

Pasche, Markus

**Working Paper**

## Welfare effects of endogenous copyright enforcement: The case of digital goods

Jena Economic Research Papers, No. 2014-008

**Provided in Cooperation with:**

Max Planck Institute of Economics

*Suggested Citation:* Pasche, Markus (2014) : Welfare effects of endogenous copyright enforcement: The case of digital goods, Jena Economic Research Papers, No. 2014-008, Friedrich Schiller University Jena and Max Planck Institute of Economics, Jena

This Version is available at:

<https://hdl.handle.net/10419/98435>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*



# JENA ECONOMIC RESEARCH PAPERS



# 2014 – 008

## **Welfare Effects of Endogenous Copyright Enforcement – the Case of Digital Goods –**

by

**Markus Pasche**

[www.jenecon.de](http://www.jenecon.de)

ISSN 1864-7057

The JENA ECONOMIC RESEARCH PAPERS is a joint publication of the Friedrich Schiller University and the Max Planck Institute of Economics, Jena, Germany. For editorial correspondence please contact [markus.pasche@uni-jena.de](mailto:markus.pasche@uni-jena.de).

Impressum:

Friedrich Schiller University Jena  
Carl-Zeiss-Str. 3  
D-07743 Jena  
[www.uni-jena.de](http://www.uni-jena.de)

Max Planck Institute of Economics  
Kahlaische Str. 10  
D-07745 Jena  
[www.econ.mpg.de](http://www.econ.mpg.de)

© by the author.

# Welfare Effects of Endogenous Copyright Enforcement – the Case of Digital Goods –

Markus Pasche

Friedrich Schiller University Jena  
School of Economics  
Carl-Zeiss-Straße 3, D-07743 Jena  
markus.pasche@uni-jena.de

March 28, 2014

## Abstract

In case of digital goods such like music, intellectual property rights are typically not exerted by the creators (artists) but by intermediaries. Their profits, and therefore also the income of the artists, are endangered by copyright infringements (piracy). It is well known from static welfare analysis that to some extent piracy reduces the deadweight loss by limiting monopoly power and could therefore increase welfare. This paper contributes to the discussion by including the costs of law enforcement into the welfare analysis. Most models in the literature assume that law is enforced by governmental activities. In contrast, this paper considers that law enforcement is exerted by agents (e.g. lawyer chancellories, provider of screening technologies) which are also seen as intermediaries. The enforcement effort is therefore endogenously determined. It is shown that this will lead to suboptimal welfare outcomes. A social planner has to regulate punishment and enforcement effort to a moderate level. A more rigorous fight against piracy could only be justified by negative dynamic welfare effects due to a loss of creativity. However, there is no empirical evidence for that.

**Keywords:** digital goods; music; piracy; copyright; intermediation; law enforcement; welfare

**JEL Classification:** D60, L12, K11, K42

# 1 Introduction

There is an ongoing and heated public debate about alleged welfare losses because copyright infringements harm the sales of digital goods, induce revenue losses in the creative industries and endangers jobs (e.g. Siwek (2007) in case of the music industry). Therefore, creative industries claim for stronger law enforcement. The academic literature on digital goods and piracy, however, also considers the consumer welfare perspective, as well as positive supply side effects like promotion and sampling effects, and therefore comes to more differentiated conclusions (e.g. Liebowitz/Margolis (2005), Waelbroeck (2013), Waldfoegel (2012a), Peitz/Waelbroeck (2006)). It is clear that exclusive rights always create market power and hence deadweight losses which could be partially offset by law infringements. Moreover, piracy by consumers with a marginal willingness to pay below the market price must *ceteris paribus* enhance static efficiency. The analysis therefore concentrates on different trade-offs between static and dynamic efficiency concerns (Belleflamme/Peitz (2010), Boldrin/Levine (2008)).

Another important issue is that intellectual property rights such like copyright is typically not exerted by the creator herself due to transaction cost arguments. Therefore, the rights to use the digital goods are typically sold by intermediaries such like commercial publishers, record labels, or performing rights organizations (Bailey (1998), Hees/Walter (2006)). These intermediaries operate on a two-sided market which is typically oligopolistic due to scale and scope effects. Thus, they have significant market power and a strong interest that the design and enforcement of law protects their profits (Sriavastrava (2006), Liebowitz/Watt (2006), and especially Rayna/Striunova (2009)). Of course, intermediaries will always argue that copyright enforcement is important for incentivizing creativity, and that piracy harms the creators. Therefore they promote an interpretation of the functionality of law which parallelizes piracy of digital goods with a theft of physical goods.

Another important question in this context is, to which extent copyright infringements are really the reason for the decline of sales and revenues as it is argued e.g. by the music industry. Such a decline could also be a result of product life cycles and missing new business models for a digital economy with changing consumer needs and behavior. Based on different methodologies, several studies confirm the intuition that piracy has negative effects (Siwek (2007), Peitz/Waelbroeck (2004), Zehner (2006), Liebowitz 2008), while some studies also see positive countervailing effects e.g. due to promotion and sampling (Aguiar/Mertens (2013), Peitz/Waelboeck (2006b), Oberholzer-Gee/Strumpf (2007, 2010), see Peukert et al. (2013) for the case of the movie industry). Others are

emphasizing that piracy has also stimulated the search for new promising business models such like streaming or MP3 stores (Rob/Waldfoegel (2004), Waldfoegel (2010), Danaher et al. (2013)). An overview about the empirical literature can be found in Smith/Telang (2012). The simple theoretical framework in this paper does not consider complex supply side effects, therefore we adopt the view of the majority of empirical studies that piracy has a clear negative effect on sales and revenues of the intermediary.

