ECONOMIC ANALYSIS OF PRIVATE COPY REMUNERATION

Report prepared by EconLaw Strategic Consulting

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0. SCOPE OF THE STUDY AND BASIC ASSUMPTIONS

The present Study focuses on the economic rationale and effects of the private copy remuneration (or PCR) system, by virtue of which consumers pay the holders of Intellectual Property Rights (IPR) a given amount in consideration of the private copying of their works. The scope of the Study is limited to the economic aspects of PCR and, consequently, legal, political, cultural, and other facets of the phenomenon are only incidentally referred to.

This Study is not comparative, in the sense that it does not analyse alternative legal systems and, particularly, no argument is intended – either expressly or implicitly – to compare IPR systems based on fair use doctrines (such as the one currently enforced in the United States) with those that are based on legal private copying exceptions (such as those in place in most European Union countries). The Study focuses only on private copy exception-based systems. It does briefly compare systems of private copy exceptions with and without remuneration, but the conclusions reached cannot be automatically transplanted to any comparison between fair use-based and private copy exception-based legal systems.

This Study focuses on the effects of PCR on the music sector. Notwithstanding this relatively narrow focus, the conclusions reached are applicable to a significant extent to all types of IPR-protected works (such as audiovisual or literary), with some adjustments to tackle certain peculiarities of the several types of intellectual and creative works. However, for the sake of simplicity and clarity, all the examples and data provided in the Study refer exclusively to music.

The Study is limited to the setting and collection aspects of PCR, as well as its effects on incentives to creation of intellectual works. The collective administration of PCR, its distribution amongst right holders, and its use as a source of financing for cultural and social activities also lie outside the scope of the Study. Each of these topics might merit a separate report. Therefore, the Study assumes that PCR is efficiently distributed by the collective management societies to each rights holder according to a proper estimation of the number of copies made of her/his works. Similarly, the Study does not analyse the potential benefits to society that may derive from the cultural activities that are financed with a share of the PCR collected in different Member States.

From a purely economic perspective, it must be stressed that the Study is implicitly based on certain assumptions that inevitably condition its content and its lines of reasoning, which are derived from economic theory and which will be out of question in the present Study. First, it is assumed that intellectual property rights are a part of the basic property rights on which developed economies have their foundations. Second, it is assumed that generating incentives for the creation of IPR-protected goods is a key role of economic regulation. Finally, it is also assumed that IPR-protected contents are a significant driver of economic growth for all societies and, particularly, for the Information Society.

Finally, this Study does not intend to forecast precisely any future market or sector sales or penetration rates, nor does it intend to predict the exact total PCR collection by countries or products. Instead, based on sound assumptions regarding market conditions, the Study tries to assess the relative efficiency of the current system and to illustrate the potential quantitative importance of certain effects that are usually neglected in the ongoing debate about the PCR system.

1. MAIN FINDINGS

1. *The Private Copying Remuneration (PCR) system has a sound economic justification, generates positive incentives to the creation of Intellectual Property Rights (IPR) protected work and increases consumers' freedom of use of intellectual works.*

2. From an economic point of view, *IPR-protected goods and technological devices –such as consumer electronics (CE) and Information technologies (ICT)- are complementary, since technology without content is virtually useless.* Economic theory predicts that an increase in consumption of one of these complements will automatically trigger increased consumption of the other(s). Therefore, it is sound and consistent with basic economic intuition to use the increase in demand for ICT and CE products as a proxy for increased use of IPR-protected products (especially through private copying). *However, despite this complementarity, the CE industry is booming while the music industry is languishing.* The growth of the CE industry reached 114% in the 2002 – 2005 period in Western Europe, while the Western European music industry lost around 17% of its revenues. The situation is not expected to reverse in the short and medium term.

   PCR amounts received by collective management societies on behalf of IPR holders represent around 5% of the sales of CE products, which does not seem likely to turn the sale of CE products into an unprofitable business, should CE manufacturers decide not to pass PCR charges through to consumers.

   The existence of PCR or its level cannot be considered a key determinant of the consumer prices charged in different EU countries. Pricing decisions for digital CE products depend heavily on other criteria and national peculiarities. PCR cannot be questioned on the basis of the assumption that its existence must necessarily translate into higher consumer prices and reduced penetration rates.

3. *The PCR system does not generate net negative effects on welfare.*

   The short-term negative impact of the PCR system has been overestimated in previous studies: each 1 euro collected causes a decrease in welfare for consumers and producers of 1.08 euros – which is far from the 2:1 proportion previously reported.

   However, any estimate of the economic impact of the PCR system needs to incorporate a dynamic analysis to capture its mid- and long-run effects on creation of IPR-protected works and on consumer demand for CE and ICT products. The result of this dynamic analysis shows that *the net long-run economic impact of the PCR system is not only neutral but could even have positive effects under certain specific circumstances, particularly in some non-competitive market scenarios for the CE industry.*

4. Any system of Private Copying Compensation, including PCR, should be evaluated under objective criteria aiming at replicating the main advantages of a theoretical system of full monitoring of private copying (which is impracticable due to its excessive costs and other legal and ethical considerations). These criteria are the following:

   - Remuneration of Right holders should be a function of the social value of their work,
   - Information, transaction and enforcement costs of the system shall be minimized,
   - Who copies more should pay more,
   - Distortions and spillovers on the economy should be minimised.

   When analysed under these economic principles, *all potential alternatives to the PCR system –such as DRM-based systems, caps on PCR collection, public funding or an Internet flat fee (Licence Globale)– show some deficiencies of their own that make them inferior to the current system*. DRM, for example, have limited penetration, technical flaws, and increase system costs. They also generate competitive problems which would have spillover effects on the economy as a whole. *The PCR system, on the contrary, satisfies all the abovementioned economic criteria and is thus the most efficient available option.*

5. *Diverging PCR regulations across the EU Member States cannot be considered a significant barrier to the free movement of ICT and CE products; however, the system may require some minor adjustments to make it more easily administrable and applicable in practice*.

   These divergences are justified by differences in several objective country characteristics, such as income level, consumers' willingness to pay, and the intensity of private copying. Charging PCR on imports does not treat importers differently from domestic producers, and the paperwork burden on importers is necessary to the operation of the system and not economically significant enough to raise barriers to the free movement of goods.

2. EXECUTIVE SUMMARY

This Study conducts an economic analysis of the private copy remuneration (or PCR) system –*i.e.* the device set up in order to compensate creators for the private copying of their works–, exploring its economic foundations and recent years development, its impact on the economy and potential alternatives to the current system –setting a new methodology to appraise them and to make comparisons between the proposed alternatives–. The Study centres on the music sector. However, the conclusions reached are also applicable to a significant extent to all types of IPR-protected works (such as audiovisual or literary), with some minor adjustments.

1. ECONOMIC FOUNDATIONS OF PRIVATE COPY REMUNERATION (PCR)

1.1 To understand the need for a PCR system, one must comprehend the general economic foundations of the IPR system. *IPR provide economic incentives to the creation of intellectual works*, which have particular features that differentiate them from other types of goods or assets. From an economic point of view, intellectual works are public goods, because they can be simultaneously used by different consumers (*non-rivalry in consumption*) and the owner of the work cannot prevent use without his or her consent (*non-excludability in consumption or free-riding*). Therefore, *without appropriate property rights on their works, authors could not charge users benefiting from their creation and could not possibly obtain an adequate remuneration for their creative and productive efforts.* As a result, creative activities would decrease, reducing the production of intellectual works to the detriment of the society as a whole.

1.2 *IPR regulations are designed to correct this market failure and grant creators exclusive rights over their works.* By virtue of IPR, their holders can largely prevent free-riding by controlling the distribution, reproduction, broadcast, and use of their works and hence obtain a remuneration that renders their activity profitable. *However, free-riding is not completely precluded.* Most IPR regulations oblige rights holders to tolerate copying by consumers in their private sphere (*private copying*). That is, *as a limit to the exclusivity of intellectual property rights, the law permits acts of copying that take place under the privacy protection of personal and familial environments*. This private copying exception substantially increases consumers' freedom to use IPR-protected goods. Nonetheless, this non-consented use of IPR protected works cannot remain uncompensated. *Most IPR regulations have established a clear and simple device that compensates the authors for this limitation of their rights: private copy remuneration (or PCR).*

1.3 *The private copying exception is a legal instrument that generates increased consumer value*. *This limit on the exclusivity of IPR increases consumers' freedom of use of the intellectual works*. From an economic perspective, this increased freedom automatically translates into a higher valuation of the IPR-protected goods –which gets expanded whenever technological or other developments allow new potential uses of the IPR-protected goods. *The appearance of digital CE devices on which IPR-protected content already in the possession of consumers can be uploaded, stored and played has increased consumers' valuation of those IPR-protected goods. Were it not for PCR charges, the additional social value created by the new use of IPR-protected works would be appropriated exclusively by consumers and the CE industry, while creators would remain uncompensated.* Such regulatory insufficiency can, however, be easily corrected by extending PCR charges to digital CE devices. If consumers pay a given amount when they purchase a device that allows them to extract extra utility from the IPR-protected goods they already own, free-riding is reduced. Furthermore, the current levels of PCR charges on CE devices do not seem to extract the whole of the consumers' increased value of their stock of IPR-protected goods –particularly because PCR charges on CE products have been adjusted downwards in order to avoid too heavy and economically unrealistic tariffs. By paying reduced PCR charges, consumers keep a share of the increased value of their stock of IPR-protected goods. Therefore, *the current PCR system partially compensates IPR holders for the increased social value of their works in the digital era, while allowing consumers to keep a share of that value –and enabling the CE industry to try to extract part of it through higher prices for its products.*

1.4 Under this system, consumers pay PCR charges on the acquisition of devices and carriers that allow or facilitate private copying and, hence *the detailed regulatory regime of PCR has to be adapted to the possibilities of copying that users have at each moment in time.* As technological improvements increase consumers' ability to copy, the need for an increased PCR becomes more pressing. If private copying kept increasing while PCR remained constant across time, the economic value of IPR would be significantly eroded and the economic incentives provided to creators by PCR would, in the long term, tend to zero. To avoid this erosion of the system, *every technological development that eases and/or improves the quality and/or the quantity of private copying requires a corresponding adjustment of the PCR mechanisms, in order to ensure that proper incentives and economic equilibria will still hold in the future.* In fact, this need to adjust the PCR system has become all the more relevant since the digital revolution. Formerly, private copies of IPR-protected content (music, for our purposes) were of lesser quality than the originals, and the threat of private copying to IPR holders' revenue streams was limited. In the digital environment, however, consumers can privately "clone" IPR-protected goods. Digital copies are nearly impossible to distinguish from originals (at least in performance terms). Besides, the cost of making digital copies decreases across time and tends to zero. In sum, *the digital environment justifies an enlargement of the PCR system*.

1.5 The impact of the PCR system is not limited to IPR; we must look also at the broader context of the Information Society. From an economic point of view, *IPR-protected goods and technological devices are complementary, since technology without content is virtually useless.* Sales of consumer electronics (CE) products like DVDs, MP3 players, home cinema systems, or set-top boxes depend on the availability of attractive content (games, films, music). So do the penetration rates of key information and communications technology (ICT) products like broadband internet connections. This relationship between IPR-protected content, CE and ICT products configures them as economic complements. Economic theory predicts that an increase in consumption of one of these complements will automatically trigger increased consumption of the other(s). *Therefore, it is sound and consistent with basic economic intuition to use the increase in demand for ICT and CE products as a proxy for increased use of IPR-protected products (especially through private copying).*

1.6 *Despite this complementarity, as the table below shows, the CE industry is booming, while the music industry is languishing.* The CE industry is growing at very steep rates, accumulating a growth of 114% in the 2002 – 2005 period in Western Europe. Year 2007 sales of MP3 players—the most dynamic product within the CE industry—are expected to be 45 times as high as those in 2002. Meanwhile, from 2002 to 2005 the Western European music industry lost around 2,000 million Euros, 17% of its revenues, and the situation is not expected to reverse in the short or medium term – even where new lines of business have been launched, such as mobile and online music. *PCR collection falls far short of compensating a substantial part of the loss in revenues of the music industry*. During the 2003 – 2005 period, increases in PCR collections have compensated for only around 4% of the impressive 2.000 million Euro lost by the music industry in Western Europe. Given its current trend, PCR collections will hardly get to compensate IPR-holders for any figure around 10% of the reduction in music revenues. *Even including the PCR revenues obtained through collective management societies, the "broad" evolution of the music industry displays no different pattern.*

Information Society related industries' growth
in Western Europe 2002 – 2005

Western Europe	2003 / 2002	2004 / 2003	2005 / 2004	2005 / 2002
Total digital CE	33%	30%	24%	114%
Music industry revenues	-9%	-6%	-3%	-17%
PCR audio collection	41%	28%	-11%	61%
"Broad" music revenues*	-9%	-5%	-3%	-16%

Source: own elaboration, based on European Information Technology Observatory (EITO) (2006 & 2007 Reports), Stichting de Thuiskopie (2006 & 2007 Reports) and IFPI (2006). * "Broad" music revenues are the result of aggregating Music industry revenues and PCR audio collection.

These diametrically opposed trends of growth are due, at least in part, to the reduced protection of IPR against free-riding in a digitalised environment. This strong asymmetry in the evolution of revenues of two *complementary* products suggests that the tremendous growth of the CE industry might partially have been a result of the new uses of the content readily available to consumers that CE products enable. The penetration rates of certain CE products have

increased due to an escalation of the phenomenon of private copying – even if precise estimates of the phenomenon are nearly impossible to calculate. Consequently, *the value created by the digital economy has benefited CE and ICT operators and consumers while content creators – key players in the development of this new economy – have been harmed because of the reduced protection that IPR regulations offer rights holders in a digitalised environment.*

1.7 Under the abovementioned circumstances, the PCR system has been re-designed in order to correct the balance of the digital economy by extending PCR charges to new CE products. However, this upwards adjustment has not been comparable to the increase in revenues of the CE industry and has been unable to fully compensate the decline in other music industry revenues. *PCR amounts received by collective management societies on behalf of IPR holders represent around 5% of the sales of CE products* (see table below), which – contrary to what has been alleged by the CE industry – does not seem to be excessive, nor likely to turn the sale of CE products into an unprofitable business (should CE manufacturers decide not to pass PCR charges through to consumers).

Evolution of PCR and digital CE sales
in Western Europe 2002 – 2006

Western Europe	2002	2003	2004	2005	2006
Sales of digital CE most prone to private copying*	6,010	7,906	10,130	12,375	12,584
PCR collected on digital devices and carriers	131.5	218.3	414.3	439.3	453.3
PCR / Digital CE ratio	2%	3%	4%	4%	4%

Source: EITO and Stichting de Thuiskopie (2006 & 2007 Reports). All figures in millions of Euros.
* The figure includes sales of DVDs, personal multimedia devices (MP3), and optical disks.

1.8 It is also worth noting that *the amount charged as PCR does not necessarily determine the price level of most CE products – particularly equipment or devices with relatively higher prices*. Consumer prices in countries with relatively higher PCR charges can be lower than consumer prices in countries with lower PCR levels.

Retail prices and PCR charges applicable to
selected CE products in 2006

	CD-R		DVD-R		iPod Nano 2Gb (or closest equivalent)		DVD Hard-disk recorder (250GB)	
	Price	*PCR*	*Price*	*PCR*	*Price*	*PCR*	*Price*	*PCR*
Austria	€0.69	€0.26	€0.99	€0.54	€199.00	€3.00	€599.00	€9.20
Belgium	€0.49	€0.12	€1.31	€0.59	€155.00	-	€475.00	1.50%
Finland	€0.80	€0.20	€2.10	€0.60	€225.00	€13.68	n/a	€15.00
France	€1.03	€0.35	€2.50	€1.10	€225.00	€8.00	€725.00	€35.00
Germany	€0.27	€0.03	€0.75	€0.17	€149.00	€2.56	€317.00	€18.42
Netherlands	€0.70	€0.14	€1.01	€0.60	€160.00	-	€397.00	-
Spain	€0.53	€0.21	€1.56	€0.60	€149.00	€0.60	€467.50	€6.61

Source: Retail prices provided by national collective management societies: Austria: Austro Mechana. Belgium: Auvibel. Finland: Teosto. France: SACEM. Germany: ZPÜ. Netherlands: Stichting de Thuiskopie. Spain: SGAE. All prices include the corresponding VAT and PCR charges. PCR charges have been either provided by the same entities or taken from Stichting de Thuiskopie (2007 report).

This indicates that *pricing decisions for digital CE products depend heavily on other criteria and national peculiarities and, consequently, the existence of PCR or its level cannot be considered a key determinant of the consumer prices charged in different EU countries.* Therefore, PCR cannot be questioned on the basis of the assumption that its existence must necessarily translate into higher consumer prices and reduced penetration rates.

2. ECONOMIC IMPACT OF PCR

2.1 *The effects of PCR charges upon both the ICT and CE industries, as well as on aggregate welfare, are usually analysed exclusively from a static perspective and, generally, under very strong assumptions that maximise their theoretical negative effects.* However, if more realistic assumptions are made, the results show that short-term negative effects are not as dramatic as it has been previously reported. Truly, from a static point of view, in the short-term PCR increases the unit price of CE products paid by consumers, decreases the real price received by producers and evaporates a certain amount of aggregate welfare. If we limit the analysis to this narrow perspective and ignore all dynamic effects (which necessarily derive from the introduction of PCR, as economy evolution is not a static, but dynamic process), both consumer welfare and producer profits are reduced. However, *if dynamic phenomena are included in the analysis, the aggregate mid- and long-term effects of the PCR system are not negative and could be welfare enhancing*.

2.2 First, under the "classic" static analysis, it is to be noted that consumers do not necessarily bear the full PCR charge per unit. Depending on market conditions, producers may not be able to pass the full PCR charge per unit through to consumers via prices. In an extreme case, if the CE industry were sufficiently competitive and consumers were significantly sensitive to the price of CE products, then manufacturers might bear the full PCR charge while consumers bore none of it. On the contrary, if there was no effective competition in the CE markets or consumers completely disregarded the level of prices, they would bear the full PCR charge. However, it is more realistic to assume that consumers and producers will share the effect of the PCR. Under this assumption, we estimate the static effect of PCR charges on both consumer welfare and producer profits and find that, in a competitive scenario (i.e. assuming that CE producers market their products under perfect competition conditions), the PCR system generates very limited negative short term effects. According to our estimates, and *from a purely static point of view, each 1 euro collected under the PCR system causes a decrease in welfare for consumers and producers of 1.08 euros – which is far from the 2:1 proportion previously reported and indicates a very moderate short-term effect of PCR on total welfare, of around 8%.*

2.3 However, this analysis is incomplete and needs to be complemented with an estimation of the dynamic effects of the PCR system. From an economic point of view, the goal of the PCR system is to ensure that creators of IPR-protected content have the right economic incentives to keep producing new and innovative content capable of being used with the new CE products. Thus, *a full analysis of the economic impact of the PCR system on consumers and sellers of CE products must also study the dynamic effects of the PCR charges on the supply of content.* Regardless of the short term negative effects, increased content availability should translate into larger consumer welfare in the mid- and long-term, and hence into larger demand for CE products that, in turn, will cause both larger sales and larger profits for CE manufacturers. In the case of musical content the quantitative estimation of this dynamic effect unavoidably relies on strong assumptions, and different scenarios can be explored. Under very conservative assumptions, *we find that the incentives put in place by the PCR system should translate into an increase in the stock of music titles of around 1.5 percent in a period of 25 years. This increase would in turn compensate for the short-term negative effects on the joint welfare of consumers and producers of CE products, increasing total welfare by around 2.8 percent in a period of 25 years, although three fourths of the positive effects would already be in place after a period of 5 years.* Regardless of the particular assumptions, the base-line conclusion is that *the dynamic mid- and long- term effects of the PCR system on content supply compensate for the negative short-term effects calculated in our static analysis. In sum, the economic impact of the PCR system is not negative and could increase total welfare.*

3. ECONOMIC PRINCIPLES BEHIND THE PCR SYSTEM

3.1 Even though the current PCR system is based on a sound economic rationale and has potentially positive economic effects in the mid- and long-term, variations of and alternatives to the system have been proposed. Their analysis on the efficiency of the system (both from a static and a dynamic perspectives) is unfeasible, due to lack of data –as these are proposals that have never been implemented or only to a partial and limited extent. Therefore, in order to evaluate them and compare them with the current system, we need to find some objective criteria. *We propose four principles for evaluating any system of private copy compensation, including PCR. These principles aim at replicating the main advantages of a theoretical system of full monitoring of private copying* (which is impracticable, due to its excessive costs and other legal and ethical considerations):

- *Remuneration of rights holders should be a function of the social value of their work*
- *Information, transaction and enforcement costs of the system shall be minimized*
- *Who copies more should pay more*
- *Distortions and spillovers on the economy should be minimised*

3.2 Creating a system to absolutely comply with these principles may be impossible. All systems bring about their own advantages and disadvantages and no theoretically perfect system is available. The previously indicated full monitoring would cost too much; hence, *only indirect systems of monitoring private copying and indirect systems for setting the amounts due to IPR holders in consideration for the non-consented use of their works are available. Therefore, some trade-offs between the principles are required.*

4. ASSESSMENT OF THE MAIN ALTERNATIVES TO THE CURRENT PCR SYSTEM

This study evaluates the PCR system "as is", as well as the proposed alternatives to the current system, and finds that none of them better satisfies the above principles, considered jointly, than the current PCR system, even though it is not without flaws.

	Remuneration should be a function of social value of works	Costs of the system should be minimised	Who copies more should pay more	Spillovers on the economy should be minimised
PCR "as is"	☑	☑	☑	☑
PCR caps	☒	☑	☑	☒
PCR exemptions	☑	☒	☑	☑
DRM	☒	☒	☑	☒
Taxation of IPR-protected goods	☑	☑	☒	☒
Public funding	☒	☑	☒	☑
Licence globale or internet flat fee	☑	☑	☒	☑

* Alternative distribution methods (Creative Commons and Copyleft) do not constitute a real alternative to PCR.

