicals, books, book printing, computer programming services, pre-packaged music, and motion picture/video tape production.

elasticity of supply to copyright protection. This may be surprising, since the promotion of innovation and thus the future supply of creative works is usually considered to be the ultimate aim of any type of IP.

Khan (2004) finds that the U.S. International Copyright Act of 1891 has had no substantial impact on the number of full-time authors. Scherer (2008) finds no substantial change in market entry by composers with music-related copyright extensions in Europe between 1709 and 1850. The markets regulated by copyright have evolved very substantially since the 19th century, and more current evidence is required to inform contemporary copyright policy.

Three studies address the impact of relatively recent copyright term extensions on the supply of copyright works. Hui and Png (2002) studied the impact of the Sonny Bono Act (resulting in an extension of US copyright duration from 50 to 70 years in 1998) on the supply of movies in the US. Studying data from the years 1990 to 2000, they find no significant effect, concluding that the Sonny Bono Act “appeared to have been a giveaway to owners of existing creative work, while having relatively little impact on new creative activity” (Hui and Png, 2002:219). These results are preliminary. On the one hand, they are based on 11 observations only. On the other, it may take more than 2 years before the full impact of more extensive copyright duration on the supply copyright works transpires.¹⁹

Landes and Posner (2003) investigated the number of optional U.S. copyright registrations to test for an effect of the term extensions in 1962 and 1998. They found no significant effect after either of these two events.

A working paper by Png and Wang (2009) used data from 26 major economies to test for an effect of copyright extensions during the 1990s on the

¹⁹In the same paper, Hui and Png (2002) also address the responsiveness of movie production to economic incentives in a panel study of 38 countries between 1990 and 2000. They find that disposable income and the diffusion of ‘video tape players’ is positively related to movie production, whereas the diffusion of tv sets has a weaker, negative effect.

quantity of movies supplied. Reverting on their results in previous versions of the paper, in the current version they found that term extensions from author's life plus 50 to author's life plus 70 years had no significant effect on the supply of movies. The latter paper provides a good primer on the complexities involved in isolating the effects of what is probably a relatively minor change in the copyright system and thus the regulated market.

Pollock (2009) deals with the duration of rights in a rather different way. He develops a dynamic model of the welfare effects of copyright that he uses to calculate the 'optimal' level of copyright protection. He includes empirical estimates of the discount factor for suppliers and the rate of cultural decay among other things. Pollock finds that the adequate level of copyright duration is in the area of 15 years.

Finally, Baker and Cunningham (2009) study the effect of legal arrangements regarding copyright on the registration of any type of copyright works in the US and Canada. When including a three-month lag, they find a miniscule positive effect of court-decisions strengthening copyright.²⁰ Changes in legal statutes have no significant effect.

6. THE COSTS OF THE COPYRIGHT SYSTEM

So far, the focus of the literature reviewed has been on the two questions whether unauthorized copying diminishes (1) rights holder revenues, and (2) the supply of copyright works. In order to devise adequate copyright policy, (3) the costs of administering the copyright system and (4) the potential for unintended consequences of existing copyright arrangements need to be taken into account as well.

²⁰Baker and Cunningham (2009:77) estimate that a high court decision that strengthens copyright is associated with 340 additional registrations in the following quarter – that is less than 0.3% of the average for total registrations per quarter.

6.1. The costs of administering and trading copyrights. The literature search did not bring up academic assessments of the costs of administration and enforcing copyright. For copyright policy, it would be useful to study the proportion of public expenditure on administering copyright to the net effect on social welfare of the copyright system.

The transaction costs of trading rights have not been studied directly, either. Information on this issue would be useful in order to discuss the case for collective administration of rights, for example.

6.2. Unintended consequences of copyright.

6.2.1. Unauthorized copying and contestability. Pivotal parts of many copyright industries are organized in narrow oligopolies.²¹ Extensive concentration is probably an efficient way to organize aspects of the copyright industries. The cost structure with high fixed costs and low variable costs entails economies of scale. On the demand side, network effects may also favor large suppliers. Nevertheless, this industry structure also comes with the usual concerns for dominant firms exploiting more fragmented, specialist suppliers and consumers. For the UK, Sweden and Denmark, Towse (1999) documents that copyright hardly yields pecuniary earnings for artists other than for a small minority of superstars, and that the bulk of revenues generated by copyright ends up with intermediary firms such as publishers and record companies. Kretschmer (2005) finds that the same holds in the UK and Germany.