If copyright infringements are harmful for the creative industry's profits and perhaps also for the dynamic efficiency, then the question of optimal enforcement arises. Without any enforcement, the consumer's commitment to law would solely rely on intrinsic social motivation. Although behavioral economics has extensively shown that many people voluntarily comply to rules even if they could easily free-ride, we adopt the pessimistic traditional view that enforcement is a necessary condition for law compliance, and that the level of enforcement correlates with the level of compliance. However, there is only little research about (optimal) copyright enforcement (see e.g. Danaher et al. (2012), Belleflamme/Peitz (2010)). Gil (2006) argues that enforcement design is often guided only by the needs of the supply side while optimal enforcement should also take the consumer welfare into account. Welfare analysis has also to consider that enforcement is costly. Since enforcement costs are carried by the punished pirates or by the taxpayer, the creative industry will not care about that. They claim for high enforcement levels and sharp punishments. Moohr (2005) and Danaher et al. (2012) argue, however, that enforcement costs could offset all efficiency gains so that "overcriminalisation" might lead to welfare losses. Moreover, a too sharp enforcement and punishment could be perceived as unacceptable by the public and undermine the legitimacy of the copyright law – instead of strengthening it (Moohr (2005)).

This paper contributes to the literature by considering law enforcement as an economic activity exerted by lawyers or chancelleries, police, courts, and technical service supporters which e.g. resolve IP addresses to names of individuals who have been active in filesharing networks. We subsume them as an "enforcement intermediary" which plays also an important role in the use of intellectual property rights beside the intermediaries in the creative industry such like publishers, record labels or performing rights organizations. Without such enforcement agents the creative industry would not be able to exert the property rights. Empirically, it is not the "state" which becomes active. The enforcement intermediaries operate as agents of the creative industry which initiates the screening of potential law violations, or they become active on their own account, e.g. when send-

ing costly written warnings to (alleged) pirates. Thus, while the level of punishment is determined by law and therefore by the government, the level of enforcement effort is endogenously determined by the intermediaries. The result of the analysis shows that they might choose a higher enforcement level than the social planner would do. This calls for a governmental regulation of law enforcement activities, favoring a mild instead of rigorous enforcement.

## 2 Static welfare analysis

### 2.1 A simple baseline model

A digital good such like a piece of music is created by several persons: composer, performing artists, technical producers etc. (in the following: artists). For other digital goods such like movies, e-books or scientific articles it can be argued in a similar way so that in the following we take “music” as *pars pro toto* for digital goods. The artist’s creativity, labor and capital input creates a particular good which does not rival in use. This means that there is a given resource input (fix costs) but zero marginal costs of reproducing the digital good, i.e. making copies. Intellectual property rights (IPR) could establish non-disclosure so that music becomes a marketable good (Landes/Posner (1989)). However, the exertion of IPR bears transaction costs: marketing, organizing the sales, controlling the performing and broadcasting rights etc. Although new technologies in the digital economy should have reduced these transaction costs significantly, they are still prohibitively high for most artists. Therefore, artists need intermediaries to use their IPR effectively in order to generate revenues. These intermediaries are institutions such like record labels or performing rights organizations. Most of the property rights are transferred to these intermediaries which have significantly lower transaction costs because of scale and scope effects, specialized human capital, and better screening technologies for controlling the use of the rights. Intermediaries are assumed to have positive constant marginal costs. Since IPR are exclusive rights on a particular piece of music or another digital good, intermediaries have monopoly power. Hence they will maximize their profits, and these profits are shared with the artists. An intermediary therefore operates on a two-sided market: as a monopolist it sells the digital good to consumers, and pays the artists for their work. We will not consider the bargaining process between intermediary and the artist. Empirical evidence shows that intermediaries have much more power to extract rents than the artists. Only famous artists are able to get a share of the profits which

significantly exceeds their costs (“superstar effect”)<sup>1</sup>. Some intermediaries such like large music labels perceive themselves as the “producer” rather than an intermediary because they are “developing” and “using” artists as an input factor which is payed according to his reservation utility. However, this confuses the difference between “creative industries” and the individual process of creative work which is essential for the analysis (Towse (2010)).

The formal structure of the model starts with a market demand function for the digital good  $x(p)$  with  $x'(p) < 0$  where  $p$  is the price, set by the intermediary, and  $x$  as the demanded quantity of copies. The inverse demand function  $p(x)$  indicates the marginal willingness to pay (WTP) for  $x$ . We assume that all consumers with different marginal WTP have the same propensity to violate the copyright law. We model this effect by a given piracy rate  $\beta$ , so that for every  $p$  the effective demand of honest consumers is  $(1 - \beta)x(p)$  while  $\beta x(p)$  is consumed illegally without paying a price. Later on, we will consider that  $\beta$  depends on punishment payments in case of being convicted to piracy.

We assume constant marginal costs of intermediation (or: transaction costs)  $c_1 > 0$ . In the first step, we neglect all fix costs of the artist. Maximizing profits

$$\max_{p \geq 0} \pi = (1 - \beta)x(p)(p - c_1)$$

leads to an optimal price  $p^*$  which is independent from  $\beta$ . If considering that  $\beta$  depends on the WTP or on quality parameters (when original and copy have different qualities), then  $\beta$  depends on strategic variables which makes the analysis more complicated. Since the focus of this paper is on the cost of law enforcement, we neglect this and consider a given optimal solution  $p^*$ . Let  $x^* = x^*(p^*)$  be the market-clearing quantity for the case that every consumer is honest (no piracy), and  $(1 - \beta)x^*$  is then the effectively sold quantity.

The producer surplus is easy to calculate:

$$PS = \int_0^{(1-\beta)x^*} (p^* - c_1)dx = (1 - \beta)x^*(p^* - c_1)$$

It is obvious that piracy ( $\beta$ ) decreases  $PS$  so that producers have a strong interest to campaign for better copyright enforcement e.g. by stronger punishment and enhanced screening of potential infringements.