4.1 *Caps on PCR collection*

It has been suggested that PCR shall maintain certain proportionality with the prices of the ICT and CE products on which it is charged and should be capped at around 5% of the retail price of ICT and CE products. In fact, on average that is the existing proportion, as PCR charges do not exceed 5% of the sales of CE products (see 1.7 above). But *legal capping of PCR collections is undesirable. It would make the value of IPR dependent on changes in the production costs of other products on which IPR holders have no influence.* Moreover, the economies of scale and learning curves that determine the evolution of the cost structure of new technologies would in the medium-long term drive down dramatically the remuneration of IPR activities – which are subject to other technology and cost conditions, without equivalent economies of scale or learning curves. In fact, *PCR collections would be determined by pricing decisions made by the ICT and CE industries, and not by the social value of authors' works. This would reduce the incentives to production of IPR-protected goods and, in a dynamic perspective, would harm the economic development of the Information Society.*

4.2 *Exemptions from the payment of PCR for certain types of users of ICT and CE products (public bodies, professional users, etc.)*

An exemption system would increase information and transaction costs, because the rule would be more complex, as well as enforcement costs, since enforcers would have to develop distinct monitoring and enforcement mechanisms applied for each class of users. Also, *the exemption of certain groups of users would require an enlargement of the charges then applicable to the rest of consumers*—in order to keep author's revenues unaffected. The net result of the introduction of this exemption would probably not be favourable. *Even the beneficiaries of the exemptions would likely be not much better off, because they too would bear reporting and compliance costs.* Therefore, the introduction of this exemption does not seem to be recommendable in strictly economic terms since *the costs of the PCR administration system would be significantly increased, to the expense of all the participants (including the beneficiaries of the exemption of PCR payment).*

4.3 *Digital Rights Management (DRM) technology*

Digital Rights Management (DRM) systems are technologies that describe and identify digital content protected by IPR and enforce usage rules set by IPR holders or prescribed by law. Inasmuch as DRM may allow IPR holders to determine the use that consumers could make of the IPR protected goods, *theoretically, DRM could preclude private copying (a feature which also Technological Protection Measures, or TPM, can achieve) and thus make the PCR system unnecessary.* However, this would be possible only if all IPR-protected goods (those already in the hands of consumers, as well as those still to be produced and/or distributed) were effectively protected by DRM. But DRM is relatively new. Precise figures are hard to estimate, but only a minor fraction of music is distributed under DRM protection –and this trend cannot be expected to substantially reverse in the future, in light of the strong consumer opposition to DRM (which has led majors such as EMI or Universal, as well as Apple, to a DRM-free approach). As a result any system based on DRM would necessarily be incomplete and would preclude that the remuneration of right holders could be a function of the social value (use and copy) of their work. Also, DRM solutions are not yet fully secure and sometimes cause operational problems in certain consumer devices. *At its current level of development, DRM is a very poor substitute for the private copying exception and the corresponding PCR system.*

Moreover, the shift towards a DRM-oriented distribution of IPR-protected goods *might not result in a reduction of the prices paid by consumers.* Development of DRM technology requires significant investment and effort on the part of the ICT and CE industries—investment that its developers would legitimately expect to recoup, so that there would be an economic substitution between PCR charges and DRM royalties. *The main effect of a PCR/DRM substitution would be to shift the current revenue stream from IPR creators to the DRM industry, impairing the long-term incentives to creative activities and generating a mixed effect on the development of the Information Society.*

Also, and this may be the strongest argument against them, *DRM run against consumers' interests, as they limit the uses that consumers can make of IPR protected goods under the private copy plus PCR system.* Current consumer freedom to use IPR protected works in their private sphere would be reduced and subject to greater constrains, and this *might result in a lower valuation of both IPR protected goods and its complements (i.e. CE and ICT products).* The reduction of consumer freedom might be particularly increased due to the non-existence of a fully compatible DRM standard in the market so far. Once consumers have chosen a given DRM by buying a device that stores and plays IPR content protected by the same (and which will not interplay, or not properly, with works protected by other DRM technologies), they would be locked-in with the producer of that given DRM technology, as switching costs are very significant in these markets (as in most of the technological sectors) due to the existence of the so-called network externalities. Therefore, *by allowing the development of proprietary DRM technologies, consumers' alternatives are restricted and their freedom to use the acquired content is limited. In a dynamic perspective, this situation has no likely consumer beneficial outcome.*

The importance of the lock-in factor is prone to generate a "war of standards" between producers of DRM technologies. Given that there is no commonly developed standard, all producers will try to have their own DRM adopted by as much creators of content and consumers as possible, so that it becomes the *de facto* standard – excluding all competitors from a substantial part of the market. The first possible outcome generated by this war of standards is a competitive landscape clearly dominated by a single provider of DRM technology (probably a situation close to monopoly) in which prices can be expected to be above the competitive level of a market in which a commonly developed standard existed. The second plausible (and alternative) outcome is that of a competitive landscape in which consumers are locked-in with DRM technologies used by relatively limited groups of users and producers of content. In this scenario, all significant network efficiencies (deriving from the use of a common technology) would be excluded and consumer utility would be significantly impaired. ICT and CE producers' position would also be second-best, as their revenue streams would be reduced to the limited number of consumers they are able to lock-in with their DRM. *Either way, in default of full standardization or interoperability of DRM technologies, the system* (be it monopolistic, be it segmented amongst a number of incompatible technologies) *decreases consumer choice and restricts competition in the ICT and CE industries.*

In sum, *DRM technologies cannot be considered a better solution than PCR, not only because of their limited penetration, technical flaws, and increased system costs, but also because the competitive problems they generate would have spillover effects on the economy as a whole.*

4.4 *Taxation of IPR-protected goods*

It has also been suggested that PCR could be charged on the sales of originals of IPR-protected goods, rather than on the sales of ICT and CE products. This system would force authors to directly charge consumers for the number of copies they would be expected to make. As a result, only the "average consumer" would be paying the same amount of PCR as under the current system. Consumers copying less than the average would be subsidizing consumers copying more than the average, and this might distort the functioning of the markets for IPR-protected goods. *By charging PCR on an item that is not a good proxy for private copying, such a system would depart from the very basic principle that who copies more should pay more*.

4.5 Public funding

Another alternative to the current PCR system would be eliminating PCR charges and substituting them with public subsidies to creators. From the perspective of the free market economy and of the generation of the proper incentives to economic growth, this alternative is not ideal. *Public financing of the cultural and creative activities giving rise to the production of IPR-protected goods decreases incentives to creation*—inasmuch as remuneration is unrelated to the market value of creations—*and violates the principle that increased intensity of private copying should trigger larger compensation for IPR use*—as all taxpayers would equally contribute to financing creative activities, regardless of the use they made of IPR-protected goods—. Consequently, it is not advisable on strict economic terms.

4.6 Licence globale or internet flat fee

It has also been proposed to replace PCR charges on equipment and media with a flat fee charge on internet subscriptions. *This proposal is ill-designed and does not fit with the purposes of compensating rights holders for private copying*, for at least two reasons. First, the design of the system is clearly intended to tackle the problem of piracy based on the peer-to-peer (P2P) exchange of files protected by IPR rights, not to compensate authors for private copying. Second, only a part of the increased private copying activities involves internet connections. Therefore, a global licensing approach would leave a substantial part of private copying uncompensated. In any case, even if the flat fee system could be redesigned, *this system would still fall short of the principle that who copies more should pay more, as flat fees designed on a temporary basis trigger payments unrelated to the intensity of private copying* during that given period of time. Therefore, global licensing or internet flat fee charges are not preferable to the current PCR system, from a purely economic perspective.

5. PCR AND THE DEVELOPMENT OF THE EU INTERNAL MARKET

5.1 PCR has been alleged to constitute a barrier to the development of the EU internal market for ICT and CE products – apparently, simply because the system is not homogeneous across EU Member States. After analysing this claim, we find that *the PCR system and its practical implementation do generate some difficulties for the development of the internal market, but there are important factors that diminish such negative effects.*

5.2 First of all, *divergences in PCR regulations in different Member States are justified by differences in several objective country characteristics*, such as income level, consumers' willingness to pay, and the intensity of private copying. Such differences require that PCR levels be set individually by each Member State and that those levels be maintained when ICT and CE products are traded within the EU (*i.e.* PCR needs to be charged at destination), as the contrary would generate significant negative economic distortions.

Second, the claims that PCR slows the development of the internal market do not hold water. *Charging PCR on imports does not treat importers differently from domestic producers, and the paperwork burden on importers is necessary to the operation of the system and not economically significant enough to raise barriers to the free movement of goods.* The additional claim that some imports may be subject to double payment of PCR (both at origin and at destination) seems to be negated by the PCR regulations of most Member States, which explicitly exempt ICT and CE goods exported to other countries (whether EU members or not).

Therefore, *diverging PCR regulations across the EU Member States cannot be considered a barrier to the free movement of ICT and CE products whose suppression is justified on economic grounds; however, the system may require some minor adjustments to make it more easily administrable and applicable in practice*.

3. INTRODUCTION: THE ECONOMICS OF PRIVATE COPYING

The technological changes that led to the development of the so-called Information Society have recently attracted significant attention from economists. The advent of the internet was initially compared to the Industrial Revolution as a major shift in economic paradigms. This revolution, it was said, would strengthen the relationships between people and organisations in an increasingly globalised world, which would move from the analog to the digital era.

This 'technological revolution' has undoubtedly created very significant changes across economic sectors, particularly significant in the consumer electronics, telecommunications, cultural, and entertainment sectors. The ways in which people communicate, express themselves, share ideas, create art and other cultural content, or spend their spare time have significantly changed. The industries producing the technological devices used in the Information Society (from PCs to mobile phones, from personal audio devices to game consoles) and providing telecommunications services have experienced maybe even greater changes. Particularly, the consumer electronics industry is booming in the Information Society.

The Information Society has not only generated new consumer consumption trends or developed information and communication systems. More so, the technological developments widely disseminated since the mid 1990s have generated important opportunities and threats to key sectors of the most advanced economies – which have had to adapt (or are still adapting) to the new landscape. Some of the most important economic issues remain unresolved—in particular, how to protect the Intellectual Property Rights (IPR) granted to authors of cultural and creative works. By their very nature, IPR are the property rights most directly affected by the technological shift. Indeed, IPR are generally thought to be in need of adaptation to the new digital environment if they are to continue bringing significant advantages in the Information Society[1]. More precisely, IPR regulations are under scrutiny in most major economies, and several proposals have been made to adjust IPR institutions to the digital landscape[2].

[1] Recently, a study commissioned by DG Information Society & Media of the European Commission under the i2010 initiative has found that certain aspects of IPR may need some adjustments in order to allow for a faster market uptake in certain content–related digital activities. That study does not question the existence of IPR, nor the need to fairly remunerate their holders, but only proposes certain improvements of the system in order to foster the development of certain European digital industries, and match the degree of development of their US and Japanese equivalents. Moreover, the study is clear in concluding that IPR are not blocking the development of the Information Society in Europe. Screen Digest - Goldmedia - CMS Hasche Sigle - Rightscom. *Interactive content and convergence: Implications for the Information Society*, October 2006. Study available at: http://ec.europa.eu/information_society/eeurope/i2010/studies/index_en.htm#interactive.

[2] Most noteworthy are the initiatives of DG Internal Market of the European Commission both on "Copyright levy reform" and "Management of Copyright and Related Rights", by virtue of which the Commission is trying to reshape and harmonise certain aspects of IPR across Europe.

Certainly, some adjustments are required to import analog solutions into the digital environment. In order to keep effective incentives to cultural and creative activity, changes may be needed in the design of IPR infrastructure of rights, remuneration schemes, and protection devices. But digitalisation does not necessitate erasing IPR, nor must new mechanisms to promote and protect cultural and creative activities be created from scratch.

Surprisingly enough, the general opinion seems to point in a different direction. Some analysts do advocate the complete abrogation of IPR, pinpointing IPR regulations as ballast for the development of the Information Society and seeing them as a costly burden on adjacent industries – particularly the information technology, telecommunications, and consumer electronics industries (ICT and CE industries). Other, more moderate analysts conclude that limiting the breadth of IPR and reducing their economic content would foster the development of the Information Society. They consider that the remuneration schemes that worked properly in the analog environment – particularly private copy remuneration schemes (PCR) – would divert to rights holders an increased value created exclusively by the ICT and CE industries.

These arguments are at odds with the very foundations of a free market economy. First of all, markets can be developed in a way that creates economic growth only if property rights and institutions are properly defined and provide adequate protection and legal security to all players involved. Suppressing IPR would be equivalent to cancelling any other property rights (on real estate, for instance, which also appreciates in value for reasons other than productive efforts by its holders), and its economic implications would be extremely significant (even if hard to predict accurately).

Second, if taken to the extreme, the arguments for reducing remuneration to IPR holders to facilitate the development of the Information Society have a clear flavour of economic planning and run against basic free market principles. These same arguments would justify public intervention in many markets, in order to guarantee that prices were set at the theoretically perfectly competitive price and, therefore, the Information Society developed at the highest possible speed. That would imply, for example, forcing the sale of technological devices at zero profits (to say the least), on the grounds that it would foster the development of the Information Society.

This is a myopic view inconsistent with the foundations that sustain any dynamic free market economy. Any market economy requires proper remuneration of effort and investment in productive resources, if production of goods is to be continued over time. Remuneration of the factors of production will be set by the market, depending on the interplay between supply and demand at any given point in time and in every market. In the extraordinary cases where markets may not be able to determine prices adequately (market failure cases, such as the particular case of PCR for the private copying of IPR-protected content), public authorities need to set prices in ways that, as much as possible, allow remuneration to increase or decrease according to changes in demand. Only in this way can incentives in markets with public intervention keep a degree of economic rationality.

The present section reviews the main reasons that justify public intervention through IPR regulations in order to properly promote and protect cultural and creative activities: the inherent failures of IPR markets (§3.1), the special nature of the digital environment (§3.2), and the benefits consumers get from digitalisation and its associated technological developments (§3.3). We also explore the reasons why reducing the protection of IPR is at odds with developing the Information Society. Cultural and creative industries are very important to most developed economies, and their importance is expected to grow in the next few years. Therefore, keeping effective incentives for the production of content in the digital environment will contribute to economic growth (§3.4). Moreover, given the strong complementarities amongst them, protecting and promoting the cultural and creative industries will further the expansion of the ICT and CE industries. As we have already mentioned, the Information Society depends not only on its technological infrastructure but, perhaps more fundamentally, on content (§3.5).

Surprisingly (from an economic perspective), despite the complementary nature of IPR-protected content and ICT and CE products, since the digital revolution these industries have shown opposing growth trends, so that their revenues have increasingly diverged, and the content industry – particularly, the music industry – is not receiving a fair share of the increased aggregate value of the "bundle" of ICT, CE, and IPR products (§3.6). Moreover, the ICT and CE industries are displaying aggressive attitudes against IPR regulations – particularly, against digital PCR to IPR holders. Their claims that PCR imposes an unbearable burden on their activities and generates disproportionate revenues to IPR holders lack economic justification (§3.7).

3.1. Protection of Intellectual Property Rights and the generation of incentives for the creation of content

IPR institutions and regulation aim to generate economic incentives for creating cultural and creative goods. Without such protection, these *information goods* would not be produced in optimal amounts. Information goods have two economically important differences from physical assets. Consumers do not use them up, as they do with other private goods (*non-rivalry in consumption*); the same song can be listened to over and over again, or simultaneously by more than one consumer, without it being exhausted. Also, the producer cannot fully prevent unpaid uses of IPR-protected goods (*non-excludability in consumption or free-riding*); consumers can enjoy IPR goods in a larger proportion than they have paid for (for example, by making copies)[3].

Therefore, in economic terms, *cultural and creative goods are public goods produced and distributed by private economic agents* (IPR holders, or authors). In contrast, most public goods are produced at the expense of public authorities, as this is the most direct way of making all citizens pay for the goods from which they collectively benefit. In the particular case of IPR, *without appropriate regulation, creators would be delivering public goods to a market*

[3] For the effects of these characteristics of information and public goods on the music industry, see TOWSE, Ruth. "Copyright and Economics", at FRITH & MARSHALL (Eds). *Music and Copyright*. Edinburgh University Press, 2004.

where they could not capture all the returns that might be due to them. Consequently, rights holders could not possibly obtain an adequate remuneration to their creative and productive efforts, as they would not be in a position as to extract rents from most users benefiting from their creation. This lack of economic incentives for the creation of cultural and creative goods would limit (or eliminate) their production, to the detriment of society as a whole – not only in cultural terms, but also in strictly economic terms, as the aggregate output and aggregate welfare would be reduced[4].

To prevent that situation, IPR regulations grant creators exclusive rights to their works. By virtue of these IPR, their holders can partially overcome free-riding by controlling the distribution and use of their works and can obtain a remuneration that renders their activity profitable. Therefore, even if IPR regulations grant exclusive rights that result in the sale of IPR-protected goods above their theoretical perfectly competitive prices, the net outcome is welfare enhancing. Nevertheless, the free-riding problem cannot be completely solved, as buyers of IPR-protected goods can usually make copies and then compete with the IPR holder – the intensity of competition being higher, the better the quality of the copies. This conduct clearly runs counter the exclusive rights of the IPR holder and, if detected, can be prosecuted and put an end to.

There is, however, one field in which rights and values superior to IPR oblige the rights holder to desist from preventing copying: the private sphere of users of IPR-protected goods (*private copying*). IPR holders are forced to tolerate consumers' behaviour against their exclusive rights that take place under the privacy protection of personal and familial environments[5]. Most IPR regulations have consequently established a clear and simple device that compensates authors for such limitation of their rights: private copy remuneration (PCR). Under this system, consumers pay a fee that is charged on the acquisition of devices and carriers that allow private copying.

Social, legal, and other considerations apart, from a purely economic point of view, the private copy exception and the corresponding PCR to IPR holders have a sound justification. If authors were to negotiate a specific contract with every consumer willing to obtain a copy of the original carriers it had previously bought (or otherwise legally obtained), the transaction costs of the system would be very substantial. Also, if authors were to monitor unauthorised private copying and prosecute infringers, enforcement costs would be even more significant. The system of private copy exception plus PCR – apart from enhancing consumer welfare through increased freedom to use IPR-protected goods (see *infra* § 3.3) – reduces the aggregate transaction and enforcement costs of the IPR infrastructure and, consequently, increases social welfare.

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[4] In order to promote economic development, the adoption of IPR regulations has spread amongst all developed economies. In fact, the lack of adequate IPR protection has been constantly pointed to as one of the main drags on less developed economies. And international organisations such as the WTO (under the TRIPS conventions), the World Bank, UNCTAD and OECD are making substantial efforts to promote adoption and/or reinforcement of IPR regulations by less developed countries, as a driver of economic growth in the years to come.

[5] Research studies of the development of the music industry always point to home recording (private copying) as one of the reasons for the crisis that the sector has been going through during the last few years. Understanding & Solutions, for example, points out that private copying has proliferated globally in recent years as hardware and media costs have fallen and that it will continue to impact potential CD album sales. Understanding & Solutions, *Music Market Outlook – Formats and Technologies Report*, June 2005.

PCR is designed to keep IPR holders' revenues as unaffected as possible by private copying. If the private copying exception was not accompanied by the corresponding PCR, users of IPR goods would be unfairly profiting at the expense of creators, who would be expropriated in the same proportion. *Therefore, PCR attempts to re-establish the economic equilibrium between producers and consumers of IPR-protected goods and to distribute the costs and benefits of the IPR system fairly.*

Obviously, the detailed regulatory regime of PCR has to be adapted to the possibilities of copying that users have at each moment in time. As technological improvements increase consumers' ability to copy, PCR also needs to increase. If private copying keeps increasing while PCR remains constant, the economic incentives provided to creators by PCR will, in the long term, tend to zero. To avoid this erosion of the system, every technological development that eases and/or improves the quality of private copying and/or the quantity requires a corresponding adjustment of the PCR mechanisms, in order to ensure that the incentives and economic equilibria will still hold in the future.

Therefore, in order to promote production of cultural and creative goods not only in the short term but, more importantly, in the medium and long term, all proposals to alter the structure of IPR and, particularly, of PCR to rights holders require an analysis of their impact on the underlying structure of economic incentives. *Any modification of the system that diminishes the value of IPR goods because of a "for free" increase of private copying would not only alter the whole IPR infrastructure but, more importantly, would reduce incentives to production of cultural and creative goods and, in the end, would threaten economic development and the aggregate welfare of the economy.*

It is precisely within this conceptual framework that both the phenomenon of digitalisation, its impact on consumers' ability to copy IPR protected goods and its spillovers on rights holders' revenue streams must be analysed.

3.2. Private copying and incentives to creation of IPR-protected goods in the digital environment

In the past, copies of IPR-protected content (music, for instance) were of lesser quality than their original carriers. Therefore, by private copying, the consumer did not get an exact replica of the original, but a more or less accurate copy of the same. Substitution between originals and copies was not perfect and the threat of private copying to IPR holders' revenue streams was to some extent limited. However, *in the digital environment, consumers can privately "clone" originals of IPR-protected goods*. In performance terms, digital copies are nearly impossible to distinguish from originals (external appearance excluded). Also, the cost of producing a digital copy is lower than that of making an analog copy (in both expense and time). In fact, the cost of digital copies decreases across time and tends to zero. Needless to say, *this enhanced copying technology has substantially increased the threat that private copying poses to IPR holders' revenue streams*.

For these reasons, the digital environment calls for an enlargement of the PCR system. As the rest of this Study shows, the most efficient known method to increase PCR revenues appropriately for the digital environment is to extend PCR obligations to digital devices and carriers – as most public authorities have done or are doing in Europe. Proposed alternative methods, as well as other modifications of the existing PCR system, would either reduce consumer welfare, increase transaction and enforcement costs, or both –to a larger extent (§5).

3.3. Benefits and costs of private copying: consumer freedom and rights holders' loss of revenues

We must stress that *private copying benefits consumers*. We have already seen that the private copy exception constitutes a limit on the absolute property rights to creative works held by their creators. This limit on the exclusivity of IPR increases consumers' freedom of use of the intellectual works, as they can not only use them as they wish, but also reproduce them without the consent of the rights owner. From an economic perspective, this increased freedom automatically translates into a higher valuation of the IPR-protected goods. The more uses a consumer can give to a work, the higher the value attached to it. A piece of music that can be stored and played on one's desktop or laptop computer, directly into one's ear as one walks down the street, or through the sound system of one's automobile for the enjoyment of several passengers obviously has more uses than a piece that can be played only on a bulky, dedicated stereo system in one's house. Therefore, *the private copy exception is a legal instrument that generates increased consumer value –particularly in the digital environment*.

This increased consumer value gets expanded whenever technological or other developments allow new potential uses of the IPR-protected goods. In the particular case of digitalisation, consumers' valuation of IPR-protected goods has increased significantly, but maybe in an unnoticed way. The appearance of digital CE devices on which IPR-protected content already in the possession of consumers can be uploaded, stored and played has increased consumers' valuation of those IPR protected goods. Now consumers can use IPR works in a different fashion and, given the current technological and legal scenarios – were it not for PCR charges attached to the new CE devices, consumers would not need to pay anything in consideration for this additional value of works they already had access to.

Suppose that, some years ago, before the extension of PCR charges to MP3 players (which still has not been done in some EU countries), a consumer bought one of these devices and uploaded her full CD collection. She could then use the music in a new way; her utility would be increased, as would the value she attached to the music. However, since she had already paid for the CDs, the rights owners would not be receiving any additional rent for this reproduction. The consumer, attaching a higher value to the "bundle" of digital CE devices and IPR-protected goods, would be willing to pay more for the "bundle"—in effect, since the music portion of the bundle came "free," to pay a higher price for the MP3 player. Thus, consumers would be free-riding on rights owners. *The additional social value created by the new use of IPR-protected*

works would be appropriated exclusively by consumers and the CE industry, while creators would remain uncompensated.