In this context, it is of interest that digital, unauthorized copying seems to have asymmetric effects, hurting well-established incumbents more than

²¹Extreme examples of concentration are Microsoft in the market for some office software, or iTunes/Apple in online retailing of authorized music downloads. Regarding more traditional parts of the copyright industries, in 2000 the distribution divisions of the major record companies in the U.S. settled allegations of price fixing out-of-court (Federal Trade Commission, 2000). Several objections to further merger activity between major record companies by competition authorities in the European Union also illustrate concerns with market power.

fringe suppliers or newcomers. In other words, unauthorized copying may increase the contestability of the market.

Blackburn (2004) found that sales of publications by previously well-known artists are diminished as file-sharers substitute purchased copies for downloads. On the other hand, file-sharing appears to boost record sales for previously unknown artists, who seem to gain more from the additional exposure of their works than they lose due to a substitution effect.

Studying the billboard charts, Gopal et al. (2006) find that the prior reputation of recording artists has become significantly less important in determining chart placement when comparing the period from 1995 to 1996 with 1998 to 2000. They conclude that Internet access and online sampling – including unauthorized copying – “threatens superstars and benefits lesser known artists” (Gopal et al., 2006:1530).

Bhattacharjee et al. (2007) observe that releases by smaller record companies exhibited longer survival times in the charts after the emergence of file-sharing networks. Their results are mixed however, in the sense that chart survival of albums ranking lower in the charts decreased with file-sharing, whereas the top hits were unaffected.

For the German record industry, Handke (2006) documented a large number of market entries by small, independent record companies in the presence of digital copying. He provides further evidence in a later study (Handke, 2010b) on a boom among ‘indies’ and a process of Schumpeterian creative destruction after 1998. It is not clear, however, whether industry fragmentation and greater contestability is causally linked to digital copying or whether it is due to other changes in the market.

Mortimer et al. (2012) find that file-sharing suppresses album sales for “large artists more than for small ones”. What is more, live performance

revenues by small artists increase due to file-sharing, whereas there is hardly any positive effect for the most popular artists.

There is some evidence that digital copying increases the contestability of markets for copyright works. The underlying, broader issue is the relationship between innovation and competition in the copyright industries.

6.2.2. *Copyright and technological innovation.* Most of the literature on copyright focuses on the creation of new copyright works. If content and technological innovations were traded efficiently, copyright should affect technological innovation in the same way as content creation. In practice, this is unlikely for example due to substantial transaction costs in markets for IP (Levin et al., 1987; Landes and Posner, 2003) and asymmetric information. A few authors have voiced concern that excessive copyright systems hold back technological innovation associated with the dissemination and commercial use of ‘artistic and literary’ works.

Related questions have mainly been addressed on the basis of descriptive, historical studies. David (1993; 2004), for example, uses historical analysis to evaluate the economic impact of copyright in various industries and in changing technological conditions, arguing that the copyright (and patent) regime has created obstacles to technological innovation and change. Boldrin and Levine (2005) address the issue in their ambitious criticism of what they refer to as ‘intellectual monopolies’.

Handke (2010b) observes that in the German record industry, a period of extensive unauthorized copying and falling revenues coincides with extensive technical innovation. In a survey of German independent record companies, Handke (2010b) finds that these firms perceive problems with clearing copyrights to entail obstacles to technical innovation. On average, these innovation costs of copyright even appeared significantly greater than

the innovation cost of unauthorized copying of the copyright works commercialized by these firms.

6.2.3. *Copyright and related industries.* Some recent studies find that unauthorized copying affects markets for a diverse set of related goods and services. Roughly speaking, Zentner (2008) documents that broadband as a proxy of file-sharing reduced the number of music retailers.²² According to Mortimer et al. (2012) total live performance revenues increase because of file-sharing.