---

<sup>1</sup>Thus, rock superstar Courtney Love suggested to use the term “piracy” for the vast rent extraction by major labels which pay the most artists poorly, see [http://www.salon.com/2000/06/14/love\\_7](http://www.salon.com/2000/06/14/love_7).

The consumer surplus, however, has to consider that also illegal consumption bears consumer welfare which is even higher because no price is paid. Furthermore, it has to be considered that only piracy of consumers with a marginal WTP *above* the market price  $p^*$  will reduce producer surplus. Piracy of consumers who wouldn't purchase the good anyway because  $WTP < p^*$ , will c.p. increase welfare. The consumer surplus can be written as

$$CS = \int_0^{x^*} [(1 - \beta)(p(x) - p^*) + \beta p(x)] dx + \int_{x^*}^{\bar{x}} \beta p(x) dx$$

where  $\bar{x}$  is the saturation quantity (everybody has a copy of the digital good). The first term is the wealth of consumers who potentially buy the good because  $WTP \geq p^*$ . A fraction  $\beta$  does not pay the price  $p^*$ . The second term captures the wealth of consumers with  $WTP < p^*$  (e.g. children with a very low budget who are downloading music illegally from the internet, or piracy in developing countries). Total welfare is  $W = PS + CS$ . The impact of piracy on total welfare in this simple framework is then

$$\frac{\partial W}{\partial \beta} = \int_{x^*}^{\bar{x}} p(x) dx + c_1 x^* > 0 \quad (1)$$

The first term comes from those consumers with  $WTP < p^*$ . Note, that even neglecting these consumers, the impact of piracy would be positive ( $c_1 x^* > 0$ ) because of saved cost of intermediation. This implies that a socially optimal piracy rate is  $\beta^* = 1$  (note that we have neglected the fix costs of the artist, hence the good is created “costlessly”).

The interpretation is straightforward: monopoly power due to IPR rises the price above the socially optimal level, namely the marginal costs of reproducing  $x$ , which is zero. Hence, the intermediary is extracting consumer welfare which results in a deadweight loss. Competitive markets would erode market power and profits. This is not possible in case of exclusive IPR. Piracy serves as a substitute for the missing competitive pressure and helps to save some social costs of intermediation. One should keep in mind that intermediation does not create any additional goods and services valued by the consumers. Intermediation is only necessary because otherwise the artists would not have an incentive to produce and to distribute their goods at all. But intermediation utilizes resources of the economy which could be used otherwise in a more productive way. If there are still enough stimuli to incentivize the artist, an increase of consumer welfare due to piracy to the expense of intermediary's monopoly profits is not only a redistribution of wealth but has necessarily positive net welfare effects because it *reduces opportunity costs of intermediation*. The potential disincentive for the artist is a matter of dynamic inefficiency which will be discussed later on.



There is a more simple intuitive proof of the positive net welfare effect: For a given  $p^*$ , the loss of profits is  $\Delta PS = -\beta x^*(p^* - c_1)$ . Since the reduction of sales,  $-\beta x^*$ , comes only from consumers with  $WTP \geq p^*$ , let us assume very conservatively that  $WTP = p^*$ . Hence the consumer welfare gain is  $\Delta CS = +\beta x^* p^*$ . The net effect is then  $+\beta x^* c_1$  which are the saved costs of intermediation. If now considering consumers who wouldn't buy the good anyway, the net effect is even larger.

Up to now, this simple textbook microeconomic analysis gives us results which are well-known already from the piracy literature (see section 1). There are at least two obvious shortcomings in this simple framework: First, we have neglected the fix costs of creative production which are limiting the optimal piracy rate. Second, we should consider costly law enforcement and punishment of copyright infringement. The latter case requires that  $\beta$  depends on punishment payments. Moreover, the socially optimal piracy rate requires that also the costs of law enforcement are considered. This will be discussed in the next subsection.

Note, that expression (1) implies an optimal piracy rate  $\beta^* = 1$ . In fact this would be optimal in the case that artists have enough intrinsic motivation or no fix costs. Now let us introduce such fix costs, covering the labor inputs of producers and performing artists as well as a sufficient compensation for the composer to exceed his reservation utility, and fix capital costs. Let us define  $C^{fix}$  as a catch-all variable for these costs which diminishes the welfare. To keep up the incentive to produce (and to intermediate), the producer surplus  $PC$  should cover  $C^{fix}$  so that the piracy rate is limited to

$$\beta^{max} = 1 - \frac{C^{fix}}{x^*(p^* - c_1)} \quad (2)$$

which can also be labelled as the *optimal piracy rate* with minimal deadweight loss. In case of zero fix cost, it would be optimal to completely wipe out the intermediary sector by piracy ( $\beta = 1$ ). If  $C^{fix}$  would exceed the profits which could be earned in a completely honest society,  $x^*(p^* - c_1)$ , then it is socially not optimal to produce such a good at all. The willingness to pay is then less than required to cover all costs. Henceforth, for “realistic” cases, a social planner cannot be interested in rigorously fighting down piracy to zero but to the optimal piracy rate  $\beta^{max} \in (0, 1)$ .

What happens in case of technological progress? The development of the digital economy reduces the transaction and intermediation costs for promotion, selling copies, streaming, licensing etc., which is a reduction of  $c_1$ . The derivative  $d\beta^*/dc_1$  is negative which implies that the social planner would be *more tolerant* against piracy instead of reducing it by

strengthening IPR. The same holds true for the fix costs.

## 2.2 The model with optimal law enforcement

A copyright law without any enforcement is pointless. Behavioral economics has shown that individuals are able to partially commit themselves to social norms and laws, and that they are also willing to pay voluntarily for digital goods (Regner/Barria (2004)). Nevertheless, we will adopt the traditional view that violation of rules must be costly, otherwise individuals have no incentive for rule compliance.