Even if creators could raise the prices of their works and compete with the CE industry to capture a part of the consumers' increased willingness to pay, that would address only new or future sales, and not the additional value attached to the stock of creative works already in the hands of consumers. The owners of these works would remain uncompensated for an increase in the social value (*i.e.,* market value) of their property – which is a specific effect attached to the non-rivalry in consumption or non-exhaustion in consumption attached to creative works; *i.e.* exactly the problem that IPR law was invented to solve (*supra* § 3.1).

In that situation, the free-riding of consumers and the CE industry on creators would be a result of flaws in IPR regulation. *Such regulatory insufficiency can, however, be easily corrected by extending PCR charges to digital CE devices*. If consumers pay a given amount when they purchase a device that allows them to extract extra utility from the IPR-protected goods they already own, free-riding is reduced and, if the system is adequately designed, excluded. Consumers compensate right holders for the increase in value of the stock of creative works they have readily available. Also, consumers have a clear picture of the price they pay for the "bundle" of (i) the digital CE product they are about to buy and (ii) the more intensive use they will be giving to their stock of IPR-protected goods. The latter is fixed, as PCR charges are set before the purchase and are equally applicable to all devices that are comparable in terms of storage capacity, etc. Given that the increased use of the IPR-protected goods stock can be assumed to be the same regardless of the particular brand of device the consumer ends up buying, *the existence of PCR charges on digital CE devices does not alter inter-brand competition in that particular market, nor does it put any manufacturer at a competitive disadvantage*.

Furthermore, the current levels of PCR charges on CE devices (see *infra* § 3.7 and 7.1) do not seem to extract the whole of the consumers' increased value of their stock of IPR-protected goods. If consumers were to pay an amount comparable to the PCR charges traditionally attached to the making of analog copies, PCR charges on digital equipment would need to be much larger than they currently are – perhaps equal to or larger than the price of the CE devices they would be collected on. It is to be stressed that during the process of setting the PCR tariffs for digital carriers, right holders have accepted to lower them (through limited coefficients for compression standards and specific coefficients limiting the remuneration for high capacities) in order to avoid too heavy and economically unrealistic tariffs. *By paying reduced PCR charges, consumers keep a share of the increased value of their stock of IPR-protected goods*. Therefore, the extension of PCR to digital devices is set to avoid expropriation of creators by the free-riding of consumers and/or the CE industry. This goal is partially accomplished under the current system. In sum, *the current PCR system partially compensates IPR holders for the increased social value of their works in the digital era, while allowing consumers to keep a share of that value, and enabling the CE industry to try to extract part of it through higher prices for its products. Also, the PCR system does not distort competition in the digital CE markets.*

3.4. The importance of content in the Information Society

The above general considerations become even more fundamental in the current information-based or knowledge-based economies. The development of the Information Society is not driven by the 'technological revolution'. Undoubtedly, ICT and CE industries build the means by which information is exchanged and communicated[6]. But the Information Society is also, and maybe more fundamentally, based on content. True, some of this is personal and business content that falls outside the scope of IPR regulations. But *most of the content that generates added value in current economies is susceptible of IPR protection*. Therefore, *creation of IPR-protected content must be considered one of the main drivers of economic growth for the Information Society,* once a minimal installed base of technological devices is in place. "*If the technological bricks* […] *are missing, we simply have a no-go situation for content services. But when technological enablers are in, availability of content becomes the key for market uptake. The volume and attractivity of content available on new platforms not only does determine the pace of uptake of new services but can decide of their mere success or failure*"[7].

In particular, creation of IPR-protected goods is one of the most significant drivers of economic growth for advanced economies, where IPR-related sectors contribute significantly to gross domestic product (GDP). Diminishing the value of IPR may have very significant impacts on economic growth, and could become a real drag not only on the development of the Information Society, but also on economic growth and development in the years to come.

A recent study commissioned by DG Education & Culture of the European Commission and performed by KEA European Affairs[8] (2006) has highlighted the importance of the cultural and creative industries (in which content industries, such as music, are embedded) for the European economies. The study found that the 2003 turnover of the cultural and creative sector in Europe amounted to €654.3 billion—2.6% of Europe's GDP. This contribution to GDP was unmatched by most other economic activities, including some of the more active sectors such as construction or retail. Also, the sector's accumulated growth in the period 1999 – 2003 was 12.3% – higher than the growth of the general economy, and nearly unparalleled.

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[6] The importance of the ICT industry for the development and spread of the Information Society is apparently being studied by the consultancy firm Intrasoft International at the request of DG Information Society & Media of the European Commission under the i2010 initiative. The objective of the study is "*to define the «new» ICT sector, to propose a set of indicators to measure its competitiveness and its impact on growth, to provide up-to-date data in this respect and to contribute to the analysis of current progress towards the spread of the information society*". Its results will probably highlight the importance of ICT to the construction of the Information Society. However, no version of the report is publicly available yet.

[7] Screen Digest. *Interactive content and convergence: Implications for the Information Society*, p. 39.

[8] KEA European Affairs - Media Group (Turku School of Economics) - MKW Wirtschaftsforschung GmbH, *The Economy of Culture in Europe*, October 2006. Study available at the European Commission webpage: http://ec.europa.eu/culture/eac/sources_info/studies/economy_en.html.

Table 1: Contribution of the European cultural & creative sector to the European and national economies in 2003 and to growth (1999 – 2003)

	Turnover (€ million)	Value added to national GDP	Average turnover growth (1999 – 2003)	Growth in value added to European GDP (1999 – 2003)
Austria	14,603	1.8%	5.4%	2.8%
Belgium	22,174	2.6%	5.2%	7.7%
France	79,424	3.4%	6.7%	7.1%
Germany	126,060	2.5%	4.9%	6.6%
Italy	84,359	3.4%	5.3%	7.3%
Netherlands	33,372	2.7%	5.0%	N/A
Spain	61,333	2.3%	10.5%	9.0%
Sweden	18,155	2.4%	7.8%	2.6%
United Kingdom	132,682	3.0%	6.6%	1.7%
Total EU (25)	636,146	-	5.4%	6.6%
Total 30 countries*	654,288	-	8.1%	12.3%

Source: KEA (Economy of Culture in Europe 2006). * The countries covered by the statistical analysis include the EU25 Member States plus the two countries that joined 1 January 2007 (Bulgaria and Romania), plus the three EEA countries – Iceland, Norway, and Liechtenstein.

Figures like these show how important adequate IPR regulation is to foster the development of the Information Society and the fulfilment of the Lisbon Agenda. Also, as we will see in the next section, the effect of regulation on incentives to creation of IPR protected goods will not only impact the cultural and creative industries, but also the ICT and CE sectors. Given their strong complementarities, restricting incentives to growth in the cultural and creative sector would have major economic side-effects on the ICT and CE industries. Therefore, incentives generated by IPR regulations will – directly or indirectly – determine the evolution of sectors representing more than 5% of the European GDP.

3.5. Complementarities between cultural and creative activities and the ICT and CE industries

In the Information Society, the use of ICT and CE products runs hand on hand with the use and exchange of information and content, which can be protected by IPR or not. As we have already stressed, free content is not the exclusive or major factor of development of the Information Society. On the contrary, most of the content that generates use of ICT and CE products is susceptible of IPR protection. The previously mentioned KEA study stressed the strong link between IPR-protected content industries and the ICT and CE sectors: "*the development of new technology depends to a large extent on the attractiveness of content*" and "*sales of DVDs, recordable devices, MP3 devices, home cinema systems, set-top boxes and flat screen TVs are dependent on the availability of attractive content (games, films, music)*"[9]. Along the same lines, the Screen Digest report (2006) has clearly identified the use of protected content as a key factor

[9] KEA, *The Economy of Culture in Europe*. p. 7.

of competitiveness for the ICT and related industries: "*this new technological environment creates great opportunities for European content providers and platforms operators. Already traditional 'networks' such as broadcasters, telcos, Internet Service Providers (ISPs), mobile phone operators and pay-TV platforms have embraced the possibilities of using the delivery of content in a digital interactive format as a means of adding value to existing products or opening up new sources of revenue*"[10].

From an economic point of view, IPR content and ICT and CE products are complements: – in the sense that consumers use them together. At this point, economic theory predicts that an increase in consumption of one automatically triggers increased consumption of the other(s). Consequently, *it is sound and consistent with basic economic intuition to use the increase in demand for ICT and CE products to proxy increased use of IPR-protected products (especially through private copying)*.

Also, reinforcing the incentives for the production of any of the complements will indirectly increase production of the other(s), as the increase of demand for the "bundle" of complements will allow current producers to extend their output and, at the same time, will ease entry of new producers into some or all of the complementary markets. Thus *a dynamic and thriving cultural and creative industry will drive growth and will foster the development and spread of the ICT and CE industries*[11]. Conversely, devaluation in the cultural and creative sector will necessarily cause economic slowdowns and a potential stagnation of the ICT and CE industries that, in the end, would impede the development of the Information Society.

Therefore, keeping the right incentives to creation through appropriate IPR regulations must be considered a complete must for any economy willing to grow in the Information Society context. An eventual retraction in the development of IPR protected content due to incorrect or excessive regulation (*i.e.* erosion of incentives to production) would more than probably also trigger a stagnation of the current growth trends in the ICT and CE industries.

3.6. Main trends of the CE and music industries since the digital uptake

Since the beginning of the present decade, the CE industry has been growing steadily in most developed economies and, particularly, in all Western European countries. And it is forecast that this growth will continue at least until the end of the decade[12]. The growth of the CE industry during the period 2002 – 2007 is expected to exceed 167% in Western Europe, which means that

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[10] Screen Digest. *Interactive content and convergence: Implications for the Information Society*, p. 26.

[11] IFPI News, "Recorded music – driver of a US$100 billion economic sector", 22nd June 2006. Available at www.ifpi.org. "*Nothing illustrates the importance of recorded music to other sectors more than the phenomenal growth in portable digital music players. IFPI estimates the value of this sector to be US$9 billion in 2005 – over four times the estimated value of digital music retail sales*".

[12] At least, this is the forecast for recordable optical disks. Understanding & Solutions. *U&S Insight*. January – February 2007. p. 15 – 17.

the sector will have nearly tripled revenues during the period – with some countries like Italy, Spain, and the United Kingdom exceeding this figure.

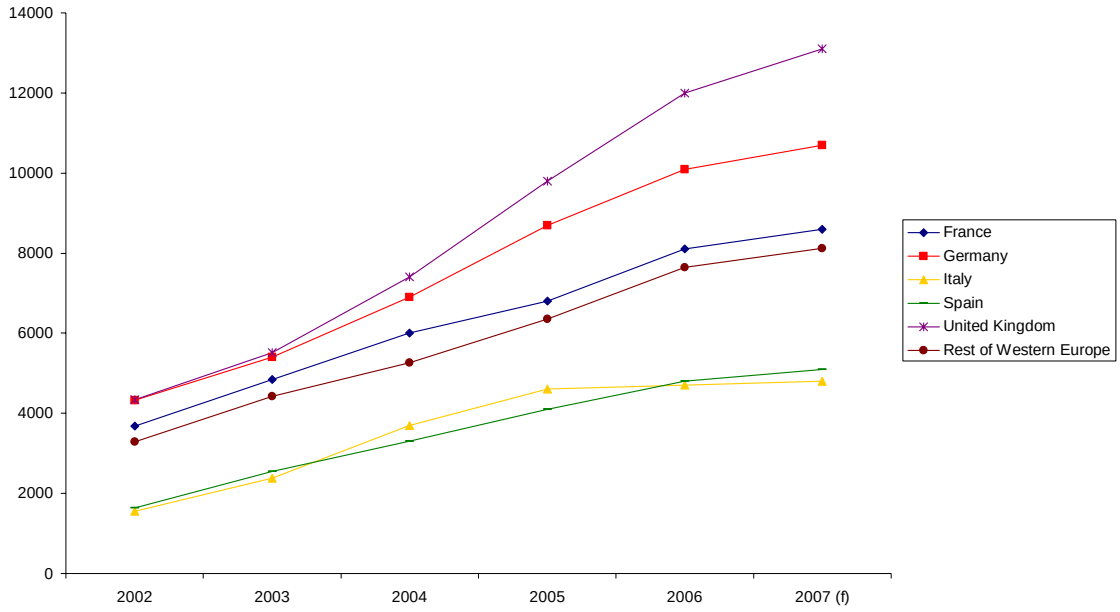
Table 2: Evolution of the digital CE industry in Western Europe 2002 – 2007

Total Digital CE	2002	2003	2004	2005	2006	2007(f)
Western Europe	18,844	25,125	32,566	40,359	47,341	50,418
France	3,677	4,849	6,000	6,800	8,100	8,600
Germany	4,331	5,402	6,900	8,700	10,100	10,700
Italy	1,560	2,386	3,700	4,600	4,700	4,800
Spain	1,633	2,549	3,300	4,100	4,800	5,100
United Kingdom	4,347	5,515	7,400	9,800	12,000	13,100

Source: EITO (2006 & 2007 Reports). All figures in millions of Euros. (f): Forecast.

As Graph 1 shows, digital CE, being a relatively young industry, has been experiencing significant growth rates.

Graph 1: Digital CE Evolution 2002 – 2007 in Western Europe



Source: EITO (2006 & 2007 Reports).

Some digital CE products marketed by the ICT industry display even more dramatic growth patterns. MP3 devices are probably the product with the largest individual growth trend in the industry. Revenues for MP3 sales will have multiplied by thirty times during the period 2002 – 2007 in some of the first adopter Western European markets (e.g., Germany and/or France) and may reach hundred–fold increments in countries where the product reached consumer success a few years later (e.g., Italy and Spain). On average, MP3 sales in Western Europe will have multiplied by forty-five during this six-year period.

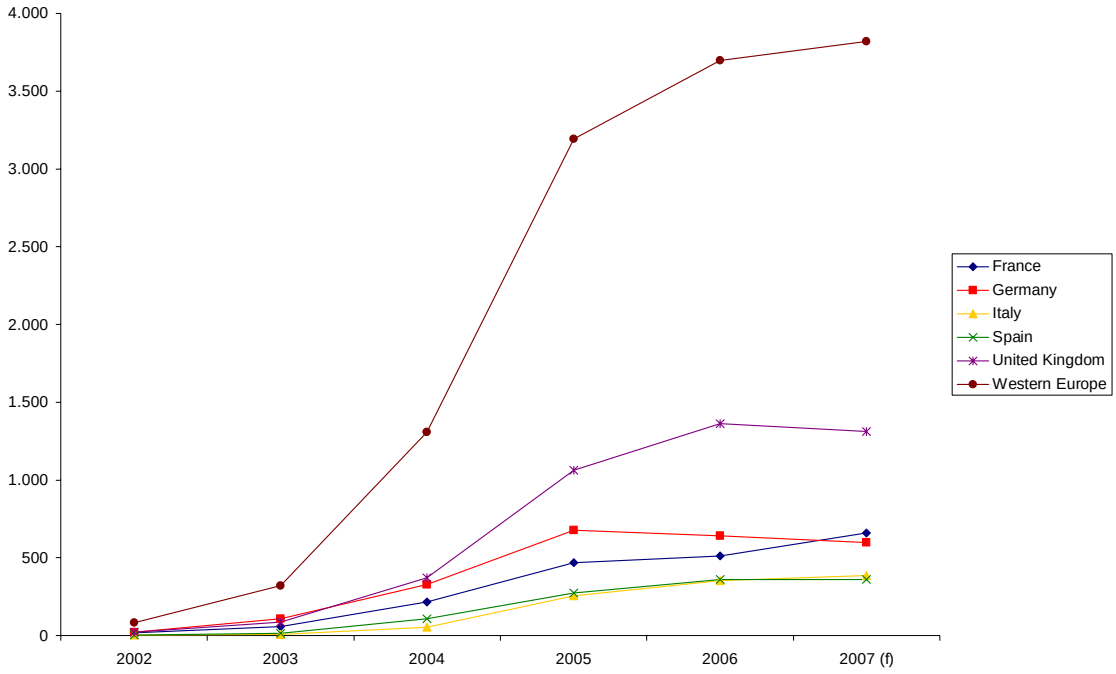
Table 3: Sales growth of MP3-format-based digital personal audio sets in Western Europe 2002 – 2007

MP3 sales	2002	2003	2004	2005	2006	2007(f)
Western Europe	83	320	1,307	3,194	3,698	3,820
France	19	59	218	470	513	660
Germany	21	108	328	679	640	599
Italy	3	9	54	255	353	384
Spain	3	13	109	275	360	362
United Kingdom	20	86	372	1,064	1,363	1,310

Source: EITO (2006 & 2007 Reports). All figures in millions of Euros. (f): Forecast.

Digital portable video devices (which are likely to replace MP3 in the years to come) will likely also exhibit the kind of growth slope shown in the graph below, which is typical for a product in its early years after market introduction. Differences across countries probably reflect different consumer preferences and rates of adoption of new technologies. In any case, this growth trend, too, has been forecast to last at least until the end of the current decade[13].

Graph 2: Evolution of MP3 Sales in Western Europe 2002 – 2007



Source: EITO (2006 & 2007 Reports).

In view of the complementarities with the content industries (such as music), *the asymmetry between CE and music industries' growth trends constitutes a clear case of unbalanced growth within the Information Society*.

[13] Understanding & Solutions. *Digital Distribution of Entertainment Content Watch. Personal & Portable A/V. Market Update*. October 2005. p. 9 – 15.

The music industry has been continually losing revenues in Western European countries, although some of them have been more severely hit than others. In the aggregate, the Western European music industry has lost 20% of its revenues during the period 2001 – 2005. Sweden, Spain, Netherlands, Germany, and France have all lost between 25% and 40% of their music industry revenues during the five-year period. But the rest of the Western European countries have performed not much better. Italy, the Western European country least hit by the music industry loss of revenues, has accumulated a reduction of 10% of the sector revenues.

Table 4: Evolution of music industry revenues in Western Europe 2001 – 2005

	2001	2002	2003	2004	2005
Austria	287.4	267.0	251.1	236.6	227.9
Belgium	317.3	293.7	262.2	269.1	263.5
France	2,114.0	2,199.6	1,882.1	1,633.5	1,592.0
Germany	2,401.5	2,211.8	1,816.0	1,760.8	1,768.5
Italy	593.7	600.3	573.7	535.0	535.4
Netherlands	498.6	467.8	444.0	412.9	344.5
Spain	693.3	585.4	530.3	467.8	444.1
Sweden	317.8	299.6	255.6	211.2	192.3
Switzerland	259.1	252.6	221.4	205.4	213.8
United Kingdom	2,913.5	2,849.5	2,853.2	2,832.1	2,756.8
Western Europe	10,396.1	10,027.2	9,089.7	8,564.4	8,338.9

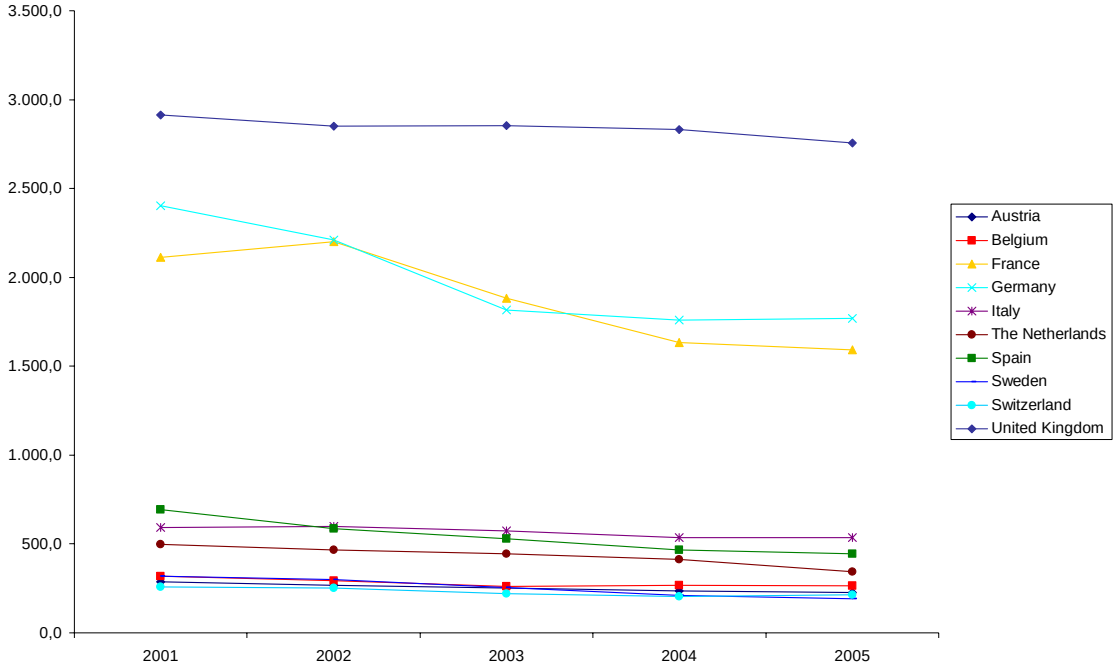
Source: IFPI (2006)[14]. All figures in millions of Euros.

This downward tendency has not yet been compensated by the launch of new lines of business (digital and mobile music). Music industry revenues will continue to decrease in the years to come, as, at least in Western Europe, the development of the online and mobile channels will not be able to compensate for the loss of revenues from sales of pre-packaged media[15].

[14] IFPI, *Global Recording Industry in Numbers*, 2006.

[15] Understanding & Solutions. *Digital Distribution of Entertainment Content Watch. The Future for Digital Music: Online & Mobile.* July 2006. p. 15.

Graph 3: Music Industry Revenues in Western Europe 2001 – 2005



Source: IFPI (2006).

As a complement of the music industry revenues, the analysis of collective management societies' revenues due to the collection of PCR charges on digital audio devices and carriers can help get a fuller picture. PCR collection on audio devices and carriers reached a peak of 237.7 million Euros in Western Europe in 2004 and was then reduced to 212.0 million Euros in 2005 and further down to 192.1 million Euros in 2006.

Table 5: Evolution of PCR audio collection in Western Europe 2002 – 2006

	2002	2003	2004	2005	2006
France	65.5	90.9	89.3	80.9	77.0
Germany	28.9	37.5	37.9	36.4	36.0
Italy	5.4	11.0	35.8	33.2	27.4
Spain	5.4	9.6	36.0	22.9	20.4
Western Europe	131.5	185.1	237.7	212.0	192.1

Source: Stichting de Thuiskopie (2006 & 2007). All figures in millions of Euros.