Especially in the IT sector, the availability of cheap copies should affect demand and thus investments in technological innovation. A working paper by Leung (2009) addresses an interesting topic on the basis of a conjoint survey of 884 students at the University of Minnesota. He finds that unauthorized copying is responsible for 22% of iPod sales. There could be similar effects on demand for other types of mp3-players. Adermon and Liang (2010) find that Internet traffic dropped by 18% with the extension of copyright protection in Sweden. This may be some indication that demand for Internet access is boosted by unauthorized copying. In other words, suppliers of mp3-players and Internet service providers seem to benefit from file-sharing.

7. MITIGATING MECHANISMS – INDIRECT APPROPRIABILITY, NETWORK EXTERNALITIES AND SAMPLING

The economics of copyright discusses mechanisms that could mitigate or even offset any adverse effect of unauthorized copying on demand for authorized copies. Under certain conditions, indirect appropriability, positive network externalities, or sampling and learning by consumers would even

²²Zentner (2008) uses phonebook entries to measure the number of specialist, ‘bricks and mortar’ retailers of sound recordings between 1998 and 2002 (around the first mass diffusion of file-sharing), and correlates this with measures on Internet use, online sales of music and the proximity of a university. In the period covered, the number of music retailers also fell particularly around universities. Michel (2005) finds no evidence that consumers would have moved from purchasing recorded music to purchasing movies between 1998 and 2003, which could have been an alternative explanation for falling record industry instead of unauthorized copying.

increase revenues of suppliers of copyright works. Such indirect effects could explain why the effect of unauthorized copying on rights holder revenues or on the supply of copyright works appear to be low in some empirical assessments. Few empirical studies have directly addressed these theoretical concepts in the copyright industries.

7.1. Indirect appropriability. Liebowitz (1985) studied the impact of photocopying on the market for academic journals and concluded that copying did not harm journal publishing because publishers were able to increase their revenues by using price discrimination. This was possible because publishers supply two distinct markets: that of individual subscribers and that of libraries. Copies in libraries are often photocopied, which should reduce demand for individual subscriptions. Libraries also tend to be willing to pay a much higher price than individual subscribers. Publishers reacted to photocopying by raising the price of library subscriptions. Liebowitz (1985) provided empirical evidence that, in the case of journal publishing, greater revenue from library subscriptions fully compensated for lost sales to individuals who would have purchased the journal issue without the possibility of photocopying. Publishers were therefore compensated indirectly for unauthorised copying.²³

7.2. Positive network externalities. Positive network externalities (also known as network effects) occur where the benefit of a good increases with the number of consumers using the same kind of good. Direct network effects concern communication devices or services like telephones or social media that have a greater utility for individual users with a greater number of total

²³Mortimer (2007) addresses copyright provisions that inhibit direct price discrimination in the US. She studies price discrimination for video sales in the US between 2000 and 2002, when both the VHS and the DVD accounted for a substantial market share. She finds that suppliers of movies use indirect price discrimination, varying prices strategically between VHS and DVD, but pricing depended even more on demand for the specific movie in question. Her welfare analysis suggests that legalizing direct price discrimination in the US would benefit rights holders and consumers, while harming retailers.

users. Indirect network effects may occur where more complementary goods become available as the number of users increases. Network effects have received most attention in the literature on business software and computer games.

7.2.1. *Commercial business software.* Givon et al. (1995) studied the diffusion of spreadsheets and word processing software in the UK between 1987 and 1992. At the time, about 85% of software users utilized unauthorized copies. This does not translate directly into a measure of lost sales, however, since the willingness to pay of illegitimate users may be lower than the retail price of the software. What is more, according to Givon et al.'s (1995) estimations “pirates significantly influenced the potential users to adopt this software” and “they contributed to generating more than 80% of the unit sales”. The authors conclude that rights holders may often benefit from alternating periods in which they do not fight unauthorized copying, extending the user base, with periods in which they enforce copyrights to maximize revenues.