Now we have a dilemma: a social planner would prefer piracy to a certain extent  $\beta^{max} > 0$ . But law has to apply to *every* consumer in the *same* way, irrespective whether a particular piracy act exceeds  $\beta^{max}$  or not, or whether the marginal willingness to pay is above or below the market price  $p^*$ . A general allowance to violate law means that *de facto* no effective IPR are given to assure non-disclosure of using  $x$ . So each law *must* be enforced by a screening and punishment mechanism which makes infringements costly. Of course this requires another type of intermediation, namely law enforcement by lawyers, judges, police etc. This intermediation uses resources and bears therefore fix and variable costs. The latter now depend on all cases of piracy,  $\beta\bar{x}$ .

Assume that  $C^E$  are the costs of screening effort for detecting law infringements. As argued above, law without any enforcement is not credible. Hence, we define  $C_{min}^E > 0$  as the minimal effort which makes the law credible to the public. The probability of successfully detecting an act of piracy is  $\mu(C^E)$  with  $\mu' > 0$ . Moreover,  $c_2\mu\beta\bar{x}$  are the expected variable costs of law enforcement such like sending letters of notice and bringing these cases to court. Note that  $\beta\bar{x}$  is the total sum of infringement cases, and  $c_2$  is determined by the “enforcement technology”.

Once, when a consumer is convicted to piracy, he has to pay a punishment rate  $z > p^*$ . Depending on the intermediary’s effort  $C^E$ , the probability of being convicted is  $\mu < 1$ , so that expected punishment is  $\mu z$ . It is important to see that punishment payments will not affect total welfare because they are only a redistribution of wealth from the convicted consumer to the enforcement intermediary or to the copyright holder.

Expected punishment payments will (and should) have an impact on the piracy rate  $\beta$ . If we assume that people have identical preferences, then *either* purchasing  $x$  *or* piracy is more beneficial for a given  $\mu z$ , but not a mixture  $\beta \in (0, 1)$ . Thus, we have to adopt the less rigorously derived behavioral hypothesis that the piracy rate depends negatively on

the expected punishment payments: let  $\beta(\mu z)$  be an invertible function with  $\beta'(\mu z) < 0$  and  $0 < \beta(0) < 1$ .

It is evident, that even in case of costless law enforcement, a socially optimal  $z$  should not bring down piracy rate to zero as argued above. It would be favourable if piracy in cases where consumers have a willingness to pay below  $p^*$  (which means that they do not harm the profits) would not be punished at all. However, this is not possible because law has to apply to everybody in a non-discriminatory way. But it might be possible to design the copyright law in a differentiated way which allows copying under conditions where social benefits exceed the loss of profits and maintains the incentive of the artist to be creative.

The simple analytics of optimal punishment starts with employing  $\beta(\mu z)$  into the welfare function  $W$ . The total welfare including the law enforcement system is now

$$W = CS + PS - C^{fix} - C^E - c_2\mu(C^E)\beta(z\mu(C^E))\bar{x}$$

Thus, we have

$$\frac{\partial W}{\partial z} = \frac{\partial W}{\partial \beta} \frac{d\beta}{dz} \mu$$

with

$$\frac{\partial W}{\partial \beta} = c_1 x^* - c_2 \mu \bar{x} + \int_{x^*}^{\bar{x}} p(x)$$

which has an ambiguous sign. (i) A positive sign would imply that marginal benefits of (consumer) welfare gains due to piracy exceed the marginal costs of punishing them. This does not mean that the convicted consumer has still a gain because he has to pay the punishment rate  $z > p^*$ . In this case we would have  $\partial W/\partial z < 0$  which means that zero punishment is optimal. (ii) If, however,  $\partial W/\partial \beta$  has a negative sign, then punishment  $z$  should be increased to extreme scales until piracy is completely wiped out. But the reason for this is clearly *not* that piracy is harming the artists and copyright holders, but because it is so costly to punish convicted pirates. Or in general terms, a behavior is punished extremely harsh not because the behavior harms the society but *because* it is so expensive to punish which makes the behavior socially undesirable. This would be a rather strange and perverse justification of law enforcement, and it will not be considered. Therefore, we consider case (i).

However, zero punishment would lead to high piracy rates  $\beta(0)$ . Again, we have to distinguish two cases: if  $\beta(0) \leq \beta^{max}$ , it is anyway socially optimal not to invest into law enforcement at all because consumers are able to commit themselves to a reasonably low piracy level which allows copyright holders to generate significant profits. Although this

might not be unrealistic, we confine to the more pessimistic case that  $\beta(0) > \beta^{max}$ . Then we have a restriction for the piracy rate which has to be implemented by law enforcement. Optimal punishment ( $z$ ) and optimal enforcement effort ( $C^E$ ) should ensure that copyright holders do not make losses, hence

$$\beta(z\mu(C^E)) = \beta^{max} \quad (3)$$

should hold true, where  $\beta^{max}$  is given by (2). This is a minimum requirement for dynamic efficiency as well. Obviously there is a continuum of  $(z, C^E)$ -combinations which induce the optimal piracy level  $\beta^{max}$ . The total derivative of the implicit function  $z(C^E)$  clearly shows that  $dz/dC^E < 0$ . Strong (low) punishment but low (high) enforcement effort (low probability of being convicted) are leading to the same results. We have argued that punishment payments  $z$  are a pure redistribution of wealth, not affecting  $W$ . Therefore, a social planner always prefers a solution with minimum enforcement effort  $C_{min}^E$  and a harsh punishment  $z(C_{min}^E)$ . However, while a too lax enforcement endangers the credibility of the law, a too harsh punishment undermines its legitimacy (Moohr (2005)). Moreover,  $\beta^{max}$  depends on  $C^{fix}, p^*, x^*$  and therefore varies across different digital goods. So there is no easy answer what a social planner should do.