Given that PCR's aim is to compensate right holders for the reduction in revenues derived from private copying activities, *a properly functioning PCR system ought to compensate for most of these losses of the music industry*. Even if i) the reduction of music industry revenues cannot be fully attributed to the intensification of private copying in the digital environment (but also to illegal copying or piracy) and, therefore, PCR collection should be lower than the reduction in music revenues, and even if ii) the evolution of the PCR collection is dependent on exogenous factors (mainly regulatory and legislative decisions) and, consequently, to some extent can

display autonomous evolution trends; we see how *PCR collection falls far short of compensating a substantial part of the loss in revenues of the music industry*. *During the 2003 – 2005 period, increases in PCR collections have compensated for only around 4% of the impressive 2.000 million Euro lost by the music industry in Western Europe.* Given its current trend and unless substantial reform is introduced, *PCR collections will hardly get to compensate IPR-holders for any figure around 10% of the reduction in music revenues*.

Table 6: Compensation of music industry losses
via increases of PCR collection in Western Europe 2002 – 2005

Western Europe	2002	2003	2004	2005	2005/2003
Decrease in music industry revenues (million Euros)	368.9	937.5	525.3	225.5	2057.2
Increase in PCR audio collection (million Euros)	n/a	53.6	52.6	-25.7	80.5
Compensation of losses via PCR collection (%)	n/a	5.7%	10.0%	-11.4%	3.9%

Source: own elaboration, based on EITO (2006 & 2007 Reports), Stichting de Thuiskopie (2006 & 2007 Reports) and IFPI (2006).

Table 7 shows that while digital CE revenues have increased by 114 percent, broad music revenues, which *include* PCR collection, have decreased by 16 percent. We believe these figures seriously undermine the criticisms of excessive remuneration made against the mechanisms designed to increase the compensation to content producers (*i.e.* the extension of PCR charges to digital CE products.

Table 7: Information Society–related industries'
growth in Western Europe 2002 – 2005

Western Europe	2003 / 2002	2004 / 2003	2005 / 2004	2005 / 2002
Digital CE revenues	33%	30%	24%	114%
Music industry revenues	-9%	-6%	-3%	-17%
PCR audio collection	41%	28%	-11%	61%
"Broad" music revenues*	-9%	-5%	-3%	-16%

Source: own elaboration, based on EITO (2006 & 2007 Reports), Stichting de Thuiskopie (2006 & 2007 Reports) and IFPI (2006). * "Broad" music revenues are the result of aggregating Music industry revenues and PCR audio collection.

Finally, Table 8 shows the differences in growth between the sales of digital audio CE devices (mainly MP3 players) and music industry revenues[16]. *The gap between CE sales growth and music industry revenues growth multiplied at least three between 2002 and 2005.* These figures are at odds with the clear complementarity between music and consumer electronics. Given that the main natural use of digital audio devices is storing and listening to music protected

[16] No comparison can be made between consumption of CE products and the use of "IPR-free" content, as by definition, it does not generate revenues. However, it is important to mention that the use of "IPR-free" content does not affect our analyses.

by IPR, any *a priori* forecast would have anticipated that the penetration of digital audio devices would bring some recovery of music industry revenues. Since the data show precisely the contrary trend, the most plausible conclusion is that MP3 owners free-ride (*i.e.,* load their devices mainly by making private copies of previously acquired or borrowed material) much more than they buy legal downloads of the music they listen to. Should this conclusion hold, the fact that private copying is a main use of MP3 devices would be straightforward.

Table 8: Music industry revenues
and digital audio CE sales in Western Europe 2002 – 2005

	2003 / 2002	2004 / 2003	2005 / 2004	2005 / 2002
Western Europe				
Growth of sales of digital audio CE	19%	57%	75%	226%
Growth of music industry revenues	-9%	-6%	-3%	-17%
Growth differential (music/CE)	-29%	-62%	-77%	-243%
France				
Growth of sales of digital audio CE	26%	45%	51%	176%
Growth of music industry revenues	-14%	-13%	-3%	-28%
Growth differential (music/CE)	-41%	-58%	-54%	-204%
Germany				
Growth of sales of digital audio CE	29%	59%	66%	240%
Growth of music industry revenues	-18%	-3%	0%	-20%
Growth differential (music/CE)	-46%	-62%	-66%	-260%
Italy				
Growth of sales of digital audio CE	31%	32%	115%	269%
Growth of music industry revenues	-4%	-7%	0%	-11%
Growth differential (music/CE)	-35%	-38%	-115%	-280%
Spain				
Growth of sales of digital audio CE	9%	58%	64%	183%
Growth of music industry revenues	-9%	-12%	-5%	-24%
Growth differential (music/CE)	-19%	-70%	-69%	-207%
United Kingdom				
Growth of sales of digital audio CE	119%	169%	206%	415%
Growth of music industry revenues	100%	99%	97%	97%
Growth differential (music/CE)	-19%	-70%	-108%	-318%

Source: Own elaboration, based on EITO (2006 & 2007 Reports) and IFPI (2006).

3.7. Aggregate impact of PCR on CE sales: the excessiveness of PCR does not hold

Since digital copies of music works are nearly perfect and the copying costs tend to zero, ***private copying has to be more intense in the digital environment than it was in the analog landscape.*** Inasmuch as digital devices and carriers provide consumers with very refined tools for copying, they are a suitable proxy for private copying activities. Consumer associations and part of the CE industry have generally opposed this assumption, but apparently there is an increasing acceptance of the principle that consumer electronics products are the most appropriate object on which to collect PCR.

A second and maybe more visceral criticism is that PCR charges are excessive in relation to the price of consumer electronics products and far more excessive as a source of revenue for collective management societies (and ultimately, for IPR holders). This argument implies that authors are unfairly benefiting from the increased sales of CE products without assuming any

additional effort or adding any value to the process. On the contrary, *data show that PCR amounts received by collective management societies on behalf of IPR holders represent around 5% of the sales of CE products* (see Table 9), which does not seem likely to turn the sale of consumer electronics products into an unprofitable business (even should CE manufacturers decide not to pass PCR charges through to consumers).

Also, it is to be strongly stressed that, given the complementary nature of certain CE products and IPR protected content (MP3, in particular, as we have already seen), the abovementioned strong relationship between content and devices becomes all the more apparent. In fact, *IPR holders contribute to the sales of these devices by providing users with attractive content.* And the fact that part of the content used with these devices is privately copied by consumers constitutes a sufficient economic justification for PCR. *PCR should be seen as a way to compensate IPR holders for the increased intensity of private copying that the explosion of sales of CE products permits to consumers , as well as a means of reducing the different evolution of the CE and content (particularly music) industries' revenues*.

Table 9: PCR and digital CE sales in Western Europe 2002 – 2006

	2002	2003	2004	2005	2006
Western Europe					
Sales of digital CE most prone to private copying*	6,010	7,906	10,130	12,375	12,584
PCR collected on digital devices and carriers**	131.5	218.3	414.3	439.3	453.3
PCR / Digital CE ratio	2%	3%	4%	4%	4%
France					
Sales of digital CE most prone to private copying*	1,236	1,617	2,133	2,283	2,249
PCR collected on digital devices and carriers**	65.5	97.3	127.5	128.9	139.3
PCR / Digital CE ratio	5%	6%	6%	6%	6%
Germany					
Sales of digital CE most prone to private copying*	1,471	1,815	2,141	2,634	2,525
PCR collected on digital devices and carriers**	28.9	56.0	109.6	119.2	126.5
PCR / Digital CE ratio	2%	3%	5%	5%	5%
Italy					
Sales of digital CE most prone to private copying*	464	731	963	1,244	1,191
PCR collected on digital devices and carriers**	7.4	12.1	52.3	57.5	60.2
PCR / Digital CE ratio	2%	2%	5%	5%	5%
Spain					
Sales of digital CE most prone to private copying*	576	857	1,064	1,269	1,217
PCR collected on digital devices and carriers**	7.4	13.4	62.1	52.0	53.1
PCR / Digital CE ratio	1%	2%	6%	4%	4%
United Kingdom					
Sales of digital CE most prone to private copying*	1,339	1,664	2,228	3,062	3,488
PCR collected on digital devices and carriers**	N/A	N/A	N/A	N/A	N/A
PCR / Digital CE ratio	N/A	N/A	N/A	N/A	N/A

Source: EITO (2006 & 2007 Reports) and Stichting de Thuiskopie (2006 & 2007 Reports) [17]. All figures in millions of Euros. * We calculate these figures by adding up EITO's figures for the sales of DVDs, personal multimedia devices (MP3), and optical disks. ** We calculate these figures as the total of PCR revenues reported by collective management societies, less those charged on analog devices and carriers. N/A: not applicable.

[17] Stichting de Thuiskopie, *International Survey on Private Copying Law and Practice*, 17th Revision, 2006; and 18th Revision, 2007. At http://www.auvibel.be/files/Survey2006.pdf and at http://www.thuiskopie.nl/nl/Documenten1/International.

It is also worth noting that *the amount charged as PCR does not necessarily determine the price level of most CE products – particularly higher-priced equipment or devices* – as prices in countries with relatively higher PCR charges can be lower than those in countries with lower PCR levels. For instance, a popular MP3 player like the iPod Nano may be more expensive in Belgium (where no PCR is collected on this device) than in Germany (where it is subject to PCR payment). Also, it is sold at the same price in Finland and France, whose PCR charges are substantially different. This is also the case with carriers. For instance, a CD-R is sold at different prices in Finland and Spain, or Belgium and Netherlands, although PCR charges are similar. Conversely, it is sold at the same prices in Austria and Netherlands, which charge very different PCR on the product.

Table 10: Retail prices and PCR charges applicable to selected CE products in 2006

	CD-R		DVD-R		iPod Nano 2Gb (or closest equivalent)		DVD Hard-disk recorder (250GB)	
	Price	*PCR*	*Price*	*PCR*	*Price*	*PCR*	*Price*	*PCR*
Austria	€0.69	€0.26	€0.99	€0.54	€199.00	€3.00	€599.00	€9.20
Belgium	€0.49	€0.12	€1.31	€0.59	€155.00	-	€475.00	1.50%
Finland	€0.80	€0.20	€2.10	€0.60	€225.00	€13.68	n/a	€15.00
France	€1.03	€0.35	€2.50	€1.10	€225.00	€8.00	€725.00	€35.00
Germany	€0.27	€0.03	€0.75	€0.17	€149.00	€2.56	€317.00	€18.42
Netherlands	€0.70	€0.14	€1.01	€0.60	€160.00	-	€397.00	-
Spain	€0.53	€0.21	€1.56	€0.60	€149.00	€0.60	€467.50	€6.61

Source: Retail prices provided by national collective management societies: Austria: Austro Mechana. Belgium: Auvibel. Finland: Teosto. France: SACEM. Germany: ZPÜ. Netherlands: Stichting de Thuiskopie. Spain: SGAE. All prices include the corresponding VAT and PCR charges. PCR charges have been either provided by the same entities or taken from Stichting de Thuiskopie (2007 report).

In fact, pricing decisions for digital CE products depend heavily on other criteria and national peculiarities (see *infra* § 7.2) and, consequently, the existence of PCR or its level cannot be considered a key determinant of the consumer prices charged in different EU countries. Therefore, *PCR cannot be questioned on the mere assumption that its existence must necessarily raise consumer prices and reduce market penetration rates for the CE products on which it is collected*, as these will be largely determined by market characteristics (see *infra* § 4).

4. ECONOMIC EFFECTS OF PRIVATE COPY REMUNERATION

The effects of PCR on the ICT and CE industries, as well as on aggregate welfare, are usually analysed exclusively from a static perspective and, generally, under very strong assumptions that maximise their theoretical negative effects. However, if more realistic assumptions are made, the results show that short-term negative effects are not as dramatic as it has been previously found in other reports, which indicated that the negative effects of the PCR system doubled its value (*i.e.* that the introduction of PCR charges had a 100% effect on the reduction of welfare)[18].

Truly, from a static point of view, in the short-term PCR increases the unit price of CE products paid by consumers, decreases the real price received by producers and evaporates a certain amount of aggregate welfare – which, however, does not get to double the amount of PCR charges, but according to our estimations, remain around 8%. If we limit the analysis to this narrow perspective and ignore all dynamic effects (which necessarily derive from the introduction of PCR, as economy evolution is not a static, but dynamic process), both consumer welfare and producer profits are reduced. *However, if dynamic phenomena are included in the analysis, the aggregate mid- and long-term effects of the PCR system are not negative* and could be welfare enhancing.

The present section *analyses the effects of PCR on the CE industry, the cultural and creative industry, and the economy as a whole, from both static and dynamic perspectives*[19]. We detail the appropriate framework for both types of analyses and adopt a two-steps approach, by virtue of which we begin estimating the static effects of the PCR system, both in a competitive and non-competitive scenario (§4.1), and then turn towards the estimate of the medium and long run dynamic effects (§4.2).

Our results show that *all short-term negative effects identified in the "classic" static analysis are offset by the mid- and long-term dynamic effects of the system*. The aggregate mid- and long-term effects of the PCR system are not negative and could be welfare enhancing. In fact, even if no perfect predictions of market behaviour can be made, *our trend analysis shows that under rather conservative assumptions, the PCR system is not negative to economic development and that, under more realistic assumptions, the PCR system may well improve the welfare of both producers and consumers in the medium and long run.*

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[18] NATHAN ASSOCIATES, *Private Copying Levies on Digital Equipment and Media*. May 2006. Available at http://w3.bsa.org/eupolicy/upload/Final%20Economic%20Impact%20Study%20-%20Nathan%20Study.pdf. The study found that each 1 Euro charged in PCR imposed a 2 Euro cost on the European economy through lost Sales and competitiveness.

[19] For simplicity, and to highlight the consequences of introducing PCR (which largely hold also for extending it to new devices and/or carriers, as well as for increasing its amount within certain values) our analysis will compare a market where PCR does not exist with the market after the establishment of PCR charges, unless otherwise indicated.

4.1. Static Analysis: Impact of PCR on retail consumer electronics prices

As we have already mentioned, PCR is charged on the sales of a quite large array of products (see *supra* §3.7 and *infra* §7.1). When PCR is set on a new product (or whenever its amount is adjusted), producers can pass the new or increased PCR charge through to consumers by increasing the ICT and CE prices by the same amount, internalize a part of the charge and pass through only part of it, or even assume it in full, depending on industry features like product market competition, the price sensitivity of consumers, and industry technologies. Depending on this features and, particularly, on the ability of producers to pass the PCR charge on to consumers without losing competitiveness vis-à-vis their competitors, the intensity of the effects of the introduction or extension of PCR charges will have different effects on consumers and on the aggregate welfare.

In this section we estimate the short-term effect of PCR introduction on consumers' and producers' welfare in two different scenarios. In the first scenario we assume that the CE industry is perfectly competitive and we compute the impact of PCR on final consumer prices, consumer welfare, and producer profits. In the second scenario we depart from the unrealistic assumption of perfect competition among manufacturers and we estimate the likely effect of PCR charges on prices assuming that the CE industry has an oligopolistic structure (i.e. that each of the manufacturers of CE products holds a certain amount of market power and, consequently, the competition among them is imperfect). Our results vary in both scenarios, but the main trends and general effects they identify are mostly identical in all cases.

4.1.1. Perfect competition

The effect on final prices of a PCR charge per unit depends critically on the relative price sensitivity of supply and demand, as measured by so-called price elasticities[20]. *The final effect on consumer prices of a PCR charge per unit will depend crucially on the relative elasticity of supply and demand*. Intuitively, the more price sensitive are consumers, with respect to suppliers the less amount of the PCR charge will be translated in market prices and instead the more PCR charges will lower producers' margins. Conversely, the more insensitive the consumers are in respect to prices, the greater ability of producers to keep their commercial margins unaffected by raising CE prices proportionately.

We can see this by *comparing the hypothetical effect of PCR on prices in two extreme scenarios*: in the first one, we assume that *supply* of ICT and CE products is perfectly elastic (in other words, supply is extremely price sensitive and the aggregate offer of CE products experiments large adjustments when relatively minor variations in prices take place); while in the second scenario we assume that consumer *demand* for consumer electronic products is perfectly elastic (demand is extremely price sensitive and, consequently, small reductions of prices produce large increases in demand, and *viceversa*).

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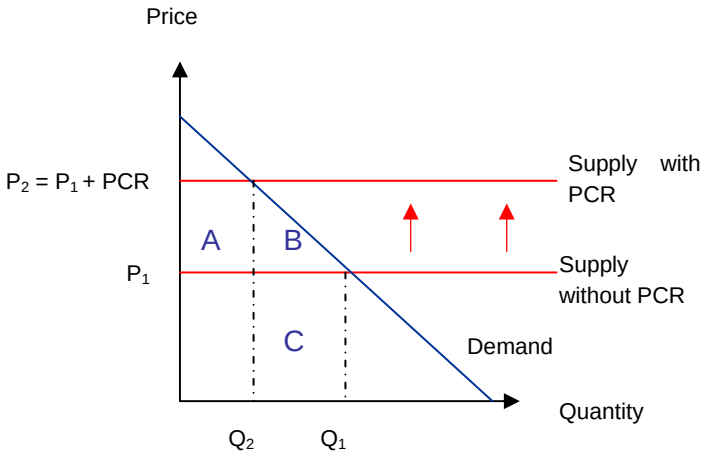
[20] I.e. the reduction in demand that would result of a one percent increase in market prices. For example, if market prices increase by 10 percent and as a result demand is reduced by 20 percent, the demand elasticity would be equal to 2. The supply elasticity measures the sensitivity to market price of suppliers in similar terms.

Figure 1 shows the likely effect of an increase in prices if supply were perfectly elastic (and demand were somewhat price sensitive, but not extremely). In this case the increase in prices for the consumer would be exactly equal to the amount of PCR. This is, consumers would bear the entire amount of the PCR charge, while producers' cost structure would remain unaffected by PCR. Producers' sensitivity to prices would determine a reduction in the amount offered in order to raise the prices in the CE products market up to the point at which the new price would fully cover the PCR amount.

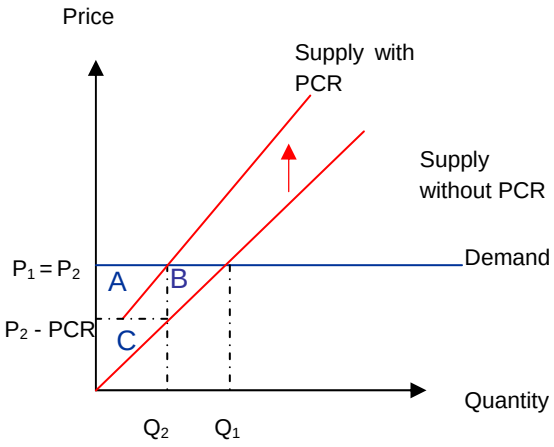
Figure 1: Effect of PCR on prices with perfect elasticity of supply (static analysis)



In this scenario, consumer welfare is reduced by an amount equal to the area A+B (given that consumers have to pay higher prices, the same aggregate amount of expense allow them to purchase a reduced quantity of units of the affected CE product). Area A is loss of consumer surplus transferred to IPR holders via PCR (and amounts exactly the PCR charge times the quantity of units of the CE product sold =PCR*Q_2), while area B is pure welfare loss, since it represents a decrease in consumer surplus not transferred to IPR holders (this area represents the impact of the PCR system on the aggregate efficiency of the economy). Area C represents lost producer revenues (and amounts to the price difference –i.e. PCR- times the quantity difference =PCR*(Q_1–Q_2); however, this does not represent any decrease in producer profits. The reasons are technical, but the main intuition is that if the CE industry is perfectly competitive and the supply is extremely elastic, the final price of the product is always equal to the average cost of production (which includes a competitive rate of return for capital invested). Thus producer economic profits are zero both with or without PCR. But the aggregate losses of consumers are larger than the additional revenues of IPR holders (i.e. there is a welfare loss represented by B), so the introduction of PCR diminishes the aggregate welfare.

On its part, and based on the contrary assumption, Figure 2 shows what happens when consumer demand is perfectly elastic – that is, consumers are extremely price-sensitive – while suppliers are only somewhat price sensitive (therefore, the effect of an increase in prices will produce much larger reductions on the demand of the CE products). In this case the price of the final product does not change at all after the introduction of PCR, as the PCR charge is internalized entirely by the manufacturers via increased costs of production of the CE products (*i.e.* they would not be able to pass the additional charge through to consumers by raising prices). That is, in Figure 2 the price paid by consumers is the same before and after the introduction of the PCR charge, while the real price perceived by producers (i.e. their margin) decreases exactly in the PCR charge. Intuitively, if consumers displayed this extreme price-sensitivity then manufacturers would be unable to pass any part of the PCR charge upon them and as a result all PCR charges would translate in lower manufacturer profits.

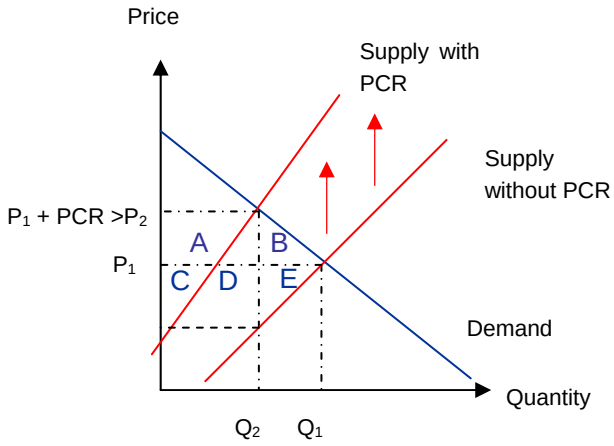
Figure 2: Effect of PCR on prices with perfect elasticity of demand (static analysis)



In this second static scenario, producer profits decrease by the sum of the areas in rectangle A and triangle B. Area A is total PCR collection (and, just as in the previous model, amounts exactly the PCR charge times the quantity of units of the CE product sold =PCR*Q_2), while area B is pure welfare loss, since it represents a decrease in producer profits that is not transferred to PCR collection (again, this area represents the impact of the PCR system on the aggregate efficiency of the economy). Consumer welfare is not affected, even if the number of units consumed decreases (Q_2<Q_1), because consumers are basically indifferent about whether to buy this particular CE product or a substitute. Instead, all PCR charges translate directly into increased producer costs and lower profit margins. Consequently, also in this scenario, the aggregate losses of producers are larger than the additional revenues of IPR holders, so the introduction of PCR diminishes the aggregate welfare.

Of course, neither of these scenarios is plausible, as they are based on extreme assumptions about price sensitivity of either market supply or demand (which are uncommon features of most markets for products and services). Figure 3 shows the most likely case, in which neither the supply nor the demand curves is infinitely elastic, and a given percentage of the PCR charge increases consumer prices while the remainder reduces profit margins on ICT and CE products.