In the US market for commercial spreadsheet software between 1987 and 1991, Brynjolfsson and Kemerer (1996:1644) find that network externalities arising from the existing user base as well as compatibility with a “dominant interface standard” were approximately as important in determining the market value of software as intrinsic product characteristics.

7.2.2. *Video Games.* There are a number of studies on network effects in the market for video game consoles and games. These studies do not deal with unauthorized copying directly, since in contrast to video games run on personal computers (PC), copying is effectively obstructed where games are run on single-purpose consoles.

Shankar and Bayus (2002) find evidence for network effects in the market for video games. In this market, there are a handful of suppliers, each

operating on the basis of a product bundle of hardware (consoles) and software (games) that is incompatible with the products of competitors. For the two leading suppliers of consoles Sega and Nintendo between 1993 and 1995, the size of the existing user base seems to have had a positive effect on hardware demand. Furthermore, Shankar and Bayus (2002) argue that stronger network effects per user may explain why Nintendo could surpass its competitor Sega in terms of profits, in spite of the advantages for market leaders that are typically associated with network effects.

Clements and Ohashi (2005) explore the implications of network effects in the US market for video game consoles between 1994 and 2002. They find that for a new console, demand is highly sensitive to price and depends less on the variety of software available. As the market for the console matures, its price becomes less important for demand whereas the variety of compatible games becomes more important. The authors argue that suppliers should thus introduce new consoles at low prices, expanding the user base even at the expense of short-term profitability. Over time, it would be more likely that more compatible software will become available, and suppliers of consoles could exploit indirect network effects and achieve high profitability later on.

These studies are roughly consistent with results for business software discussed above. After all, unauthorized copying could be seen as an extreme case of low prices. Suppliers of information goods and services subject to network effects may often face a trade-off in their pricing decisions and the attitude towards unauthorized copying. They could sacrifice short-term profits and set promotional prices or permit unauthorized use in order to expand the number of users. Of course, this only makes business sense when at some point, suppliers can charge monopoly prices because network effects endow them with some market power.

Furthermore, the situation in many other copyright industries is quite different. For console-based video games, suppliers are basically suppliers of hardware and software (or of licenses to external software suppliers). In most copyright industries, many suppliers are specialized on software, which could make their business models more vulnerable to unauthorized copying.

7.3. Consumer learning (sampling). Many copyright works have the attributes of experience goods: their value cannot be judged adequately before purchasing and experiencing the good through consumption. What is more, there are often literally thousands of product variants available (Caves, 2000). This implies that there are problems with incomplete information of consumers.

The ‘frictionless market’ hypothesis suggests that the Internet may host a more efficient market for information goods because it allows for more efficient product searches and lower costs of reproducing and distributing such goods. For an early discussion of the (limited) empirical evidence for the ‘frictionless market’ for copyright works online see Brynjolfsson and Smith (2000). Some of the literature on copyright discusses whether unauthorized copying contributes to greater consumer information and thus greater efficiency through ‘sampling effects’ or ‘exposure effects’ (e.g. Blackburn, 2004; Peitz and Waelbroeck, 2006).

There seem to be three aspects to this. First, as long as cheap, unauthorized copies are not perfect substitutes for authorized copies, some consumers may use them to establish their utility before buying. There is little empirical evidence whether consumers actually buy works they have previously downloaded without authorization. In a student survey run by Gopal et al. (2006), some respondents reported that unauthorized copying of music coincides with a greater propensity to purchase authorized copies, if the music is found to be of high quality during sampling (see also Andersen and

Frenz, 2010). In a survey conducted at French universities in 2005, Bounie et al. (2006:20-21) found that almost half of ‘pirates’ used unauthorized copies of movies to “discover new actors/directors”, and nearly a third claimed that “watching pirated movies has led them to purchase movies that they would have most likely not purchased otherwise”. In any case, more complete pre-purchase information on product qualities and lower search costs should increase the probability of detecting a good match for individual preferences and willingness to pay (cf. Smith and Telang, 2010). This could counteract any sales displacement due to the substitution of authorized copies for illegitimate downloads. However, consumers could also buy less if they can avoid experimental purchases.²⁴

Second, over time greater exposure from access to cheap, unauthorized copies could also lead to rational addiction and boost demand for authorized goods and services. Taste formation is widely discussed in the specialized literature on the economics of arts and culture/cultural economics (McCain, 2003). However, few empirical results concerning copyright industries are available. Cameron (1999) finds little evidence of previous exposure leading to greater demand for cinematic performances.