Closing this section, it has to be remarked that even in times where the movie industry and the music record labels were ringing the alarm bells that piracy is perishing their business model and artists would suffer, there have still been significant profits. From a social planner perspective there is hence no evidence of a “too weak” law enforcement. Thus, from a static (!) welfare perspective, the campaign for strengthening IPR e.g. by more frequent controls and harsher punishment, is understandable from the viewpoint of rent-seeking intermediaries, but not from the viewpoint of a social planner. The latter aims at regulating  $\beta$  to a socially optimal level. This should be done by large values of  $z$  and low levels of  $C^E$ . However, this perspective neglects, that empirically seen, law enforcement is not exerted by a social planner or “the government”, as most literature sources suggest, but by law enforcement agents in an institutional environment. This will be considered in the next section.

### 2.3 Law enforcement by intermediaries

How are copyright infringements detected and punished? Without going into details of the legislation of different countries, in most cases lawyers are hiring technical experts (or simply using a specific software) who detect illegal activities e.g. in peer-to-peer

networks. The lawyer then has the right to claim the internet provider to reveal the personal data behind the IP address which was involved into the illegal activity. For other digital goods the screening process might be simpler. Then the lawyer sends a costly call of notice and eventually the case comes to a court where the pirate might be convicted to punishment payments. These lawyers can be active either by being commissioned from the copyright holder, or on their own account. In any case, they will become active only if it is beneficial for them. Therefore, we understand the institutional arrangement of law enforcement as a special kind of intermediary sector, connecting copyright holders and consumers who are infringing the law. These activities have to create profits which depend, among others, on legally defined punishment rates  $z$  and market regulations for lawyers and other agents. Therefore we should expect diverse rent-seeking activities which should protect their profits.

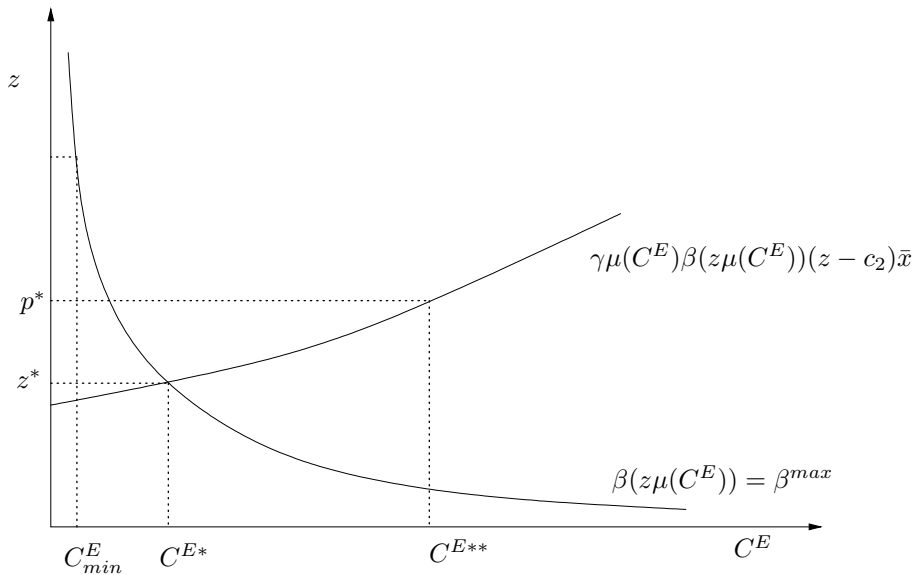
We extend our framework by modelling the law enforcement activities in the following way: assume that  $z$  is exogenously determined by law. It is a catch-all variable which includes different things like the charges of letters of notice and compensations of copyright holders if the case is brought to court. Furthermore, we assume that an intermediary carries a part of the variable costs  $c_2$  but also gets a fraction of the punishment payments  $z$ . For simplicity, we assume that he receives a fraction  $\gamma$  of the net revenues  $(z - c_2)$  of a specific case of infringement with  $z > c_2$ . Now let us assume that the market for copyright enforcement activities is open so that more and more agents could enter this lucrative market or, alternatively, few specialized chancellories expand their activities in this field. This means that enforcement effort  $C^E$  increases as long as this is profitable. This process stops when expected profits are zero (Chamberlin solution):

$$\gamma(z - c_2)\mu(C^E)\beta(z, \mu(C^E))\bar{x} = C^E \quad (4)$$

Also this is an implicit function  $z(C^E)$  which obviously starts at  $z \geq 0$  for  $C^E = 0$ . The total derivative of the equation shows that  $dz/dC^E$  has an ambiguous sign. A negative sign would imply that a higher effort  $C^E$  has a large effect on probability  $\mu$  of detecting a pirate but a low effect on piracy rate  $\beta$ , so that c.p. the profits will increase more than  $C^E$ . In such a case lower penalty rates  $z$  are required to ensure the zero profit condition. For a given penalty  $z > c_2$ , however, this case would induce an *infinitely* high effort  $C^E$ . This is implausible for economical and also mathematical reasons: since  $\mu, \beta \in [0, 1]$  holds true, an increasing  $C^E$  must have decreasing marginal effects on both variables. For sufficiently high levels of  $C^E$  there will be only marginal effects on the profits so that further efforts  $C^E$  must be compensated by increasing  $z$ .

Given these endogenous law enforcement activities of intermediaries, a social planner has to set the exogenous variable  $z$  so that wealth is maximized under the condition of  $\beta = \beta^{max}$  which ensures an incentive to produce the digital good. Technically, this is the solution of the system of the two implicit functions (3) and (4). Since (3) represents an implicit function where  $z \rightarrow \infty$  for  $C^E \rightarrow 0$  and  $dz/dC^E < 0$  for all  $C^E$ , and (4) represents an implicit function with  $z(C^E = 0) \geq 0$  and  $dz/dC^E > 0$  at least for sufficiently large  $C^E$ , there must exist a positive solution ( $z^* > 0, C^{E*} > 0$ ).