Figure 3: Effect of PCR on prices with imperfect elasticity of both supply and demand (static analysis)



In this third static scenario, the evolution of market prices is different from both of the two previous scenarios, as there is an increase in prices that does not equate to the PCR charge, but a part of it. This percentage being determined by the relative proportion between the supply and demand elasticities – the more sensitive the supply, the larger the price increase; the more sensitive the demand, the lower- (consequently, $P_2<P_1+PCR$). In this scenario, consumer welfare is reduced by an amount equal to the area of the rectangle A plus the area of the triangle B (just as in the first scenario considered, as the demand elasticity is identical in both). The area in rectangle A [that is, $Q_2*(x\%PCR)$] is transferred to IPR holders via PCR, while the area in triangle B is pure welfare loss, since it represents a decrease in consumer surplus not transferred to IPR holders. The total loss of producer profits is equal to the areas C+D+E. The area of C+D is revenue transferred to IPR holders via PCR [that is, $Q_2*(1-x\%PCR)$; so that $A+C+D=Q_2*PCR$)[21]], while the area in triangle E is also pure welfare loss, since it represents a decrease in producer profits that is not transferred to PCR collection. In this case, the aggregate welfare loss equals B+E. Consequently, also in this scenario, the aggregate losses of producers and consumers are larger than the additional revenues of IPR holders, so the introduction of PCR diminishes the aggregate welfare.

[21] In fact, the aggregate transfer to IPR holders cannot exceed the total value of PCR times the number of units of the corresponding CE product sold. The mathematical expressions simply indicate this fact, even if precise estimates of the share of PCR charge between consumers and producers cannot be estimated in a theoretical example. The numerical example provided herein might help get a clearer idea of these effects.

Numerical example: Imagine a case in which the market price before the introduction of a PCR charge (P_1 in Figure 3) is €250, the market quantity (Q_1 in Figure 3) is 15 million units, the demand elasticity is 1.33, the supply elasticity is 9, and the PCR charge per unit is €12.00. Given that we have assumed that the supply elasticity is much larger than the demand elasticity, most (but not all) of the PCR charge is passed on to consumers; the market price is increased by €10.45[22], not by €12.00. After the introduction of the PCR charge the new market price, P_2 in Figure 3, would be approximately €260.45 (equal to €250, i.e. the market price before the introduction of PCR, plus €10.45, equivalent to the consumers' share of the PCR charge). The increased market price (€260.45) would naturally reduce consumer demand, and we can compute the percentage of this decrease by multiplying the percentage increase in price (0.042) by the demand elasticity (1.33), to find that the new market quantity (Q_2 in Figure 3) is reduced by 5.5 percent, to 14.16 million units. Consumer welfare has been reduced by the sum of the area of rectangle A, €147.97 million (=14.16m*10.45), and the area of triangle B, €8.78 million (=10.45*(15m-14.16m)), for a total of €156.75 million. Producer profits have been reduced by the sum of the area of the rectangle that includes C and D, €21.94 million [=14.16m*(€250-(€260.45-€12))], plus the area in E, €1.3 million [=1.55*(15m-14.16m)], for a total decrease in producer profits of €23.24 million. The amounts transferred to IPR holders equal €169.91 million –i.e. the result of multiplying the PCR charge (€12.00) times the quantity sold (Q_2 in Figure 3 = 14.16 million units), which equals the sum of areas A+C+D (€147.97m+€21.94m).

Under the theoretical model depicted in Figure 3, *we have estimated all these effects for a total of thirteen different products that are subject to PCR charges in many European countries*: CD-R, CD-RW, DVD-R, DVD+R, DVD+RW, DVD-RW, DVD video recorders, Flash MP3 players, MP3 players with hard disk functionality, set top boxes with hard disk functionality, SD memory cards, flash memory cards, and, finally, mobile phones with MP3 function. Naturally, the importance of these effects will vary by country, since country characteristics like the magnitude of the PCR charge and the market size are critical determinants of the estimation of the total economic impact. Given the limits on data availability, we have computed these effects for nine Western European countries: Austria, Belgium, Finland, France, Germany, Italy, Netherlands, Spain, and Sweden. We have finally aggregated the country results in order to find general effects of PCR on the Western European markets for each of the abovementioned products.

[22] This 10.45 comes from multiplying the PCR charge by a ratio of demand and supply elasticity: 10.45=12*9/(9+1.33); see Mathematical Appendix 1 for more details.

Our estimations of the price increases, decrease in consumer surplus, decrease in producer profits, and total welfare loss by product and country are displayed in Tables A1 to A13 in Statistical Appendix 1, while Mathematical Appendix 1 explains the more technical details and assumptions of these computations. Table 11 summarises the main results by product. In total, for the thirteen products and nine countries that we have taken into account, we find a static loss in consumer surplus equal to €1,204.7 billion (areas A+B in Figure 3), and a static decrease in producer profits of €172.6 million (areas C+D+E in Figure 3). IPR holders would get a PCR collection of €1,273.8 billion, so *the total static welfare loss for society in these nine countries would be around €104.1 million.*

Table 11: Summary: static effects of PCR, competitive scenario

Product	(1) % Static increase in prices (weighted average on country sales)	(2) Static decrease in consumer surplus (million euros)	(3) Static total decrease in producer profits (million euros)	(4) Static total PCR collection (million euros)	(5) Static total decrease in welfare equal to (2)+(3)-(4) (millions euros)
CD-R	95%	263.4	38.7	273.1	29.1
CD-RW	13%	10.1	1.5	11.3	0.4
DVD-R	76%	207.9	30.6	216.7	21.7
DVD+R	82%	180.3	26.5	187.3	19.5
DVD+RW	108%	64.8	5.3	54.1	16.1
DVD-RW	62%	17.6	2.6	18.5	1.7
DVD video recorders	4.9%	146.7	21.5	162.2	6.0
Flash MP3 players	2.8%	75.4	11.0	84.6	1.9
MP3 players with HDD functionality	4.8%	54.8	8.0	59.6	3.2
Digital satellite set top box with HDD functionality	1.1%	9.7	1.4	11.7	0.1
SD cards	11.29	27.9	4.1	29.9	2.1
Flash cards	9.2%	8.5	1.3	9.6	0.2
Mobile phone with MP3 function	1%	137.6	20.1	155.4	2.3
TOTAL		1,204.7	172.6	1,273.8	104.1

[l] *Germany and Spain have been excluded from the computations for SD and flash cards owing to lack of market data. Figures may not add up due to rounding.*

Our results show that the short-term impact of PCR charges in the European economy is negative but moderate. Each 1 euro collected under the PCR system causes a decrease in welfare for consumers and producers of 1.08 euros – which is far from the 2:1 proportion previously reported and indicates a very moderate short-term effect of PCR on total welfare, of around 8%[23].

[23] The 1.08:1 proportion is calculated by dividing the estimated €104.1 million of welfare loss on the estimated €1.2 billion PCR collections. It is to be noted that our results differ significantly from the findings in the Nathan report (2006) that, for a comparable PCR collection estimated a *"€2.1 billion total direct effect on consumers and producers in 2005 from Europe's currently applied levies*" – what would yield a 2:1 proportion of the negative effects vis-à-vis

4.1.2. Non-competitive scenario

The analysis above assumes that the CE industry is perfectly competitive: all producers in the industry have no influence upon market prices and therefore all manufacturers take market prices as given. However, in reality, the number of producers of CE equipment is not very large and their products are generally differentiated via branding and Intellectual Property protection (mainly patents), so *we also need to compute the decrease in static welfare assuming that the manufacturer's industry is not perfectly competitive* –i.e. introducing CE producers' market power in the model, in order to reflect a more realistic level of competition in this market-.

In such a case, the effect of PCR translates in a different manner than the one we have explained just above for the perfectly competitive market. For example, in a non-competitive scenario it is possible that the industry increases final prices to the consumers by more than the amount of the PCR. This case is called in the specialized literature "overshifting" (see Fullerton & Metcalf, 2002) and it happens because firms with market power increase prices above the PCR to compensate the expected fall in demand. On the contrary, in a non-competitive scenario it is also possible that producers do not pass PCR charges through to consumers via prices because they act strategically and they try to steal market share from their competitors by not passing the effect on to consumers. Therefore, it is important to stress that in a non-competitive scenario, *the CE industry retains a significant degree of discretion as regards passing PCR charges through to consumers and, consequently, an introduction/enlargement of the PCR charges does not necessarily translate into higher consumer prices*.

Unfortunately, the economic methodology to measure the static impact of PCR charges on social welfare when markets are not perfectly competitive is not as widely accepted as it is the case in a perfectly competitive scenario. *A non-competitive framework can be modelled in many different ways and the effects of PCR charges on social welfare critically depend on how we model firms' non-competitive behaviour.* For example, the results may vary depending on whether we assume that firms compete in prices or in quantities, and depending on firms' cost structure. Accepting that the results may change depending on the specific non-market assumptions, and as an illustration, we have modelled a simple oligopoly model (for details see Mathematical Appendix 2) to compute the effect of PCR in prices in a non-competitive scenario for the same thirteen products and the same nine countries. The results are displayed in Tables B1 to B13, in Statistical Appendix 2 and summarised in Table 12.

Table 12 summarises the main results of assuming a non-competitive scenario. The results are similar to those in Table 11, but less negative in terms of consumer and aggregate welfare (as we have just pointed out, CE producers retain the ability of absorbing part or all of the PCR charge and, therefore, can reduce the effect of the PCR charge on consumers), although in general the loss in producer profits is somewhat higher in the non-competitive scenario. This is because in an oligopolistic market we assume the existence of economies of scale: the PCR charges decrease

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PCR collection or, put differently, a 100% negative impact on the economy. NATHAN ASSOCIATES, *Private Copying Levies on Digital Equipment and Media*, p. 2.

the total number of sales, and this causes an increase in the unit cost of production that did not happen in the competitive scenario. Note also that in this particular case there is not a decrease in social welfare as a result of the PCR charge but rather a small increase.

Under this scenario, the estimated static total loss in consumer surplus is €1,026.8 billion (areas A+B in Figure 3), the static decrease in producer profits is €203.9 million (areas C+D+E in Figure 3), and IPR holders would get a PCR collection of €1,273.8 billion. In this case, ***the effect on social welfare is not negative, as it would be increased by €43.2 million. Therefore, under non-competitive market conditions, the short-term effect of PCR on consumer welfare is not negative and, given the assumptions of our model, could be welfare increasing.***

Table 12: Summary: static effects of PCR, non-competitive scenario

Product	(1) % Static increase in prices (weighted average on country sales)	(2) Static decrease in consumer surplus (million euros)	(3) Static total decrease in producer profits (million euros)	(4) Static total PCR collection (million euros)	(5) Static total decrease in welfare equal to (2)+(3)-(4) (millions euros)
CD-R	100.5%	280.1	76.1	273.1	83.1
CD-RW	15.91%	10.8	1.8	11.3	1.3
DVD-R	81.5%	221.1	31.7	216.7	36.0
DVD+R	87.7%	191.7	27.5	187.3	31.8
DVD+RW	93.36%	55.5	6.6	54.1	8.1
DVD-RW	44.35%	15.6	2.8	18.5	-0.2
DVD video recorders	2.5%	74.0	18.2	162.2	-70.0
Flash MP3 players	1.4%	38.3	9.6	84.6	-36.7
MP3 players with HDD functionality	2.49%	27.5	6.7	59.6	-25.5
Digital satellite set top box with HDD functionality	0.5%	5.0	1.3	11.7	-5,44
SD cards	11.91%	28.3	3.3	29.9	1.7
Flash cards	11.66	9.0	1.1	9.6	0.5
Mobile phone with MP3 function	0.62%	70.1	17.6	155.4	-67.7
TOTAL		1,026.8	203.9	1,273.8	-43.2

[l] *Germany and Spain have been excluded from the computations of SD and flash cards owing to lack of market data. Figures may not add up due to rounding.*

In any case, since these results depend crucially on the particularities of how to model the oligopoly behaviour, we choose to stress the results found above under the competitive scenario. This also helps comparisons with other studies that have used exclusively a competitive scenario to estimate the welfare effects of PCR charges. Therefore, we will conduct our dynamic analysis in a perfectly competitive scenario.

4.2. Dynamic Analysis: Effect of PCR on the supply of IPR-protected goods

As we have already mentioned, the foregoing static economic analysis shows short-term negative effects of PCR but is incomplete inasmuch as it ignores the positive mid- and long-term effects of PCR charges for both consumers and manufacturers. The PCR effects cannot be restricted to its collection and, consequently, on the immediate effect on the prices of the products on which it is charged. It needs to be taken into account that the amount collected via PCR will be distributed among IPR holders as a function of the estimated collective use of their works, so that rights holders whose creative work is more widely used – and therefore more intensely copied – will receive a higher compensation.

This naturally generates incentives to create new works that maximise social value. Even if incentives to creation other than its economic viability can influence creators' behaviour, it would be absurd to assume that IPR holders are completely isolated from all economic incentives. Therefore, it is to be assumed that increases in the revenues of creators will induce larger production of IPR-protected goods. By the same token, it is likely that without the introduction of PCR and if the current downward trend in music revenues (*supra* §3.6) continues, rights holders will devote less time to creating IPR-protected goods. Even worse, in the long term it is probable that more people will abandon the prospect of a career devoted to the production of IPR-protected goods and services[24].

Consequently, introducing or extending PCR charges on digital goods would increase both the variety of digital content available to consumers and the demand for the products of the ICT and CE industries. The increase in demand of CE products derives from the complementarity nature of both goods (*supra* §3.5). According to economic intuition, the increased offer of IPR-protected goods due to the extra revenues for IPR holders obtained via PCR collections will drive an increased valuation of CE products by consumers (as they would have a larger availability of content to store and play in their devices and, consequently, will increase the value of the "bundle" of products). This increased valuation will increase consumers' willingness to pay for CE products and, therefore, demand of these devices and carriers will expand.

In this subsection we try to show that *these positive long-term economic effects of the PCR system compensate the short-term welfare loss* computed in subsection § 4.1. *The extent to which immediate losses deriving from the introduction of PCR will be compensated by the mid- and long-run benefits of the system will depend on a relatively large number of market features. However, in general terms, the aggregate effect of the PCR system* (i.e. static plus dynamic) *is not negative and could be welfare enhancing.* We depict the positive

[24] In fact, there is some preliminary evidence that this decrease in the creation of IPR-protected goods is already taking place, at least in music markets. In 1999 in the USA there were 39,400 new unique titles created. In 2002 the total decreased to just 34,293, a decrease of around 12% that has reduced consumer welfare by reducing new title variety. University of California, Berkeley "How Much information 2003", available at http://www2.sims.berkeley.edu/research/projects/how-much-info-2003/.

effect of the digital PCR coming back to a standard supply and demand of ICT and CE products representation in Figure 4.

Figure 4: Effect of PCR introduction in digital ICT and CE markets (dynamic analysis)

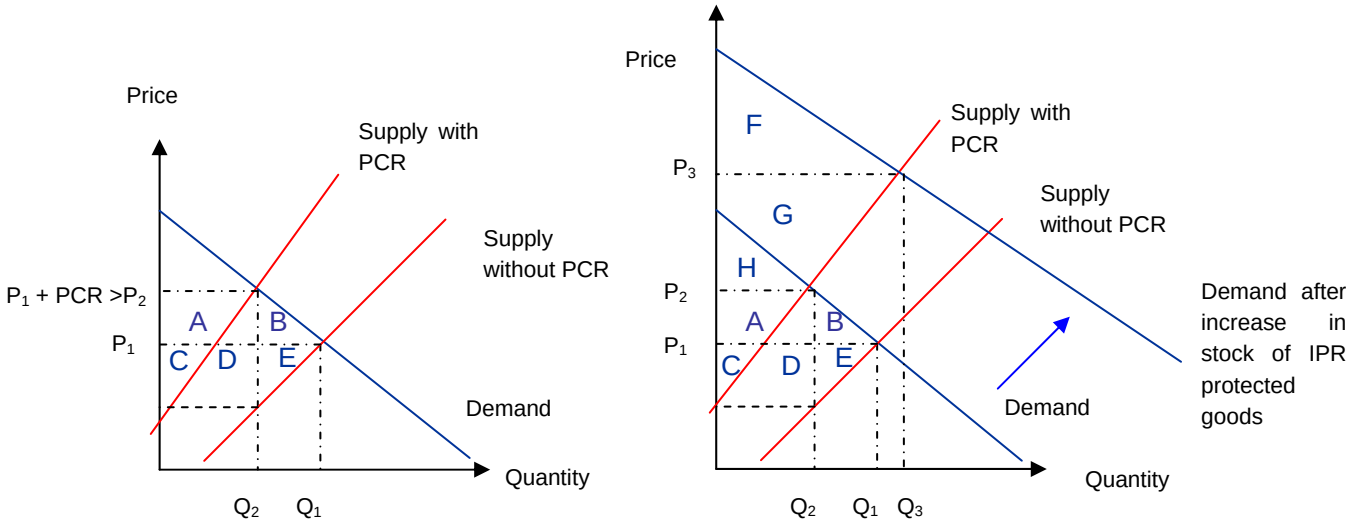


Figure 4 is identical to Figure 3 (§ 4.1.1 above, represented on the left) except that it has *an additional demand curve that captures the increased demand due to an increased variety of IPR-protected goods.* Note that this shift in demand may increase the demand of ICT and CE products above the equilibrium level prior to the introduction of PCR (note that Q_3 is larger than Q_1). Once we take into account this positive effect of an enhanced variety of IPR goods, we can compare the welfare of consumers without PCR against the welfare of consumers under a PCR system. Consumers will be better off if area F is larger than H+A+B. Similarly, it can be proven that producers will unambiguously be better off in a situation like the one depicted in Figure 4, in which total sales increase.

Next *we estimate the projected effect of the introduction of digital PCR on the supply of IPR goods*. This effect may vary depending on a variety of factors. For example, there are rights holders who make their living basically out of live performances, whose works are rarely copied and for them the impact of the PCR on their economic incentives to create is likely going to be small, while for some others the impact of the PCR charges on their economic incentives to create may be substantial since their works are more profusely copied. To estimate the approximate increase in the number of music titles due to the introduction of the PCR system, we first need to estimate the increase in the economic incentives to create for a representative rights holder, deriving from his or her share in the PCR collection. Given the difficulty of obtaining real data on the PCR effect on the increase in compensation for an average artist and, additionally, taking into account the fact that every author will have an individually differentiated compensation

structure, *we estimate that the impact of the PCR collection on author's revenues represents, for an "average" author, a 5% increase in the creator's compensation* (that is, that authors' compensation for the creation of new music titles will be a 5% higher in a scenario with PCR charges than in a non-PCR scenario)[25].

For our next step, we have to multiply this 5% increase in compensation by the elasticity of labour supply for cultural and creative activities. This elasticity of supply is a parameter that measures by how much artists increase the number of hours devoted to creative effort as a result of an increase in compensation for the creation of new music titles. We use the measure of hours of creative work as a proxy to quantify the key input in the production of IPR-protected works. Note that this parameter not only incorporates the effect on the number of hours worked by already established artists but, much more significantly, it also captures the increase in the number creative effort of those artists that only work part time –or not at all- in the creative process, so that an increase in the compensation may allow them to reallocate more time to creation. The empirical economics literature has found that economic incentives are more important to explain increases in the number of hours worked due to changes in occupational choices, i.e. the so-called "extensive margin" -like changing from part time to full time- in a wide variety of professions (Heckman 1993) and the same will likely apply to artists or creators of IPR-protected goods.

Up to our knowledge, no study has estimated the elasticity of labour supply for cultural and creative activities. Evers, De Mooj and Vuuren (2005) compile estimates of labour supply coming from 239 different studies and find that the average labour supply elasticity is 0.24. Since most of these studies do not explicitly incorporate the extensive margin, we take the labour supply elasticity for cultural and creative activities to be around 0.30. We can then infer that the increase of effort (measured in hours) devoted by creators to the creation of IPR-protected goods (music, in particular) will be annually around 1.5 percent (equal to 5% multiplied by 0.30); and we assume a proportionate increase in number of titles. The assumed proportionality between increase of productive input (creators' effort) and output (IPR-protected goods) derives from the fact that an increase of input of less than 2% will rarely affect the structure of the production function and, consequently, from a purely theoretical economic approach, the output can be assumed to be increased in the same proportion.

This does not mean that a direct relation of the type "1 hour of creative work equals 1 IPR-protected work" (for instance, a song), as we are only using the measure of hours of creative work as a proxy to quantify creative effort. We do not know how intense in human capital creation is. Probably this intensity will depend crucially on a large number of factors and vary significantly from author to author, but we do not need any estimates on the intensity of the creative activity in order to conduct our analyses. Our working assumption is simply that authors' production function is linear: i.e. that an author that, for instance, requires 100 hours to produce a new song, will be producing two songs if she devotes 200 hours to her creative activity. Or that an author that invests 35 hours in creating a song will be able to produce two of them in 70 hours. We do not

[25] According to authors' societies estimates, PCR is on average around 5% of rights holders' compensation.

make any judgement on whether producing a song takes 100 or 35 hours (or any other human capital intensity); our assumption is limited to the fixed proportionality between creative input and output –whatever that precise proportion is.

Even if this assumption might imply a relevant simplification of the creative activity and might not be true in the extreme cases (for instance, authors already devoting all of their time to creation might not be able to increase their production, regardless of their level of rents, while "amateur" authors might generate much larger increases of production if due to PCR collections they can get to develop a profitable activity that allows them to "professionalize"), we think that it is sound inasmuch as our analysis require. Consequently, since our purpose is to produce a conservative estimate of the increase in titles that can derive from the introduction of a PCR system that increases creators' revenues moderately (in our estimates, by 5%)., we will stick to the 1.5% estimate of increase in IPR-protected goods due to the PCR collection distributed to creators.

This larger title production will gradually increase the demand for CE devices, since consumers will have more content available. This effect will not crystallize instantaneously, because consumers listen to old music as well as to new music and a current increase in the production of new titles will have only a small effect on the total stock of music available to the consumer (since the consumer can still enjoy the product of many past-years creativity). However, if the increase in annual production of titles is sustainable across time, in the medium to long run, the total stock of music available to the consumers will expand significantly, and this will increase the demand for digital gadgets devoted to consumption of music or other IPR-protected content.

In order to estimate these long-term dynamic effects, we need to know how the age of music affects its consumption. If, for example, consumers prefer recently created music, the positive effects of PCR will be felt sooner – since the increased availability of titles will logically affect the most recent music titles rather than the already existent ones –. On the contrary, if consumers have a tendency to stick to older music the positive impact of the PCR system will be noticed in later years. Table 13 summarises our estimates of music consumption according to the year it was created (the details of the calculation are reported in Statistical Appendix 3). As might be expected, newer titles represent a larger proportion than older titles, and most music that is a few years old is barely consumed at all.