A third issue related to ‘sampling’ and ‘exposure’ does not concern total demand but the extent to which the market is concentrated on a few hits, superstars, and dominant intermediary firms. Several empirical findings suggest that file-sharing/digital copying has more adverse effects for large incumbent suppliers than for smaller firms and newcomers (e.g. Blackburn, 2004; Bhattacharjee et al., 2007). The explanation may be that smaller

²⁴If consumers make more informed purchasing decisions after sampling, suppliers of high quality works would be likely to benefit.

firms gain more from the additional exposure than they lose from sales displacement due to unauthorized copying (see section 6.2).²⁵

7.4. Other mitigating factors regarding copying and supply. The literature suggests a few further mitigating factors that concern the impact of unauthorized copying on the supply of copyright works. For example, creativity may be intrinsically motivated, or suppliers of copyright works supply multiple products, not all of which are equally affected by unauthorized copying.

7.4.1. Intrinsic motivation. The empirical literature on artists' labor markets/cultural economics suggests that these types of workers accept below average compensations. They seem to be intrinsically motivated. A brief survey of empirical results is found in Benhamou (2003). Towse (2006) contains an application with a view to copyright. Intrinsic motivation would decrease the sensitivity of supply to any adverse effects of unauthorized copying on rights holder revenues. See also the research on unpaid work and open source software (e.g. Lakhani and von Hippel, 2003).

7.4.2. Multi-product firms. Last but not least, many suppliers of recorded music do not solely operate in the primary market, where authorized copies are sold to end-consumers. They often incur revenues from the secondary market where copyrights are licensed to professional users – say advertisers or video-game producers who wish to make use of a song – and often also from live performances. Where exposure in one market boosts demand in others, rights holders who are not specialized in the primary market might be compensated in secondary markets for falling sales of authorized copies. Changes in additional sources of income to rights holders thus need to be included in the analysis. The idea is related to network effects.

²⁵Another explanation would be that newcomers and smaller firms enjoy a temporary advantage over larger incumbent firms in initiating, adapting to and perpetuating radical technological change (Fellner, 1951; Arrow, 1962; Reinganum, 1983).

A survey conducted by Handke (2010b) shows that most independent record companies in Germany have other sources of income than sales of sound recordings to end consumers. He finds little evidence that income from related markets would have increased between 1998 and 2004, however, as digital copying technology diffused rapidly.

8. CONCLUSIONS

Economic theory suggests that copyright policy relates to a trade-off between a number of costs and benefits to various stakeholders. To inform copyright policy, it is desirable to develop: (1) a reasonably comprehensive and balanced analysis; and (2) reasonably precise empirical estimates of the various costs and benefits.

Over the last decade, a substantial number of empirical studies on the economic consequences of unauthorized copying and copyright have been published and many more seem to be forthcoming. Such studies may be of use to inform copyright policy. However, many empirical studies have produced conflicting or counter-intuitive results, illustrating the need for careful empirical investigations rather than the heedless application of economic theory. Overall, the picture that emerges is still ambiguous and patchy.

Four problems with the literature stand out at this point. First, the literature is not balanced. Most empirical research deals with rights holder revenues. User welfare, the supply of copyright works, or even copyright industry adaptation has received much less attention. Further research is also desirable on the administration and transaction costs associated with copyright systems, or on unintended consequences of copyright policy. Second, data limitations have made it hard to produce definite empirical assessments regarding the economic effects of unauthorized copying and copyright. Third, the limited empirical evidence suggests that the economic effects of unauthorized copying may vary substantially between markets for different

types of copyright works, but these differences are not yet well understood. Fourth, even results on closely related questions stray widely. For example, it is still debated whether file-sharing substantially diminished demand for authorized copies of musical sound recordings in the US or elsewhere. This debate should not divert attention from the bigger picture.