A graphical example with  $\beta = 1/(1 + \mu z)$  and  $\mu = C^E/(1 + C^E)$  is shown in figure 1. Points above the downwards sloped curve indicate  $\beta < \beta^{max}$  which imply welfare reduction due to deadweight loss, points below this curve would lead to a piracy rate  $\beta > \beta^{max}$  which makes it non-profitable to produce the digital good. For each given level of  $z$ , the enforcement effort  $C^E$  will increase until the upwards sloped curve is reached (zero profit condition). Welfare increases with decreasing  $C^E$ , independently from  $z$ . The intersection point  $(C^{E*}, z^*)$  indicates the socially optimal level the social planner would choose by determining  $z^*$ . Such a second-best solution implies a moderate level of punishment and a moderate level of enforcement activities.



**Figure 1:** *Socially optimal law enforcement*

Without specifying all functions in our model we do not know much about the solution  $(C^{E*}, z^*)$ . The following cases could occur:

- First, assume that  $z^* > p^*$ . The minimum requirement for effective enforcement that punishment is more costly than paying the regular market price is met. The

social planner would implement  $z^*$ . The piracy level is then optimal:  $\beta = \beta^{max}$ . The welfare loss from endogenously determined law enforcement by intermediaries compared to the social planner's solution is  $C^{E*} - C_{min}^E > 0$ .

- Second, assume that  $z^* \leq p^*$ . Under the endogenous enforcement regime the social planner cannot implement  $z^*$  because it will not create any incentives to pay the market price  $p^*$ . Hence, a punishment level  $z > p^* \geq z^*$  has to be implemented with the consequence that enforcement intermediaries choose an effort level above  $C^{E**}$  (see figure 1). Thus, the piracy rate drops below the optimal level:  $\beta < \beta^{max}$ , and the welfare losses compared to the social planner's solution are  $C^{E**} - C_{min}^E > 0$  plus *additional* deadweight losses from too low piracy.

The analysis has shown that even in the case, that a social planner aims at optimally regulating the effort of the law enforcement intermediary to a moderate level by limiting the punishment rates, there might be negative welfare effects. Although the system of intermediation between artists and consumers as well as law enforcement intermediation seems to work successfully (with  $z > p^*$  as a pre-requisite), the society is not aware that behind the *veil of intermediation* more resources are utilized and more rents are created than it is socially optimal. As a consequence, the social planner has to set  $z = \max\{z^*, p^* + \epsilon\}$  and eventually to limit the enforcement effort  $C^E$  to its socially optimal level which implements  $\beta^{max}$ . This can be implemented e.g. by explicitly tolerating some copying activities under a "fair use" rule, and to restrict screening activities by binding them to strict legal conditions. However, from Public Choice perspective it is clear that this route is neither favored by the creative industry nor by the enforcement intermediaries. Thus, this analysis of endogenous enforcement strengthens the arguments of e.g. Waldfoegel (2012b) and Moohr (2005), that the consumer perspective should play a significant role for policy design. If policy would follow the rent-seeking intermediaries,  $z$  and  $C^E$  would climb up the implicit function (4) (see figure 1) until piracy is nearly wiped out which results in maximum intermediary's surplus and minimized overall welfare.

### 3 Dynamic welfare losses – what drives creativity?

The analysis in the previous chapter is a pure static one. It is well known that piracy undermines monopoly power and therefore reduces deadweight loss, but might endanger dynamic incentives for further creative output. Thus, fighting piracy and enforcing the copyright law would have the reverse effects. Before I discuss briefly few theoretical

and empirical arguments against this view, it has to be pointed out that piracy not necessarily reduces the revenues of the *creative individual*: (a) in the first place piracy might reduce the revenues of the intermediary and hence its profit margin. Depending on the competitiveness on the two-sided market and especially the contract design between creator and intermediary, it is not necessary that the revenues of the creative artist are reduced as well. (b) There might be positive supply side effects from piracy such like promotion effects for newcomers or stimulating the demand for legal downloads so that the impact on revenues is ambivalent (see chapter 1). (c) Piracy might endanger the classical business models of intermediaries but stimulate the search for business models which are more appropriate for a digital economy and more fitting the needs of the consumers (see Liebowitz (2006), Waldfogel (2012)).

But let us adopt the more pessimistic view that copyright infringements are finally affecting also the artist's revenues negatively. Towse (2010) argues that the focus on the "creative industries" might be misleading since the core of this industry is the creative individual. And our understanding of the individual creative process and how copyright enforcement and monetary rewards are affecting this process is not very well understood. Landes and Posner (1989) point out that copyright might have ambivalent impact on creativity, and Frey (2000) emphasizes that there are multiple sources of creative motivation, but also motivation crowding-out. Danaher et al. (2013) discuss different channels how piracy might affect creative activities. They argue that it is unclear how monetary profits affects the output since creative persons are typically not primarily motivated by profits (see also Nadel (2004), Towse (2001)). Since from a theoretical point of view the effect of copyright and piracy on the creative activities of *individuals* is not clear, it is negligent that policy adopts the view of the creative *industry*.

Since it is difficult to measure creativity and its underlying motives, there is not much empirical investigation how piracy or law enforcement affects creativity. Empirical studies face the problem that creation of music or other goods by individuals on the one hand, and the piracy effects on sales and revenues of the music industry on the other hand, cannot relate directly creativity and monetary rewards on an *individual* level. But this could be investigated experimentally. As Eckartz, Kirchkamp and Schunk (2012) found out, individuals exert a significant effort in creative tasks nearly independent from the payment scheme. Bailey and Fessler (2011) showed that monetary incentives have an impact only if the creative task is un-attractive and less complex. In case of attractive tasks the effort is not stimulated by payment incentives. Eckartz (2014) introduces some



modifications: if individuals have the possibility to “pause” from the creative task (a paid outside option), then performance-based payments lead to a higher performance than fixed payments. However, although the pause option would enable the participants to earn money without any activities, they are still committed to creative effort.