Table 13: Estimation of percentage of sales by year of release of the album for the year 2006

Year	Share of music sales by year of creation of the title
1981	0.01
1982	0.01
1983	0.02
1984	0.03
1985	0.02
1986	0.09
1987	0.15
1988	0.26
1989	0.28
1990	0.34
1991	0.45
1992	0.62
1993	0.90
1994	1.14
1995	1.16
1996	1.64
1997	2.58
1998	3.00
1999	3.49
2000	3.48
2001	3.36
2002	3.98
2003	6.6
2004	5.4
2005	26.3
2006	34.6
Total	100.00

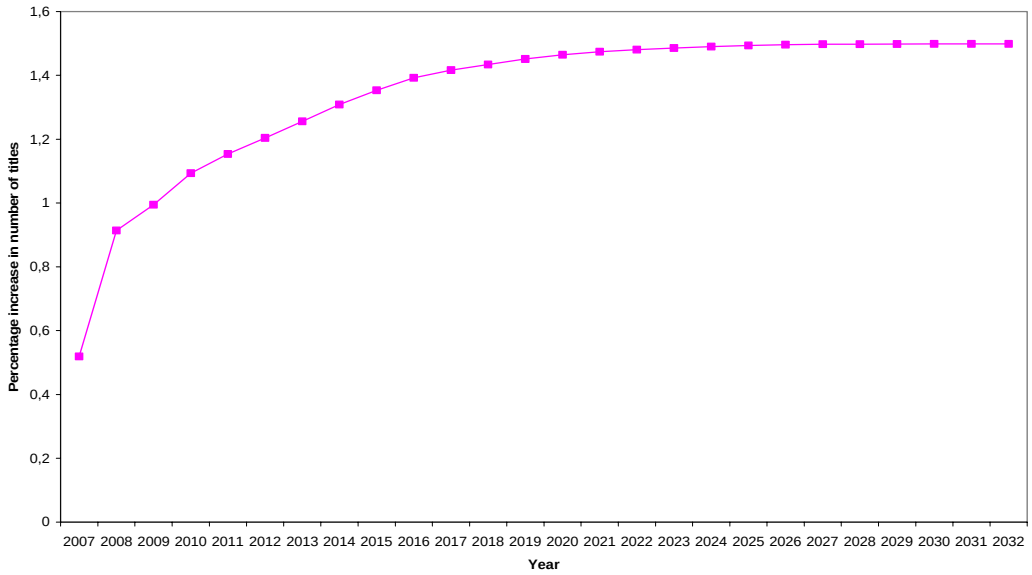
Source: own elaboration (see Statistical Appendix 3 for details).

In our theoretical scenario, for 2007, we multiply the estimated increase in new tittles of 1.5% by the estimated share of new music in total consumption, which is 34.6% (using the 2006 number from Table 13), and find that the stock of music available to consumers will have increased by around 0.52%. In 2008, we will have the same 1.5% increase in new titles created in 2008, again multiplied by 34.6%, plus the increased titles produced in 2007, now multiplied by only 26.3% because they are a year old. The increase in the stock of titles available will be 0.52% (=1.5* 34.6%) plus 0.39% (=1.5*26.3%), for a total of 0.91%. This accumulative effect is depicted in Table 14. Graph 4 shows the gradual increase in the stock of titles over the next 25 years.

Table 14: Estimated long-term increase in stock of music titles

Year after PCR charges	%increase in stock of music titles available
T+1	0.52%
T+2	0.91%
T+3	0.99%
T+4	1.09%
T+5	1.15%
T+6	1.20%
T+7	1.25%
T+8	1.30%
T+9	1.35%
t+10	1.39%
t+11	1.41%
t+12	1.43%
t+13	1.45%
t+14	1.46%
t+15	1.47%
t+16	1.48%
t+17	1.48%
t+18	1.49%
t+19	1.49%
t+20	1.49%
t+21	1.49%
t+22	1.49%
t+23	1.49%
t+24	1.49%
t+25	1.49%
t+26	1.50%

Graph 4: Percentage increase of music titles available due to the introduction of the PCR system



Once we have estimated the likely increase in title availability, we proceed to estimate the economic impact of this enhanced variety on the demand for CE products and the consequent increase in prices, sales, consumer surplus, and producer profits. Intuition suggests that the economic effects should show the same positive dynamics depicted in Figure 4. We use a study by Clements and Ohashi (2005) as a basis for quantifying the reaction of consumer demand for CE products to an increase in the stock of music titles available. The details of the computations are technically complex, since they require an estimation of the new prices and quantities as a result of the increased stock of titles and an estimation of the complementarity between the demand for CE products and the stock of titles available (we explain the technical procedure for arriving at these numbers in Mathematical Appendix 3).

Tables C1 to C13 in Statistical Appendix 3 summarise the economic impact of the PCR system once we take everything into account for the same 13 products for which we reported static effects in section §4.1.

Tables C1 to C13 show that *once we take into account the dynamic effects of the PCR charges*, the positive dynamic effects compensate to a large extent the negative static effects and, as a result, *consumers are better off in all CE markets* because of the increase in music content caused by the incentive effects of the PCR system.

If we combine both static and dynamic effects, we find that total welfare (adding consumer surplus and producer profits) may go up by 2.8 percent in a period of 25 years as a result of the introduction of the PCR system[26]*, although three fourths of the positive effects would already be in place after a period of 5 years.* Regardless of the particular assumptions, the base-line conclusion is that *the dynamic mid- and long- term effects of the PCR system on content supply compensate for the negative short-term effects calculated in our static analysis. In sum, the economic impact of the PCR system is not negative and could increase total welfare.*

[26] This 2.8% is the result of adding all the effects on both consumer surplus and producer profits reported in Tables C1 to C13.

5. PRINCIPLES UNDERLYING THE ECONOMIC RATIONALITY OF PRIVATE COPY REMUNERATION

5.1. What is the optimal way to keep the value of IPR unaffected by private copying?

The capital importance of IPR and of incentives to cultural and creative activities from a social and economic point of view has already been clearly shown. Content is a key driver for the development of the Information Society and, particularly, a determinant of economic growth in more advanced economies. Therefore, protection of IPR and the generation of the right economic incentives to the production of IPR protected goods is a regulatory must and its importance is out of question. Building on this principle, a more detailed IPR regulatory regime needs to be configured – IPR rules shall establish strong mechanisms that appropriately ensure their value.

We have seen already (*supra* §3.1) that private copying decreases the value of IPR, that a compensatory device is absolutely necessary, and that PCR is designed to re-establish the economic equilibrium between producers and consumers of IPR-protected goods and distribute more fairly the costs and benefits of the IPR system. However, *it may be impossible to create a system of private copy compensation that can simultaneously protect the incentives to cultural and creative activities and generate the minimum social cost.*

All systems have their advantages and pitfalls. In theory the optimal system of determining the amount due to IPR holders by each particular user of IPR-protected goods would require a prohibitively expensive degree of monitoring and, consequently, it is economically unfeasible and undesirable. All the available systems of compensating authors for private copying are imperfect, and these second-best solutions need to be deeply scrutinised before being promoted, as their impact on economic growth will be hefty. Accordingly, *we shall define the economic principles that can be derived from the theoretically perfect system of full monitoring and use them as benchmarks to evaluate each of the alternative systems.* Needless to say, the alternative system that gets a better global appraisal according to such principles shall be implemented, while the others shall be simply discarded.

This analysis will allow us to get a clear picture of the available mechanisms to protect IPR and incentives to cultural and creative activities. The advantage of this analytical framework will help us capture most of the economic implications of these systems, which are also freighted with subjective considerations that generally impede comparison and make the analyses fuzzy and inconclusive. Even if our analysis is based on some necessary simplifications and assumptions, it will provide us with comparable information about the alternative systems. And an objective comparison of their benefits and costs will help us determine which system is preferable from an economic perspective.

5.2. Economic principles of private copying compensation to authors

The theoretically perfect system to determine the amount of compensation for private copying activities due by consumers to IPR holders would require direct observation or full monitoring of such activities. Such a system would be anti-economic, given its excessive costs. However, full monitoring would establish a perfect direct relationship between consumption of IPR-protected goods and revenues collected by IPR holders. It would embody two basic economic principles: (1) remuneration of rights holders should be a function of the social value of their work (measured in terms of both use and copying), and (2) consumers who value the content more (i.e. ,those who do more private copying of the content) should pay a higher price. Any alternative system should comply with both principles to the maximum possible extent.

Also, given that implementation of the abovementioned system is unfeasible and undesirable, and in order to compare alternative systems with full-monitoring and among themselves, we have to search for economic criteria to appraise the alternatives. Any alternative system should minimise its own information, transaction, and enforcement costs, as well as its impact on the economy as a whole.

Consequently, we can define *four economic principles* against which to evaluate each system of private copy compensation:

- *Remuneration of rights holders should be a function of the social value of their work*
- *Information, transaction and enforcement costs of the system should be minimised*
- *Who copies more should pay more*
- *Distortions and spillovers on the economy should be minimised*

We will now turn to each of them in greater detail, analysing their importance and determining how private copy compensation systems shall be compared to them. We will perform such detailed analysis of the proposed modifications and alternative systems to PCR later (*infra* §6).

5.2.1. Remuneration of rights holders should be a function of the social value (use and copying) of their work

Rights holders' revenues are the price that consumers (in broader terms, society) pay for IPR-protected goods. As in any other market, *goods should be priced according to the level of demand (or social value) attributed to them*. Only with such a direct relationship between consumption and price will the optimal level of production be set. Should revenues be insufficient because of uncompensated private copying, production in the cultural and creative sectors would be suboptimal, and this reduced level of production would harm other sectors (such as the ICT and CE industries) and the growth of the economy as a whole. Should revenues be excessive, there would be resources devoted to IPR production that would render a higher social return if applied to alternative uses. Finally, should revenues be unrelated to the social valuation of creative work, the quality of IPR-protected goods would decrease, as market mechanisms discipline producers who depart from social preferences. The only way to achieve the optimal level of production of IPR-protected goods that fit social needs is to comply with the basic

principle that *remuneration of right holders should be a function of the social value (use and copying) of their work.*

5.2.2. Information, transaction and enforcement costs of the system should be minimised

The costs associated to the compensatory devices of IPR loss of value due to private copying shall be taken into account when appraising them. All economic systems generate their own costs in terms of the information that is required to make decisions in the market, the costs imposed on each transaction, and the costs of implementing and enforcing the system. All these costs reduce the general efficiency of the economy. *There is no way to generate an economic environment completely free of all these costs, but efficiency calls for reducing them to the optimal minimum* (so that they are offset by the efficiencies generated by the system).

Costs imposed on private copying do not merely transfer rents between consumers, IPR holders,and collecting societies or PCR administrators, but generate social losses, no matter which agent assumes such costs. Minimising the costs of the compensatory system will benefit all stakeholders and, ultimately, promote social welfare. From this perspective, under an efficiency criterion, the system that keeps the level of social loss to the minimum optimal level is preferable Therefore, *information, transaction and enforcement costs of the system should be minimised*.

5.2.3. Who copies more should pay more

Private copying generates a negative externality, as the cost associated with the (over)use that consumers give to IPR-protected goods is not borne by them, but assumed by or imposed on IPR holders. It is a general economic principle that externalities lead to over-consumption, as consumers free-ride at the expense of other agents. And over-consumption is inefficient, as it keeps the levels of production abnormally high and therefore distorts the optimal allocation of productive resources. Moreover, over-consumption generates an expropriation of the agents assuming the costs of the externality, at the benefit of the agents generating such externality.

It follows that *the system would be more efficient if consumers were forced to bear the cost of private copying*, as it would drive consumption back to the optimal level and would minimise the expropriation of IPR holders, thus maintaining the right economic incentives to the development of cultural and creative activities.

Mechanisms of compensation of private copying impose a cost on consumers and, consequently, make them internalize the negative impact of such additional consumption on IPR-protected goods' value. Such mechanisms reveal themselves fit for the purpose of getting consumers to internalize the cost of their activities and, consequently, shall drive consumption of IPR protected goods to its optimal level. In short, the system should be based on the quite simple principle that *who copies more should pay more*.

5.2.4. Distortions and spillovers on the economy should be minimised

Finally, IPR regulations and private copy compensation devices shall not be analysed in the vacuum. We have already seen the importance of IPR to global economic growth; consequently, *any alterations of the current system should be analysed in relation to their impact on the economy as a whole*.

Needless to say, those systems that generate lower negative effects on other sectors of the economy (such as the ICT and CE industries) and pose lower risks to economic growth and to the development of the Information Society will be clearly preferable to others giving rise to contrary effects. It is a general criterion of regulatory intervention that its *distortions and spillovers on the economy should be minimised*, if regulation is to foster economic development.

5.3. Trade-offs between the economic principles

Getting a system to absolutely comply with the abovementioned principles may be impossible. All systems bring about their own advantages and disadvantages and, as we have already emphasised, no theoretically perfect system is available. *Some trade-offs between the above principles are required*. It is virtually impossible to satisfy all of them fully, and even to rank them would, if possible at all, require further information and very detailed empirical data. *Therefore, our analysis will be comparative and cumulative*. Under a given criterion, one system will be preferable to another if it fits all the requirements of that criterion. Overall, a system will be preferable to another if it satisfies a larger number of criteria, and a system will be preferable to all the others if it satisfies the maximum number of criteria. This analysis may not be definitive, but it sheds significant light on the advantages and disadvantages of each of the systems and, globally, highlights their effects on the economy as a whole and on the interests of each of the stakeholders involved.

To anticipate the analysis in later sections (*infra* §6), *according to these principles, none of the modifications or alternatives significantly improves on the current PCR system*.

6. ASSESSMENT OF PROPOSED VARIATIONS ON THE PCR SYSTEM AND ALTERNATIVE SYSTEMS OF PRIVATE COPY COMPENSATION

Although it is not acknowledged by some groups of stakeholders, current remuneration schemes for private copy (*i.e.* PCR) balance the interests of IPR holders, manufacturers and importers of ICT and CE products and consumers. Some criticisms made against PCR have been restricted to highlighting its drawbacks and limitations. As we have already seen, *PCR is not completely free of defects, but once the economic rationale of PCR is considered and its positive effects on the generation of incentives to cultural and creative activities are taken into account, it must be reckoned that its net effect may be positive*.

Therefore, even counting for the existence of certain drawbacks and limitations of PCR; it still holds as a proper system of IPR protection and of economic promotion. Some critics have proposed variations of the PCR system, or alternative systems, that are intended to reduce its negative effects and increase its contribution to the development of the Information Society and, ultimately, to economic growth. Other critics have simply suggested that IPR holders should modify their business models in order to adapt to a scenario in which IPR would no longer be enforceable[27].

In the present section we analyse those proposals that have been already implemented in certain countries, those that have been strongly defended, and those that seem economically most plausible. We begin analysing the compliance of the current PCR system "as is" with the abovementioned economic principles (§6.1) and then turn to focus on the proposed modifications of the current PCR system, such as capping PCR collection and exempting certain groups of consumers from the payment of PCR (§6.2). We then turn to alternative systems: DRM, taxation of IPR-protected goods, public subsidies, global internet licensing and proposals such as copyleft, Creative Commons, and the like (§6.3). We end by showing that (PCR "as is") best balances all the requirements of the system (§6.4).

In fact, if we confront the abovementioned systems with the economic principles applicable to compensation for private copying (*supra* §5.2), we find that PCR under its current definition (PCR "as is") is the system that provides a better balance of all the requirements of the system and, consequently, superior to the modified versions and alternative systems hereby analysed.

[27] Most of these proposals, even if sometimes named differently, can be found at VARIAN, Hal R. "Copying and Copyright", *Journal of Economic Perspectives*, Vol. 19, Number 2, Spring 2005, Pages 121 – 138.

	Remuneration should be a function of social value of works	Costs of the system should be minimised	Who copies more should pay more	Spillovers on the economy should be minimised
PCR "as is"	☑	☑	☑	☑
PCR caps	☒	☑	☑	☒
PCR exemptions	☑	☒	☑	☑
DRM	☒	☒	☑	☒
Taxation of IPR-protected goods	☑	☑	☒	☒
Public funding	☒	☑	☒	☑
Licence globale or internet flat fee charges	☑	☑	☒	☑

* Alternative distribution methods (Creative Commons and copyleft) do not constitute a real alternative to PCR.

6.1. The current PCR system

	Remuneration should be a function of social value of works	Costs of the system should be minimised	Who copies more should pay more	Spillovers on the economy should be minimised
PCR "as is"	☑	☑	☑	☑

The PCR system "as is" fits the four principles indicated above. Even if its compliance with some of these principles might be considered partial, it does not run counter to any of them.

First, since (i) PCR revenues are distributed to authors as a function of the number of copies of their work, and (ii) PCR is charged on devices and carriers that consumers use to conduct private copying, *the PCR system establishes an adequate relationship between the social value of IPR-protected goods and the remuneration received by rights holders*. This relation is not direct and not perfectly adjusted, since some consumers do not use the PCR-charged devices to make private copies, but full monitoring is unworkable and excessively expensive. Therefore, the approximate or indirect aspects of the PCR current system constitute unavoidable imperfections of any PCR compensation system, and, as we show below, exempting groups of consumers less prone to private copying sacrifices the efficiencies of the current system without much effect on the intended beneficiaries. In any case, the fact that some "IPR-free" uses of the devices and equipment get charged PCR collections does not break the relationship between social value of the works and right holders remuneration. The strong complementarity between IPR protected works and CE products configures consumption of the latter as good but not perfect proxy for private copying activities in any case (see *supra* § 3.5).

Second, *the current PCR system minimises collection costs*. It is based on a simple rule: the purchase of the devices and/or carriers subject to PCR triggers the payment of a certain amount. This rule is easy to apply and generates few information and transaction costs. The enforcement costs of the system are also limited, and it might be fair to say that current enforcement costs are

larger than expected because of strong social and industry resistance in certain countries. The practical implementation of the system can still be improved in order to drive enforcement costs down, particularly in the case of transnational intra-EU community sales (where some legal amendments may strengthen collective management societies' position vis-à-vis PCR debtors – see *infra* § 7.3). As we shall see, very few alternative systems would be able to reduce the enforcement costs associated to the PCR system and, in any case, would be less desirable systems on other grounds.

The PCR system also complies with the principle that who copies more pays more. Given that each purchase of a device or carrier subject to PCR collection triggers an additional payment, consumers who do more intense private copying will likely pay larger PCR than those with more moderate uses of IPR-protected goods. This is particularly clear in the case of consumables, which get used up after the first use for private copying (for instance, in the case of burning a private copy of a music CD to a CD-R blank disc). But this proportional aspect of PCR still holds when the carriers or equipment allow for repeated private copying, as the amount of the PCR is raised in proportion to the storage capacities of the device. Therefore, the current PCR system distributes PCR charges amongst consumers according to the intensity of their private copying activities. Consequently, the system is preferable to those systems that disregard this criterion and charge all consumers equally (generating a cross subsidization problem, which we will detail *infra* § 6.3.2 and 6.3.4).

Finally, *the PCR system minimises potential negative effects on the economy as a whole*. Given its compliance with the three previous principles, its neutrality as to any eventual competitive effects in the IPR or neighbouring or complementary markets (such as CE and ICT markets, on which see *supra* § 3.3) and the fact that no particular spillover can be identified for the PCR system, it does not do much harm to the economy.

For all these reasons, *the PCR system is the best or least bad available system to compensate and remunerate right holders for the private copying of their works*.

6.2. Proposed variations on the current PCR system

6.2.1. Capping PCR collection

	Remuneration should be a function of social value of works	Costs of the system should be minimised	Who copies more should pay more	Spillovers on the economy should be minimised
PCR caps	☒	☑	☑	☒

It has been suggested that PCR shall maintain certain proportionality with the prices of the ICT and CE products on which it is charged and should be capped at around 5% of the prices of the ICT and CE products on which it is charged. As we have already seen (*supra* §3.7), this is in fact

the average current level of PCR calculated on total sales of digital equipment closely related to IPR protected content. Therefore, the limit to PCR collection to 5% of ICT and CE sales is, in itself, currently *de facto* in place. But PCR charges on different equipment and media are in some cases above 5% and in others below, and *it is hard to envisage a reason why all equipment and media should be charged uniformly, as they are subject to different patterns of use and consumption, and as they allow consumers to make different types of private copies* (permanent or temporary, shareable or not, etc).

In some cases, the setting of fixed amounts of PCR per unit sold and the evolution of prices of ICT and CE products have led to a situation where PCR represents a substantial part of the price paid by the consumer, or even the larger share of it (particularly in the case of lower-priced products such as blank optical discs). These situations have been considered unacceptable by consumer associations and also by industry representatives, as they are deemed to impede the sales or consumption of those goods. However, we have already seen that this assumption does not hold (*supra* § 3.7).

As a result of those criticisms, some people have argued strongly for capping PCR collection, or setting the PCR rate as a function of the price paid by consumers (*ad valorem*, instead of fixed charges), as a means to "maintain the rationality of the system". However, *the establishment of such caps would run against the economic rationale of PCR*. In fact, such proposals are at odds with basic economic principles and completely disregard the fact that IPR-protected goods and consumer electronics goods are not comparable, as they are subject to different production technologies and cost structures.

First of all, it must be taken into account that production of physical goods such as ICT and CE products, and production of IPR protected goods have very different production cost structures. ICT and CE products benefit from significant economies of scale (*i.e.,* producing a larger number of units reduces the cost per unit) and from learning curves (producers become more and more efficient with experience). Therefore, the natural evolution of these industries drives production costs down and, insofar as they are relatively competitive, lowers consumer prices across time. However, the profitability of these activities is not harmed by this decrease in consumer prices, as the saving for the consumer stems from reduced production costs and not from reduced commercial margins. On the contrary, inasmuch as production savings are not fully passed through to consumers, the profitability of the industry may increase as consumer prices decrease.

On the other hand, cultural and creative goods production is not subject to the same technologies and structure of costs. The cost of creation of every IPR protected good is determined by a cost function that does not depend significantly on economies of scale, nor can be significantly affected by learning curves. The creative effort put into the production of a new work is completely unrelated to the number of copies that may be sold in the future. Moreover, the creator has a very specific learning curve that most probably gets exhausted (or nearly) with the creation of each IPR good. Once an author has created a song, the composition of the next one is not eased by that fact, and may even be harder, as the next song will have to be different. In effect, previous creations restrict the available alternatives and thus raise the hurdle that the

author has to jump in his or her next one. Whereas in ICT and CE production, learning curves reduce the marginal requirements of every new unit, the author's marginal costs are constant or increasing. Therefore, no significant reductions of consumer prices can be expected, as there are no savings in production costs with which to subsidise them. Consequently, any reduction of revenues directly implies a loss of profitability of the cultural and creative industries.