Many studies on unauthorized copying and rights holder revenues find a significant negative effect, at least over the relatively short periods of time covered in most assessments. If this stands, other steps have to follow in order to inform copyright policy. It is still unclear how user welfare is affected, and what the more protracted effects are, for instance on the supply of copyright works. The sparse evidence so far raises doubts whether any losses to rights holders translate into a loss in social welfare under current market conditions. For example, there is hardly any evidence that copyright strength would be positively related to the quantity or quality of copyright works supplied. Particularly in this area, much work remains to arrive at reasonable implications for copyright policy.

Appendix

The following list expands on Tables 2 and 3. The list presents the specific, empirical studies on the effects of unauthorized copying and copyright protection within the classification system developed above. Studies can appear several times in the list if aspects of them fall into various categories. An asterix (*) indicates that studies do not address US data. To have some exclusion criteria, only papers calculating statistical significance levels for the relevant findings are included.

(1) Copyright Strength

(a) Short run: Right holder welfare²⁶ (here: revenues or unit sales)

²⁶The distinction between short-run and long-run studies of rights holder welfare is difficult to make, because the time needed for complete adaptation is not known. In this list only studies

(i) Unauthorized copying²⁷*Recorded music:*

- Hui and Png (2003)
 Peitz and Waelbroeck (2004a and b)
 Blackburn (2004)
 Boorstin (2004)
 Hong (2004)
 Zentner (2005)
 Michel (2006)
 Rob and Waldfogel (2006)
 Zentner (2006)
 Gopal et al. (2006)
 Oberholzer-Gee and Strumpf (2007)
 Liebowitz (2008)
 Andersen and Frenz (2010)*
 Adermon and Liang (2010)*
 Mortimer et al. (2012)

Movies:

- Bounie et al. (2006)
 Rob and Waldfogel (2007)
 Hennig-Thurau et al. (2007)
 Smith and Telang (2010)
 Adermon and Liang (2010)*

(ii) Copyright law

Various Industries

- Baker and Cunningham (2006)

that deliberately address copyright industry adaptation to unauthorized copying are classified as covering long-term effects on rights holder welfare.

²⁷Copyright enforcement is addressed indirectly through unauthorized copying in several studies, if the assumption is that copyright enforcement measures do substantially affect unauthorized copying.

- (b) Short run: User welfare (access)
 - (i) Unauthorized copying
 - Recorded music*
 - Rob and Waldfogel (2006)
 - Waldfogel (2010)
- (c) Long run: Right holder welfare (profits after indirect effects and adaptation)
 - (i) Unauthorized copying
 - Indirect appropriability/academic journals:*
 - Liebowitz (1985)
 - Network and exposure effects/software.*²⁸
 - Givon et al. (1995)
- (d) Long run: User welfare (quantity or quality of works supplied; innovation)
 - (i) Unauthorized copying
 - Recorded music:*
 - Handke (2010a)*
 - Waldfogel (2011)
 - Handke (2012)*
 - (ii) Copyright law
 - Duration: Various industries*²⁹
 - Hui and Png (2002)
 - Landes and Posner (2003)
 - Khan (2004)
 - Png and Wang (2009)

²⁸Other studies dealing with network effects do not explicitly address network effects from unauthorized copying and how they might affect sales and rights holder revenues.

²⁹Hui and Png (2002) deal with the supply of movies in the US; Landes and Posner (2003) deal with the number of several types of copyright works registered with the US Copyright Office; Khan (2004) addresses the number of book authors; Png and Wang (2009) address the supply of movies in a cross-country panel study.

(2) Costs of copyright/Unintended consequences³⁰

(a) Contestability

(i) *Recorded music:*

Blackburn (2004)

Gopal et al. (2006)

Bhattacharjee et al. (2007)

Handke (2010a)*

Mortimer et al. (2012)

(b) Effects on technological innovation

(i) *Recorded music:*

Handke (2010a)*

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³⁰In these papers, no distinction is made between long-run and short-run effects, or between rights holder and user welfare. In the economic literature, the author found no quantitative-empirical studies estimating either the administration costs or the transaction costs associated with copyright systems

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