It has to be pointed out that the presumed negative (positive) effects of copyright infringement (enforcement) on dynamic efficiency is the pivotal point of the debate. The pure *static* allocative efficiency cannot be negatively affected by piracy. As the real value of the bundle of produced physical and digital goods is given, piracy creates additional consumer surplus by a more extensive use of a digital good with zero reproduction cost, and by re-distributing wealth from intermediaries (and perhaps artists) to the consumers. The reduction of sales and revenues, and perhaps also jobs in the intermediary as well as in the law enforcement sector is clearly not a loss of wealth, as the rhetoric of these industries suggests (e.g. Siwek (2007)). Consumers spend the income which they otherwise would have spent for legal music, for other goods instead. This means that valuable input factors in the intermediary industry could be re-allocated to productive opportunities in order to *enlarge* the produced bundle of goods. Thus, piracy serves as a vehicle to reduce deadweight loss and to enhance global allocative efficiency. The only requirement for static efficiency is that the fix costs of creative production must be covered. Therefore, copyright law and a mild enforcement regime is necessary. The justification for rigorous enforcement policies, as advocated by the creative industry, must therefore be based on strong negative *dynamic* effects on creativity. However, the theoretical and empirical arguments discussed above indicate that the impact of monetary revenues on creativity and hence dynamic efficiency is not clear, and that many arguments point into the direction that the impact is very limited. Since piracy affects in the first place the revenues of the intermediaries and only indirectly those of the creators (depending on contract design), the linkage between piracy and creativity is even more weak.

Taking the music industry as an example, Handke (2010) does not find evidence that the long-run trend in annual new recordings or publications of titles – as a proxy for creative output – is affected by piracy or the strong enforcement activities from 2004. Since the number of annually recorded and published titles are not only a sign of creativity since this is also a strategic decision of those record labels which are member of the data providing organizations, it should be considered that creativity measures should also depend on the quality of music as well as on its diversity. Waldfogel (2011, 2012b) develops a measurement concept which accounts for music *quality* as a primary measure for creativity,

reaching the conclusion that piracy and the decline of industry's revenues do not have a significant impact on creativity. Tschmuck (2003, 2006) points out the role of *diversity* as an important aspect of creativity. He argues on an empirical basis that conventional paradigms of the music business are more limiting rather than fostering creativity in terms of diversity. Thus, the decline of conventional business models do not negatively affect creativity, while the latter is fostered by the emergence of new forms of music production and allocation modes. In more general terms, Frey (2000) and Cohendet et al. (2009) argue that cultural and social impact factors are much more important for creativity than industry's profits, especially radical innovations in music styles seem to be completely independent from material payoff (see also Sternberg (2006) and Tschmuck (2006) on this issue).

## 4 Conclusion

From a pure static welfare perspective piracy reduces deadweight losses and enhance allocative efficiency. Additional consumer wealth is created, but to a significant extent wealth is also redistributed from intermediaries to consumers. From this perspective, copyright law and its enforcement is necessary only in order to keep piracy on a level that fix costs of creating digital goods are covered. If we consider that costly law enforcement is endogenously determined by the activities of an "enforcement industry", the enforcement effort will be higher than the efficient level which a social planner would choose. The justification for rigorous copyright enforcement could *solely* be based on the negative effects of piracy on *dynamic* efficiency. However, theoretical considerations as well as the empirical picture to which extent monetary revenues are affecting the creativity of individuals is ambiguous. Most insights point into the direction that the impact is weak. From this we can conclude that policymakers should not be tempted to adopt the rhetoric of the creative industries which have a strong rent-seeking interest in fighting down piracy. Instead, "fair use" principles for consuming and replicating digital goods (Landes/Posner (1989)) as well as strict control and regulation of market power in intermediary industries – thus strengthening the position of the creative individuals – seem to be a more preferable way. Law enforcement is still necessary but punishment as well as enforcement effort have to be regulated to a moderate level.

## References

- Aguiar, L., Martens, B. (2013), Digital Music Consumption on the Internet: Evidence from Clickstream Data. Institute for Prospective Technological Studies, Digital Economy Working Paper 2013/04.
- Bailey, J. P. (1998), *Intermediation and Electronic Markets: Aggregation and Pricing in Internet Commerce*. Doctoral Dissertation, Massachusetts Institute of Technology. May 1998.
- Bailey, C. D., Fessler, N. J. (2011), The moderating effects of task complexity and task attractiveness on the impact of monetary incentives in repeated tasks. *Journal of Management Accounting Research* 23(1), 189-210.
- Belleflamme, P., Peitz, M. (2010), Digital Piracy: Theory. *CESifo Working Paper* No. 3222, Category 11: Industrial Organization.
- Boldrin, M., Levine, D. K. (2008), *Against Intellectual Monopoly*. Cambridge University Press.
- Cohendet, P., Grandadama, D., Simonb, L. (2009), Economics and the ecology of creativity: evidence from the popular music industry. *International Review of Applied Economics* 23(6), 709-722.
- Danaher, B., Smith, M. D., Telang, R. (2013), Piracy and Copyright Enforcement Mechanisms. *NBER Chapters, Innovation Policy and the Economy*, Vol. 14.
- Danaher, B., Smith, M. D., Telang, R., Chen, S. (2012), The Effect of Graduated Response Anti-Piracy Laws on Music Sales: Evidence from an Event Study in France. Working Paper, forthcoming in: *Journal of Industrial Economics*.
- Eckartz, K. M. (2014), Task enjoyment and opportunity costs in the lab - the effect of financial incentives on performance in real effort tasks. *Jena Economic Research Papers* No. 2014-005.
- Eckartz, K. M., Kirchkamp, O., Schunk, D. (2012), How do Incentives affect Creativity? *Jena Economic Research Papers* No. 2012-068.
- Frey, Bruno S. (2000), *Arts and Economics*. Heidelberg: Springer.
- Gil, R. (2006), The Economics of IPR Protection Policies, Working Paper.
- Handke, C. (2010), Digital Copying and the Supply of Sound Recordings. Working Paper, Erasmus University Rotterdam.
- Hess, T., Walter, B. v. (2006), Toward Content Intermediation: Shedding New Light on the Media Sector. *International Journal on Media Management* 8(1), 2-8.
- Landes, W., Posner, R. (1989), An Economic Analysis of Copyright Law. *Journal of Legal Studies* 18, 325-366.
- Liebowitz, S. J. (2008), Testing File-Sharing's Impact on Music Album Sales in Cities. *Management Science* 54(4), 852-859.
- Liebowitz, S. J., Margolis, S. E. (2005), Seventeen Famous Economists Weigh in on Copy-