It is therefore natural for PCR to grow vis-à-vis ICT and CE products' consumer prices, as the latter decrease while the former tend to remain constant. This progressive imbalance is not a problem in the design of the system; on the contrary, it is the only way to assure that the profitability of both activities is positive and consistent across time. In the absence of productive efficiencies, there is no reason to expect prices going down over time. Therefore, in the absence of scale or experience economies in the production of IPR protected goods, PCR shall not be expected to decrease across time, as should do prices of CE and ICT prices where strong scale and experience economies exist. It follows that the establishment of *ad valorem* PCR, or the establishment of caps on per unit PCR charges, can only run against the interests of IPR holders, to the detriment of cultural and creative activities.

ICT and CE producer revenues would be largely neutral to the establishment of caps, as the PCR charges are mainly (if not completely) borne by consumers. Consumers would be better off, but only in the short run, as PCR payments would decrease along with ICT and CE product prices. However, IPR holders would be worse off, and incentives to cultural and creative production would be greatly reduced.

The reductions in PCR collection would diminish the profitability of IPR-related activities and might render them unprofitable in absolute terms. Also, the value of IPR would be made dependent on the evolution of the production costs of other products, over which IPR holders have no influence. In fact, pricing decisions made by the ICT and CE industries would determine the volume of PCR collected by IPR holders, a situation that has no economic justification. Moreover, the consumption of complementary products would generate opposing trends in the producers' revenue streams, and this makes poor economic sense. Just as is currently the case (see *supra* §3.6), a decrease in ICT and CE products' prices would probably generate extra revenues to ICT and CE producers (given the increase in consumption) and would reduce IPR holders' PCR revenues (inasmuch as the reduction in PCR was not offset by the increase of units sold), further increasing the disproportion in profitability of these two industries so closely related in the economy of the Information Society.

In short, *capping PCR collection would run against the principle that remuneration of authors should be a function of social value of their works.* IPR holders would be expropriated to the benefit of consumers in the short run and at the expense of economic growth in the medium and long run. In the end, even consumers would be worse off, as the quantity and/or variety in offer of ICT, CE and IPR goods would be reduced in the medium and long term. Consequently, capping PCR collection *cannot minimise the distortions and spillovers on the economy as a whole.*

Since it both weakens the relationship between IPR holders' remuneration and the social value of their work and cannot minimise distortions and spillovers on the economy as a whole, capping PCR does not seem to be recommendable in strictly economic terms.

6.2.2. Exempting from the payment of PCR certain types of users of ICT and CE products (public bodies, professional users, etc).

	Remuneration should be a function of social value of works	Costs of the system should be minimised	Who copies more should pay more	Spillovers on the economy should be minimised
PCR exemptions	☑	☒	☑	☑

It has also been suggested that an exemption from PCR payment be granted for certain groups of users who are less likely to privately copy IPR-protected goods, such as public institutions, professional users, educational institutions, etc. Even if it is clear that private copying will be significantly less common among such users (although it cannot be completely ruled out), the logic of the PCR system makes exemptions less desirable than they may seem at first glance.

One of the main economic advantages of the PCR system are linked to its straightforwardness, general application and reduced information and enforcement costs. These advantages are based on the simple fact that the rule is clear, so information costs are low, it is automatically applied, so transaction costs are also low, and it is of general application, so the enforcement costs are relatively low. It might be said that the main advantage of the systems stems from its simplicity. An exemption system would necessitate mechanisms for categorizing purchasers and giving them different treatments – which *would increase information and transaction costs, because the rule would be more complex, as well as enforcement costs, because diversity of cases would oblige enforcers to distinguish the monitoring and enforcement mechanisms applied in each of the different cases. Also, the exemption of certain groups of users would require an enlargement of the charges then applicable to the rest of consumers—in order to keep author's revenues unaffected.*

Given the difficulty of implementing such a solution automatically, most probably the beneficiaries of the exemption would need to make reports (either to the seller of the product, or to the PCR administrator) in order to get the PCR charges waived or, more probably, refunded. This red tape would increase the enforcement costs of the system. Also, the exempted consumers' information and transaction costs would be higher than those of non-exempted consumers, and therefore, *the economic advantage of the exemption would not be the PCR amount in full, but the difference between that amount and the additional transaction costs.* These increased transaction costs would generate a net loss in the system, as no stakeholder would be able to appropriate these rents.

Also, this system would generate incentives to defraud and misreport, in order to get personal, non-exempted consumption covered by the exemption. *The potential for fraud would further increase the transaction, monitoring, and enforcement costs of the system, and this would further evaporate a significant part of the economic benefits of the current system*.

Inasmuch as the decision of passing the PCR charge through to these users is for the ICT and CE sellers, the exemption of payment might not necessarily translate into an identical reduction on the ICT and CE prices paid by these consumers. ICT and CE sellers might argue that, since they were partially assuming the cost of the PCR, they deserved a portion of the exemption; and accordingly, they might offer only partial discounts to exempt consumers while appropriating a part of the exemption. Monitoring these cases and guaranteeing that the intended beneficiaries of exemptions get their full share would be costly and complicated.

To sum up, *the benefits of the exemption would be largely absorbed by the increase in information, transaction, and enforcement costs* to both the beneficiaries of the exemption and the PCR administrators, as well as the costs of the increased incentives to fraud and misreporting, and the appropriation of part of the PCR by ICT and CE sellers in certain circumstances. *The net result would probably not be favourable, as the beneficiaries would not be much better off, and the system would be more costly and complicated. Therefore, the introduction of this exemption does not seem to be recommendable in strictly economic terms.*

6.3. Alternatives to the PCR system

6.3.1. Digital rights management (DRM)

	Remuneration should be a function of social value of works	Costs of the system should be minimised	Who copies more should pay more	Spillovers on the economy should be minimised
DRM	☒	☒	☑	☒

Digital rights management systems (DRM) are technologies that describe and identify digital content protected by IPR, and enforce usage rules set by IPR holders or prescribed by law for digital content. Inasmuch as DRM may allow IPR holders to determine the use that consumers could make of the IPR-protected goods, DRM could theoretically preclude private copying and, therefore, make the whole PCR system unnecessary[28]. However, *it would be possible to eliminate the private copying exception and the corresponding PCR only if all IPR goods*

[28] DRM must be differentiated from Technological Protection Measures (TPM) or copy-control devices, which would simply prevent consumers from making any copies of the protected originals. DRM can also prevent copying in all or some cases. But both limit consumers' freedom to use IPR-protected goods and neither is a good substitute for the current PCR system.

were covered by DRM systems. Should all IPR goods be protected by DRM, consumers would not be able to copy them without compensating right holders (or not, at the right owners will) and, therefore, PCR would lack economic justification.

In practice DRM is far from assuring full coverage of all IPR-protected goods. Precise figures are hard to estimate, but only a minor fraction of music is distributed under DRM protection (although a relatively larger share is distributed with copy-control restrictions). The larger part of the offline music distribution is still not covered by DRM, and this situation is not expected to change in the near future. Currently, in the online environment, most of the music legally distributed is copy-control protected, and a share is also distributed with DRM devices embedded (mostly that distributed by Apple). However, this trend seems to be reversing, mostly because DRM faces significant consumer opposition – because of the limits they impose on consumers' freedom and, not least, because in certain instances DRM are acting as computer intruders regarding personal data (which can harm the protection of private life). A very recent research study conducted in the UK by Entertainment Media Research/Olswang found that 68% of respondents who expressed an opinion agreed that downloads are "only worth purchasing if free of DRM", 61% agreed that DRM "invades the rights of the music consumer to hear their music on different platforms", and 49% agreed that "it's a nuisance and I don't like it"[29]. A business strategy of using DRM has so far been implemented successfully only by Apple. And recently Apple, EMI, Universal and Amazon have all moved towards distributing DRM-unprotected IPR content, which may be very significant evidence of the difficulties in pursuing a pure DRM-based business strategy in the digital environment. Therefore, *it cannot be regarded as the preferable business strategy to be pursued in the sector in the years to come*.

According to recent studies, only around 37% of music will be distributed under DRM protection in 2010[30]. Therefore, DRM penetration will hardly exceed 40% of new releases in a relevant time frame. If we take into account the fact that there is already a very significant stock of unprotected music, the proportion of DRM-protected originals available for private copying is still lower (and may be well below 5%). Consequently, in 2010, only a very minor proportion of music content susceptible of private copying will be protected by DRM, and private copying will still be largely available to consumers *causing a disruption in the relationship between authors remuneration and the social valuation of their work (shall PCR be eliminated)*. It follows that substitutability of the private copying exception plus PCR system and DRM systems will remain very poor in the medium term, if it can ever reach the sufficient penetration to be real alternative.

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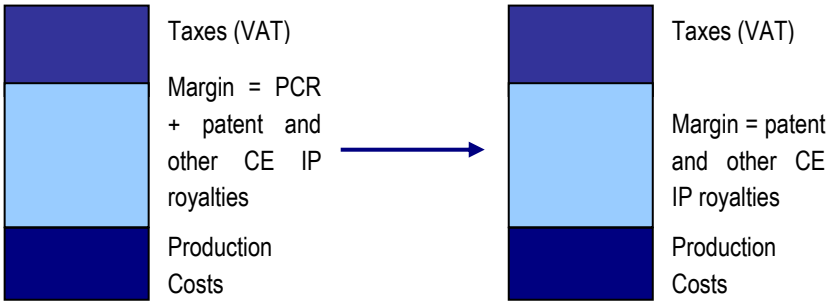
[29] EMR/Olswang *The 2007 Digital Music Survey*. London, July 2007, available at http://www.entertainmentmediaresearch.com/reports/EMR_Digital_Music_Survey2007.pdf.

[30] Forrester Research estimates used by the European Commission in its EU Commission, *Stakeholders' Consultation, Copyright Levies in a Converging World*. June 2006. p. 6. Available at http://ec.europa.eu/internal_market/copyright/docs/levy_reform/stakeholder_consultation_en.pdf. However, these figures may be too high; estimates closer to 10% should be considered more accurate.

Moreover, *the shift towards a DRM-oriented distribution of IPR protected goods might not result in a reduction of the prices paid by consumers*. DRM technology is complex, and its development requires significant investment and effort (mainly by the ICT and CE industries). Therefore, its developers would legitimately expect to collect royalties on it (either from IPR holders, from consumers, or both). Consequently an economic substitution between PCR charges and DRM royalties would occur and, even though there are significant difficulties in estimating the net quantitative effect, there is no good reason to expect the prices of CE products on which PCR is currently collected to go down. Thus *DRM would not necessarily generate savings to consumers and would mainly shift the current PCR revenue stream to the DRM industry*, which would also negatively affect the long-term incentives to creative activities and generating a mixed effect on the development of the Information Society.

Break-down of CE products prices



It must also be taken into account that DRM is still a very young technology and, consequently, its solutions are still not fully secure (often being "cracked") and generate problems of interoperability with certain consumer devices. Also, and this may be the strongest argument, DRM runs against consumers' interests, as it limits the uses that consumers can make of IPR-protected goods under the PCR system. These difficulties, together with the very limited rates of DRM penetration, confirm that DRM will remain a very poor substitute for the private copying exception plus PCR in the medium term, if it can ever be a real alternative.

A hybrid system combining DRM and PCR is also impractical. Theoretically, it is economically justifiable that PCR charges should take into account that a certain proportion of music is distributed in carriers that do not enable consumers to make private copies. Accordingly, ICT and CE products used with both DRM-protected and DRM-unprotected IPR-covered content (such as MP3 devices) should be subject to lower PCR charges, while other products that can be used only with DRM-unprotected content (such as optical discs, onto which DRM-protected content cannot be burnt insofar as DRM works properly) should continue to be subject to the same PCR charges. DRM generates the need to determine which products can be used with DRM-protected content, the extent to which they are effectively used by consumers, the relative importance of DRM-protected content vis-à-vis total distributed and stocked IPR-covered content, etc., which requires significant and costly market research. *DRM increases the information and*

enforcement costs of the system. Consequently, a partial use of DRM technologies – the situation we currently have – both generates additional costs to the PCR system and extraordinarily limits consumer freedom. Only producers of DRM-related solutions (*i.e.,* the ICT and CE industries) are better off, while all other stakeholders bear the costs of a more restrictive system of IPR protected goods distribution, as well as the increased costs of enforcement of the PCR system.

Also, DRM significantly *fails to minimise the spillover effects on the economy as a whole*. The decisions of regulatory agencies (and competition authorities, in particular) may jeopardise full adoption of DRM technologies (at least, in their current versions). This consideration needs to be taken into account in projections of DRM penetration and technical development, as the scenario is not absolutely clear in the medium and long term. As in other fields of IPR law, a neutral market approach to DRM would require the development of a common standard in order to foster interoperability (like the 3G technology in the telecommunications field). But in the current situation, the development of proprietary DRM technologies may segment the market and force both producers of content and users to choose among existing DRM technologies (as with the choice between operating systems in the PC sector). Once consumers have chosen a given DRM, they are locked in with its producer, as switching costs are very significant in these markets (as in most of the technological sectors) owing to the existence of so-called network externalities. Therefore, *allowing the development of proprietary DRM technologies restricts consumers' alternatives and limits their freedom to use the acquired content*.

Given the nascent stage of DRM technologies, the importance of the lock-in factor is likely to generate a *"war of standards"* between producers of DRM technologies. Given that there is no commonly developed standard, all producers will try to have their own DRM adopted by as much creators of content and consumers as possible, so that it becomes the *de facto* standard – excluding all competitors from a substantial part of the market –. The first possible outcome of this war is a competitive landscape clearly dominated by a single provider (probably a situation close to monopoly, as in the operating systems market), in which prices can be expected to be above the competitive level of a market with a commonly developed standard. The second plausible outcome is a fragmented competitive landscape in which consumers are locked in with DRM technologies used by relatively limited groups of users and producers of content. In this scenario, all significant network efficiencies (deriving from the use of a common technology) would be excluded and consumer utility would be significantly impaired. ICT and CE producers' position would also be second-best, as their revenue streams would be reduced to the limited number of consumers they were able to lock in.

Either way, *in default of full standardisation or interoperability of DRM technologies, the system decreases consumer choice and restricts competition both in the ICT and CE industries, and in the markets for IPR-protected goods*. In this situation, prices paid by consumers are expected to be higher and PCR system costs will also increase (for the reasons given above).

Therefore, at their current level of development and in the current environment, *DRM technologies cannot be considered a better solution than PCR, not only because of their limited penetration, technical flaws, and increased system costs, but also because of the competitive problems they generate – which are far from minimising the spillover effects on the economy as a whole*.

6.3.2. Taxation of IPR-protected goods

	Remuneration should be a function of social value of works	Costs of the system should be minimised	Who copies more should pay more	Spillovers on the economy should be minimised
Taxation of IPR-protected goods	☑	☑	☒	☒

It has also been suggested that PCR could be charged on the original copies of IPR-protected goods, rather than on the sales of ICT and CE products. This system would be tantamount to eliminating PCR and requiring authors or PCR administrators to estimate, in advance, the number of copies consumers are expected to make, in order to include, in the price of the first copy sold, an amount equal to current PCR charges times the average number of copies expected to be made – which depends on a large number of factors, both related to the relative success of the IPR-protected good and to other exogenous criteria.

By charging the compensation on an item that is not a good proxy for private copying, the PCR system would depart from the very basic principle that who copies more should pay more. Under this regime, only the "average consumer" would be paying the same amount of PCR as under the current system. *Consumers copying less than the average would be paying PCR in excess and cross-subsidizing consumers copying more than the average.* For example, if the average number of private copies done by consumers was 3.5, those consumers that did less copies (2), would be paying proportionally a higher IPR per copy than with the current PCR system. On the contrary, a consumer making more copies (5) would be paying less PCR per copy. As a result the principle "who copies more shall copy more" would not be satisfied. Therefore, this situation would reduce the economic rationality of the system, to the benefit of no group of stakeholders (except perhaps consumers with intense private copying habits).

Also, as the prices of original copies would be nominally increased (even if they would remain constant in purely economic terms), this model would indirectly encourage piracy. Fighting piracy is one of the major objectives and obligations of all stakeholders involved in the IPR-related industries. Consequently, any system that increases the risk of piracy must be particularly scrutinised. As this is an alternative system that would purport no advantage and would generate incentives to piracy, *it falls short from minimising the spillover effects on the economy as a whole*.

This system would break the economic relationship between use of IPR-protected goods and payment of compensation, generating cross-subsidies, while increasing spillover effects on the economy as a whole. Therefore, taxation of IPR-protected goods or original copies is not preferable to the current PCR system.

6.3.3. Public subsidies

	Remuneration should be a function of social value of works	Costs of the system should be minimised	Who copies more should pay more	Spillovers on the economy should be minimised
Public funding	☒	☑	☒	☑

Another alternative to the current PCR system might be the remuneration of IPR holders via public subsidies, grants, or other State funds. This system represents the closest possible version to pure public provision of IPR-protected goods. Inasmuch as IPR goods are information goods or public goods (see *supra* §3.1), this option may seem reasonable and justified (just like public security and other public goods, IPR production would be financed and controlled by the State). However, *from the perspective of the free market economy and of the generation of the proper incentives to economic growth, this alternative is not ideal*.

First, it establishes a *public intervention in the market* when determining the aggregated value of IPR-protected goods. General theory has been clear enough in pointing out how much better markets price products than public authorities do. Second, establishing a fixed value for cultural and creative activities decreases the incentives to production, as remuneration of authors becomes unrelated (or mostly unrelated) to their success in the relevant market. This may generate underproduction by more successful authors and overproduction by less successful ones. Therefore, the volume of output may remain constant, but its quality will more than probably be reduced. In the aggregate, *the system completely erases the relationship between IPR holders' remuneration and the social value of their work.*

Also, the system imposes (indirect) costs on all consumers, regardless of their degree of private copying. Therefore, criticisms made against current PCR systems on the ground that certain groups (such as public bodies or professional users) deserve exemption from PCR payment similarly apply to State subsidies. In the end, the *system departs from the principle that who copies more should pay more* and thus loses economic rationality.

To sum up, *public financing of the cultural and creative activities giving rise to the production of IPR-protected goods decreases incentives to creation inasmuch as remuneration is unrelated to the market value of creations and violates the principle that increased intensity of private copying should trigger larger compensation for IPR use. Consequently, it is not advisable on strict economic terms.*

6.3.4. Licence globale or internet flat fee charges

	Remuneration should be a function of social value of works	Costs of the system should be minimised	Who copies more should pay more	Spillovers on the economy should be minimised
Licence globale or internet flat fee charges	☑	☑	☒	☑

It has also been proposed to replace PCR charges on equipment and media with a flat fee charge on internet subscriptions. By virtue of this global licence (or *licence globale*, as it is known in France), internet users would pay a fixed charge on a specified periodic basis (monthly, most probably) in consideration of all the reproductions and uses of IPR-protected goods that they conducted by means of their internet connection during that specified time period.

This proposal is ill-designed and does not fit with the purposes of compensating right holders for private copying, for at least two reasons. Firstly, the design of the system is clearly intended to establish a compensation for peer-to-peer (P2P) exchange of files protected by IPR rights. These acts fall outside the private copy exception and constitute violations of IPR rights (*i.e.,* piracy). P2P activities generate different issues from private copying, and the fight against piracy requires its own solutions, the elaboration of which falls outside the scope of this Study.

Second, global licensing is not appropriate to compensate right holders for the increased use of their works. It is true that a part of the increased private copying involves internet connections. However, these means cover only a fraction of private copying. Therefore, global licensing cannot capture enough private copying to replace the current PCR system. *Limiting rights holders' remuneration to the perception of such internet flat fee charges would leave a substantial part of private copying uncompensated.*

Even if the flat fee approach could be redesigned to be applicable to means of private copying other than internet connections, *this system would still fall short of the principle that the one who copies more should pay more*. Flat fees designed on a temporary basis trigger payments unrelated to the intensity of the private copying activities performed during that given period of time. Therefore, consumers with different private copying behaviour would be paying the same amount in compensation to right holders. It would introduce the same problem of cross-subsidisation between consumers that we have already identified in relation to the taxation of originals alternative (*supra* § 6.3.2).

Therefore, for the abovementioned reasons, *global licensing or internet flat fee charges are not preferable to the current PCR system, from a purely economic perspective.*

6.3.5. Alternative systems of distributing IPR-protected goods

	Remuneration should be a function of social value of works	Costs of the system should be minimised	Who copies more should pay more	Spillovers on the economy should be minimised
Alternative distribution methods (Creative Commons and copyleft) do not constitute a real alternative to PCR.				

Quite as a particular phenomenon of the scientific and IT communities, some alternative systems to copyright (and, indirectly, of PCR) have been proposed. Under the copyleft and Creative Commons initiatives, authors and creators can decide to waive some of their IP rights under certain conditions. The typology of copyleft and Creative Commons licenses is large and expanding; however, they are all based on traditional copyright regulations, which they alter or customise via contractual arrangements to suit specific purposes.

In a general sense, *authors licensing their IPR-protected goods via Creative Commons and copyleft licenses do nothing different than authors exploiting their IPR in traditional and regular ways*, as they establish by contract the rights and obligations that they grant to and require from their licensees. The fact that they do not obtain specific payments in consideration of these licenses is not sufficient to place them outside the general framework of IP regulations. Therefore, "alternative" licenses cannot be considered a real alternative to the current system, but only a variation of it.

Copyleft and Creative Commons representatives claim that PCR should not be charged on equipment and media used to make private copies of the IPR-protected goods licensed on their terms, because authors who give away their IPR (provided some conditions are respected) suffer neither economic harm nor loss of revenues to be compensated or remunerated. The argument as such must be considered correct, but it makes no difference in the rationality of the whole PCR system. In setting the amounts of PCR charges, the system already takes into account the fact that some of the copies made on equipment or media subject to PCR are copies of free content (whether because it has been licensed under copyleft or Creative Commons agreements, or because it is not susceptible of IP protection at all). In this sense, *Creative Commons and copyleft content is no different than personal documents or other IPR-free content susceptible of being copied into carriers on which PCR is charged.*

In any case, copyleft and Creative Commons licensing is most intense in the software and other related scientific fields, and is largely marginal in other sectors of the cultural and creative industries. Although approximate percentages are hard to estimate, it seems that these phenomena are relatively unimportant in terms of total content delivered.

6.4. General comparison between PCR and its modifications or alternatives

As we have seen in the previous subsections, the modifications and apparently alternative systems to the private copying exception and the corresponding PCR that are currently in place in most EU Member States may successfully overcome some of the shortages of the system but, most noteworthy, have their own drawbacks and potential spillovers.