- right: The Role of Theory, Empirics, and Network Effects. *Harvard Journal of Law and Technology* 18(2).
- Liebowitz, S. J., Watt, R. (2006), How to Best Ensure Remuneration for Creators in the Market for Music? Copyright and its Alternatives. *Journal of Economic Surveys* 20(4), 513-545.
- Moohr, G. S. (2005), Defining Overcriminalization Through Cost-Benefit Analysis: The Example of Criminal Copyright Laws. *American University Law Review* 54, University of Houston Law Center No. 2005-A-02.
- Nadel, M. S. (2004), How Current Copyright Law Discourages Creative Output: The Overlooked Impact of Marketing. *Berkeley Technology Law Journal* 19, 785-856.
- Oberholzer-Gee, F., Strumpf, K. (2007), The Effect of File Sharing on Record Sales: An Empirical Analysis. *Journal of Political Economy* 115(1), 1-42.
- Oberholzer-Gee, F., Strumpf, K. (2010), File Sharing and Copyright. *Innovation Policy and the Economy* 10(1), 19-55.
- Peitz, M., Waelbroeck, P. (2004), The Effect of Internet Piracy on CD Sales: Cross-Section Evidence. *CESifo Working Paper Series* No. 1122.
- Peitz, M., Waelbroeck, P. (2006a), Piracy of Digital Products: A Critical Review of the Theoretical Literature. *Information Economics and Policy* 18, 449-476.
- Peitz, M., Waelbroeck, P. (2006b), Why the Music Industry May Gain from Free Downloading – the Role of Sampling. *International Journal of Industrial Organization* 24, 907- 913.
- Peukert, C., Clausen, J., Kretschmer, T. (2013), Piracy and Movie Revenues: Evidence from Megaupload A Tale of the Long Tail? Working Paper.
- Rayna, T., Striukova, L. (2009), Monometapoly: Market Structure and Welfare of the Music Industry. Working Paper.
- Regner, T., Barria, J.A. (2004), Do consumers pay voluntarily? The case of online music. *Journal of Economic Behavior & Organization* 71, 395-406.
- Rob, R., Waldfogel, J. (2004), Piracy on the High C's: Music Downloading, Sales Displacement, and Social Welfare in a Sample of College Students. *NBER Working Paper* No. 10874.
- Siwek, S. E. (2007), The True Cost of Sound Recording Piracy to the U.S. Economy. Institute for Policy Innovation, Policy Report No. 188.
- Smith, M. D., Telang, R. (2012), Assessing the Academic Literature Regarding the Impact of Media Piracy on Sales. SSRN Working Paper.
- Srivastava, A. (2006), The Anti-Competitive Music Industry and the Case for Compulsory Licensing in the Digital Distribution of Music. *Touro Law Review* 22, 375-472.
- Sternberg, R. (2006), The nature of creativity. *Creativity Research Journal*, 18(1), pp. 87-98.
- Towse, R. (2001), Partly for the Money: Rewards and Incentives to Artists. *Kyklos* 54, 473-490.
- Towse, R. (2006), Copyright And Artists: A View From Cultural Economics. *Journal of Economic Surveys* 20, 567-585.

- Towse, R. (2010), Creativity, Copyright and the Creative Industries Paradigm. *Kyklos* 63, 461-478.
- Tschmuck, P. (2003), How Creative Are the Creative Industries? The Case of the Music Industry. *The Journal of Arts Management, Law and Society* 33(2), 127-141.
- Tschmuck, P. (2006), *Creativity and Innovation in the Music Industry*. Heidelberg: Springer.
- Waelbroeck, P. (2013), Digital Music. In: Towse, R., Handke, C. (eds.), *Handbook of the Digital Creative Economy*, Edward Elgar.
- Waldfoegel, J. (2010), Music file sharing and sales displacement in the iTunes era. *Information Economics and Policy* 22(4), 306-314.
- Waldfoegel, J. (2011), Bye, Bye, Miss American Pie? The Supply of New Recorded Music since Napster. *NBER Working Paper* No. 16882.
- Waldfoegel, J. (2012a), Copyright Research in the Digital Age: Moving from Piracy to the Supply of New Products. *American Economic Review: Papers & Proceedings* 102(3), 337-342.
- Waldfoegel, J. (2012b), Copyright Protection, Technological Change, and the Quality of New Products: Evidence from Recorded Music since Napster. Working Paper March 13, 2012 5(3), 635-715.
- Zentner, A. (2006), Measuring the Effect of File Sharing on Music Purchases. *Journal of Law and Economics* 49(1), 63-90.

I thank Randolph Schönefeld for fruitful discussions and hints.