It might be true that no perfect system of management of IPR exists or is available in practical terms but, when considered carefully, protection of intellectual property via IPR and the establishment of the PCR to compensate authors for the private copying activities that consumers perform seem to be the best possible alternative. The chart below summarises the arguments above and clarifies the advantages and disadvantages of each of the proposed modifications or alternatives to the PCR system:

Modifications or Alternatives Proposed	Positive Effects and Advantages	Negative Effects and Drawbacks	Net Effect
PCR caps	May guarantee a certain proportionality between the revenues of the ICT & CE industries and the IPR sector May contribute to keep downward pressure on ICT and CE prices	Is unrelated to the economics of IP and at odds with the structure of production costs Expropriates value of IPR and decreases incentives to cultural and creative activities across time In the medium and long run, may decelerate the creative industries and reduce consumer welfare	Negative, as it generates perverse incentives to cultural and creative activities by making creators' revenues dependent on pricing decisions by the ICT and CE industries. Can negatively affect economic growth in the long run
PCR exemptions	Eliminates taxation of copies of IPR-free content	Increases the information, transaction, and enforcement costs of the system	Negative, as it increases the general costs of the system without guaranteeing that the beneficiaries of the exemption are better off when taking into account the additional (informative and transaction) costs

Modifications or Alternatives Proposed	Positive Effects and Advantages	Negative Effects and Drawbacks	Net Effect
DRM	Eliminates taxation of copies of IPR-free content	Its very limited penetration and technological flaws make of it a very imperfect substitutive of the current PCR system Restricts consumer freedom and the possibilities of secondary uses of IPR-protected content Raises significant economic issues still to be resolved (and scrutinised by competition authorities) that may jeopardise its effective adoption in the future If co-existing with PCR, increases the costs of the PCR system to the exclusive advantage of the DRM industry	Negative, as it would reduce consumer welfare. Also, in the absence of standardisation or interoperability of the DRM technology, may give rise to a nearly monopolistic market, or to a market that precludes network economies. In either case, would deprive consumers of some of the advantages of the current system.
Taxation on originals of IPR-protected goods	Eliminates taxation of copies of IPR-free content	Increases uncertainty and complexity of pricing strategies of IPR holders Departs from the principle that "who copies more should pay more," generating cross-subsidies between different groups of consumers Generates incentives to piracy	Negative, as it increases the costs of the system and generates a very significant externality in terms of likelihood of piracy, without improving the position of any stakeholder (other than intensive private copiers)
Public Funding	Eliminates information and transaction costs of the system, as public goods are financed with public funds	Unlinks IP remuneration from its market value, so incentives are diminished Generates over- and under-production that may lower the quality of output Departs from the principle that "who copies more should pay more"	Negative, as it replaces free market principles with public intervention in a way that may lower the quality of IPR products and, in the long run, induce stagnation of the cultural and creative sectors due to lack of incentives
Licence globale or internet flat fee charges	None remarkable	Does not fit with the purposes of compensating right holders for private copying Leaves a substantial part of private copying uncompensated	Negative, as it mixes remedies to piracy with compensation for private copying and still falls short of the principle that the one who copies more should pay more

Modifications or Alternatives Proposed	Positive Effects and Advantages	Negative Effects and Drawbacks	Net Effect
Alternative distribution methods (Creative Commons and copyleft)			Does not differ in principle from traditional and regular ways of exploiting IPR. Constitutes no real alternative to the current system and is relatively insignificant outside the software sector

Source: own elaboration.

It has also been mentioned that the co-existence of a variety of systems (such as PCR and DRM) sacrifices a significant part of the main economic advantages of the PCR system, which are linked to its straightforwardness, general and homogeneous application, and reduced information, transaction, and enforcement costs. Introducing exceptions dissolves such efficiencies and reduces aggregate welfare – most probably, without any economic agent being able to fully capture the extra costs as benefits or rents – so it results in sub-optimal situations in which aggregate welfare is affected. On balance, we consider *PCR as the preferable system of IPR protection and promotion of economic growth in the cultural and creative industries.*

7. THE PCR SYSTEM AND THE EU INTERNAL MARKET

The diversity of PCR regulations within the EU has been considered a barrier to the development of the internal market. The underlying argument is that PCR is not fully harmonised and, consequently, there are duties on imports of devices and carriers that are subject to PCR payments. These allegedly impose a higher burden on imports than on domestic sales of ICT and CE equipment and therefore pose a significant obstacle to the free movement of goods, particularly IPR-protected goods, established by the EC Treaty. Differences in PCR regulation have been attacked as measures having an effect equivalent to quantitative restrictions and running against the free movement of goods established by the EC Treaty It has been consequently proposed to replace current PCR charges with other means of remuneration to IPR holders (which have, however, not been specified), in order to eliminate this barrier to the development of the internal market[31].

No consideration whatsoever has been given to the fact that, because of the special nature of IPR, the EC Treaty establishes particular exceptions to the free movement of goods when industrial and commercial property is involved – and, according to European Court of Justice case law, this concept covers IPR[32]. From an economic perspective, the need to take into account the special nature of IPR is crucial, as suppression of certain IPR regulations (such as PCR) on the grounds of promoting the development of the internal market may result in an insufficient protection and a consequent devaluation of IPR that, in the end, would result in a slowdown in economic growth that would jeopardize the development of a real internal market for all IPR protected goods and other related industries (such as ICT and CE) (*supra* §3). Doubtless, the development of the internal market will bring significant economic advantages and will foster growth and welfare in the EU[33]. And doubtless, numerous regulations currently in place limit the development of the internal market. Therefore, a special effort to abrogate these unnecessary

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[31] If such a substitution should occur, from a purely economic perspective the benefits deriving from the elimination of the alleged barriers to internal trade ought to outweigh the inefficiencies created by the alternative system – which, as we have seen (*supra* §6), are likely to be quite significant.

[32] From a strictly legal point of view, it is at least arguable that the important function of PCR in safeguarding the economic value of IPR (i.e. their specific subject-matter or essential function, depending on whether we focus on distribution or performance rights, as declared by the European Court of Justice) constitutes sufficient grounds for exempting it from the prohibition established by Article 28 of the EC Treaty, under the provisions of Article 30.. The importance of PCR to guaranteeing the economic content of IPR in the digital environment has been already shown (*supra* §3). This key role of PCR in keeping the right incentives to the development of the content and creative industries in the Information Society satisfies the proportionality test. The PCR system design – which imposes PCR payments on goods objectively defined, regardless of their country of origin – also satisfies the non-discrimination test. Therefore, PCR meets the conditions for the application of the exemption established in Art. 30 of the EC Treaty. Even if these legal arguments exceed the scope of the present report and require a more detailed and refined analysis, they run along the same lines as the present economic analysis.

[33] On the positive impact of a reduction of the barriers to trade in services to the growth of the EU economy, see Copenhagen Economics. *Economic Assessment of the Barriers to the Internal market for Services.* January 2005. Available at http://ec.europa.eu/internal_market/services/docs/services-dir/studies/2005-01-cph-study_en.pdf.

and welfare-reducing regulations constitutes one of the main objectives of the European Commission.

However, certain types of trade restrictions generate higher economic efficiencies and, therefore, produce a net positive effect. These should be considered '*instrumental restrictions*' and, because of their net positive effects on the internal market and the European economy, should be upheld and protected by public bodies. It is true that reducing the barriers to trade in goods and services will generally have a positive effect and, therefore, regulations imposing unnecessary barriers to the free movement of goods shall be eliminated. However, where regulations serve a sound economic purpose and promote the economic activity and growth in member states, ('*instrumental restrictions*') any decision of regulatory harmonization that may destroy those incentives would be raising the economic difficulties associated to the development of the internal market, instead of reducing the barriers to the same. A rigid approach to deregulation that abrogated all '*instrumental restrictions*' would run counter to the final objective of fostering growth of the European economy and developing the internal market. Pushing for a complete harmonisation (or, worse, elimination) of PCR would be a case of "harmonisation for its own sake".

Even if the development of the internal market is expected to bring about a certain degree of price homogenisation in all goods and services across the European Union (the so-called *law of one price*), the converse does not necessarily hold. Setting PCR to be equal in all EU countries – on the grounds that it would foster the internal market for ICT and CE products – would not necessarily translate into significant development or homogenisation of the internal market for creative works, ICT, or CE. On the contrary, as basic pricing theory explains, price discrimination according to the level of rent and consumers' willingness to pay expands total supply in the market – inasmuch as it allows low-income and/or low-valuation consumers to be charged lower prices than high-income and/or high-valuation consumers for the same good or service. Therefore, imposing a uniform price across the EU, regardless of consumers' rent level and their willingness to pay (determined, partially, by their socio-cultural background) would distort the current market equilibrium. Indeed, homogenising PCR amounts at a community level might generate a perverse incentive to the development of the internal market. Moreover, it is true that reducing the barriers to trade in goods and services will generally have a positive effect and, therefore, regulations imposing unnecessary barriers to the free movement of goods shall be eliminated. However, where regulations serve a sound economic purpose and promote the economic activity and growth in Member States, any decision of regulatory harmonization that may destroy those incentives would be raising the economic difficulties associated to the development of the internal market, instead of reducing the barriers to the same.

As we have already mentioned, at the bottom line, PCR is under detailed scrutiny simply and exclusively because of its lack of harmonization across the EU – not because in and for itself lacks economic justification or imposes an excessive economic burden on the ICT and CE industries (*supra* §3) –. However, PCR is not the only aspect of IPR regulation that is not harmonised across the EU and, therefore, does not display significant differences if compared with other IPR institutions.

National PCR regulations do differ across the EU, particularly on the carriers and devices subject to PCR payments and on the amounts collected. However, these differences are justified by particular economic and socio-cultural traits of different EU Member States, and mechanisms designed to protect these differences avoid significant negative economic effects. The economic efficiencies of the PCR system and its benefits to the development of the European economy clearly outweigh any inefficiency derived from the obstacles that it may create to the internal movement of ICT and CE products. Therefore, PCR cannot be considered a 'net' barrier to the free movement of goods.

This section reviews the existing differences in PCR regulation among the EU Member States, identifying their common ground and their national particularities (§ 7.1). It then outlines the main economic and socio-cultural differences between Member States that determine, at least to a certain extent, the divergence in PCR regulations (§ 7.2). Later, we address the impact of diverging regulations on the internal trade in ICT and CE products, the fact that PCR is charged on imports of those products (which is claimed to constitute a discrimination vis-à-vis domestic sales), the circumstance that the importer is generally subject to self-reporting obligations, and the risk of double-payment of PCR in certain instances (§ 7.3). We conclude that, in the absence of risks of double-payment of PCR, the existence of diverging PCR regulations across the EU Member States cannot be considered a barrier to the free movement of ICT and CE products whose suppression is justified on economic grounds (§ 7.4).

7.1. Differences and common trends in the PCR regime across the EU

As Stichting de Thuiskopie recently reported, PCR regulations differ across the EU because EU Law has not yet harmonised intellectual property regulations up to this level of detail. In fact, Directive 2001/29/EC of the European Parliament and of the Council of 22 May 2001, on the harmonization of certain aspects of copyright and related rights in the information society, left to the discretion of Member States the possibility of establishing a private copying exception and the corresponding PCR in their national regulations. Most Member States have made use of this possibility and have regulated PCR (or had already put this system in place before the approval of Directive 2001/29/EC and have maintained or extended it to digital devices and carriers). Therefore, the establishment of a PCR system has been the preferred alternative in most Member States and, therefore, the private copying exception plus the corresponding PCR is the generally accepted device to compensate rights holders for lost revenues due to private copying;

even if Member States have adjusted PCR regulation to their particular economic and social realities, creating certain differences amongst them.

In the EU25, only Cyprus, Ireland, Luxembourg, Malta, and the United Kingdom lacked PCR regulations. The system of private copying exception plus PCR is thus generally accepted, even though the Directive left room for alternative mechanisms of remuneration or compensation to rights holders (which have not been developed by any EU25 legislature so far). Most Member States share the view that PCR is an adequate response to private copying, but they have had to adjust PCR regulations to their particular economic and social realities. Therefore, differences in PCR are no more (and no less) than a reflection of differences in Member States' socio-economic conditions. And, as such, harmonisation of PCR regulations cannot occur before the underlying socio-economic determinants are also sufficiently harmonised. In the next subsection, we turn to the analysis of such determinants.

Table 15: Private Copy Remuneration charges in the EU in 2005

COUNTRY	Data CD-r	DVD-r	DVD+r	mp3 player (256MB)	HD DVD-rec.
Austria	0,34	0,54	0,54	3,-	0,27 (2,35gb)
Belgium	0,12	0,59	0,59	-	-
Bulgaria	n/a	n/a	n/a	n/a	n/a
Cyprus	-	-	-	-	-
Czech Republic	4%	4%	4%	3%	3%
Denmark	0,25	1,34	1,34	-	-
Estonia	n/a	n/a	n/a	n/a	n/a
Finland	0,20	0,60	0,60	1,71	15,- (80gb)
France	0,35	1,27	1,27	2,-	10,- (40gb)
Germany	0,07	0,17	0,17	2,56	18,42 (80gb)
Greece	6%	6%	6%	6%	6%
Hungary	0,19	0,46	0,46	4,14	-
Ireland	-	-	-	-	-
Italy	0,25	0,58	0,58	3%	3%
Latvia	0,14	0,28	0,28	1,42	1,42 (80gb)
Lithuania	6%	6%	6%	-	-
Luxembourg	-	-	-	-	-
Malta	-	-	-	-	-
Netherlands	0,14	0,60	0,40	-	-
Poland	3%	3%	3%	3%	3%
Portugal	0,14	0,14	0,14	-	-
Romania	n/a	n/a	n/a	n/a	n/a
Slovakia	6%	6%	6%	3%	3%
Slovenia	n/a	n/a	n/a	n/a	n/a
Spain	0,24	1,20	1,20	0,6	6,61 (80gb)
Sweden	0,11	0,36	0,36	0,11	31,11 (80gb)
United Kingdom	-	-	-	-	-

Source: Stichting de Thuiskopie (2006). n/a: No information available for these countries. All figures in Euros, except in the case of percentages of final price, where indicated. Although the 2007 Report is available, we use 2005 figures to keep coherence with other data used in other sections of this Study. In any case, most countries have not significantly altered the level of PCR.

PCR charges on certain carriers (such as CDs and DVDs) differ across countries; also, some countries have already introduced PCR on digital audio (MP3) and video (DVD-recorder) devices, while others have not yet extended PCR to the latter. Some countries impose *ad valorem* PCR (*supra* § 6.2.1), while others have set fixed amounts on each device or carrier. The absolute values of PCR also vary from country to country. If no measure were implemented to adjust the level of PCR paid in the country of origin when such products were introduced into other EU countries, there would be an economic incentive to generate 'grey imports' from countries with lower PCR rates to countries with higher PCR rates. In that case, the PCR revenues of IPR holders not only be substantially reduced, but more fundamentally, would become nearly unrelated both to the intensity of the consumer's private copying and to the consumer's level of rent and willingness to pay. Most of the economic principles on which PCR is based and nearly all the criteria that are taken into account when setting the amounts due to IPR holders would be negated. The system would lose its economic rationality and, consequently, incentives to cultural and creative activities would be impaired (*infra* § 7.3).

Until there is a harmonisation of both socio-economic factors and regulatory regimes, it is important to prevent forum shopping that may render the PCR differences useless, to the detriment of the European economy as a whole. It makes economic sense to require payment of the PCR set at the country of destination, rather than the country of origin. As long as deductibility or refund of the PCR paid at origin is guaranteed, charging PCR at import of goods cannot be considered a barrier to the free movement of goods within the internal market (see *infra* § 7.4).

7.2. Differences in economic and socio–cultural conditions across the EU

Even if a significant degree of economic convergence can be identified in all EU countries – particularly in those that have joined the EU27 recently and have had to comply with very strict macroeconomic objectives – there are still significant gaps in economic development between the several European economies. With a proper implementation of community policies, these differences should be reduced and, ideally, completely erased in the future. However, they need to be progressively reduced by natural economic development (for which the proper incentives need to be created), and cannot be diluted simply through regulations of any kind (whether at the European or the national level).

Table 16 shows significant differences in absolute terms in GDP per capita, which ranges from close to 30,000 Euros a year for the most advanced EU economies to less than 2,000 Euros a year for the two youngest members of the EU27. Prices in countries with such differences in GDP per capita are likely to differ significantly. It should also be taken into account that prices are determined not only by disparities in economic factors (such as rent levels, development of the welfare state, etc.), but also by social and cultural factors (such as values or social conventions that determine consumers' willingness to pay for certain goods or services).

Table 16: Gross Domestic Product per capita in the EU 2003 – 2007

	2003	2004	2005	2006	2007 (f)
Austria	26,800	27,300	27,600	28,400	29,000
Belgium	24,800	25,400	25,500	26,300	26,800
Bulgaria	1,400	1,500	1,600	1,700	1,800
Cyprus	12,700	13,000	13,200	13,400	13,700
Czech Republic	4,800	5,000	5,300	5,600	5,900
Denmark	30,200	30,700	31,600	32,500	33,200
Estonia	3,600	3,800	4,300	4,800	5,200
Finland	25,700	26,600	27,300	28,600	29,500
France	23,200	23,500	23,700	24,100	24,500
Germany	26,100	26,400	26,700	27,400	27,700
Greece	11,000	11,500	11,900	12,400	12,800
Hungary	4,600	4,900	5,100	5,300	5,400
Ireland	23,900	24,500	25,300	26,000	26,800
Italy	16,800	16,800	16,700	17,000	17,100
Latvia	2,600	2,900	3,200	3,600	3,900
Lithuania	2,300	2,400	2,700	2,900	3,100
Luxembourg	51,000	52,500	54,100	56,900	59,100
Malta	8,600	8,600	8,800	9,000	9,100
Netherlands	24,700	25,100	25,400	26,100	26,800
Poland	3,900	4,100	4,200	4,500	4,700
Portugal	10,400	10,500	10,500	10,500	10,600
Romania	1,400	1,500	1,600	1,700	1,800
Slovakia	3,700	3,900	4,100	4,500	4,800
Slovenia	10,500	11,000	11,400	11,900	12,400
Spain	14,600	14,800	15,100	15,400	15,800
Sweden	26,300	27,300	27,900	29,000	29,900
United Kingdom	18,300	18,800	19,000	19,500	19,900

Source: Eurostat. Gross domestic product at market prices. Euro per inhabitant (at 1995 prices and exchange rates). (f) Forecast.

In the particular case of PCR, differences in private copying activities associated to diverging national consumer behaviour trends are also to be taken into account in order to analyse the spread of PCR amounts. It is very difficult to estimate the actual level of private copying activities in a particular country. However, if consumption of other goods or services displays different patterns across diverse economies, there is no good reason to assume that private copying will be conducted by consumers with the same intensity in all countries[34] or in all Member States. It follows that PCR do not necessarily need to be homogeneous across the EU27 until there is a sufficient degree of convergence in socio-cultural factors (as well as economic indicators).

[34] For instance, it has been recently reported that "*One in two Germans above the age of ten burns CDs or DVDs. Since figures were first analysed in 1999 the number of people burning CDs or DVDs has increased almost fourfold from 7.9 million to 31.4 million*". See IFPI News, "Music industry sales figures in Germany", 30 March 2007. Available at http://www.ifpi.org/content/section_news/20070330.html. These figures show a strong contrast with the private copying habits of Canadians. "*In the past six months, three in ten have copied music onto a blank or reusable CD for personal use, two in ten have copied to a portable MP3 player or iPod, and fewer than one in ten have copied onto an audio cassette*". See Environics Research Group, *Public Opinion on the Levy on Blank CDs and Other Music Recording Media*, July 2006. Available at http://cpcc.ca/english/pdf/FC62-CPCC-Omnibus-Report-FINAL-English.pdf.

7.3. Impact of the differences in PCR regulation on the internal market for ICT and CE products: the need to make PCR applicable at destination

It has already been stressed that PCR shall be set according to different factors that necessarily relate to the particular characteristics of a given economy (level of rents, consumers' willingness to pay for IPR protected goods, intensity of the private copying activities, etc). Therefore, a device or carrier sold in a given market shall be subject to the PCR set according to the characteristics of that given market (collection of PCR at destination principle). This means that *ICT and CE products should be subject to the level of PCR set according to the peculiarities of the economy in which the buyer is going to use the device or carrier*. And payment of PCR should be made to the PCR administrator of that particular country. In the absence of harmonization, this requires adjustments of the PCR system in case of intra-community sales of ICT and CE products. *Otherwise*, if no compensation on the level of PCR charged on the devices and carriers sold in a given market was imposed; *several negative economic effects of substantial importance would appear*:

i) In-flows of devices and carriers subject to relatively lower PCR in their countries of origin would under-remunerate IPR holders residing in the country of import and over-remunerate IPR holders residing in the country of export, and would evaporate the economic rationale of the PCR system – as rights holders would be remunerated for acts of private copying performed in a different territory and maybe on a different repertory, and as consumers would be paying a level of PCR completely unrelated to their level of rent, their willingness to pay, and their degree of private copying. This effect would make the system depart both from the principle that remuneration of rights holders should be a function of the social value of their work (as consumers in one country would be paying a PCR calculated on the social value given to IPR in a different country), and from the principle that distortions and spillovers on the economy should be minimised.

(ii) In-flows of devices and carriers subject to relatively higher PCR in their countries of origin would either be completely precluded, or subject to unfavourable economic conditions that would be fully paid by the importer. Consumer choice would be reduced and the prices of domestic ICT and CE products would probably increase (because of this partial shielding of the domestic market against external competition). And these price increases would probably also reduce sales and therefore the revenues of IPR holders. Again, distortions and spillovers on the economy would not be appropriately minimised.

(iii) Incentives to forum shopping and non-compliance with PCR regulations would be generated or increased (at least in those countries where PCR amounts where relatively higher). In short, 'grey imports' would be encouraged and enforcement costs of the system would increase, damaging both IPR holders and law-abiding competitors in the affected ICT and CE markets. Thus the system would not minimise information, transaction, and enforcement costs.

An effective mechanism for collecting PCR at destination is therefore indispensable. This mechanism, as it is currently configured in most EU Member States, among other formalities requires (i) PCR to be collected or charged at import of the devices or carriers subject to PCR payments; (ii) the importer to self-report sales in the country of destination; and (iii) the PCR paid

at origin to be eventually deductible or refunded (in order to avoid double payments of PCR). These requirements have been subject to strong criticism and considered some of the most problematic aspects of the existing PCR system. In fact, they have been stressed as the main arguments favouring the abolition or, at least, the harmonization of the PCR mechanism in the EU (with the final aim of promoting the development of the internal market for ICT and CE products). We will focus at each of them in turn, in order to analyze whether they can be considered substantial barriers to trade.

However, it must be stressed that current mechanisms to subject cross-border sales of CE products to the PCR applicable at the country of destination might be insufficient and still give room to *improvements in the legal system in order to foster the application of this "PCR charge at destination" principle*, which would contribute to increase the efficiency of the current system, especially in terms of reduction of information and enforcement costs (see *supra* § 6.1)[35].

7.3.1. Collection of PCR charges at import

As we have just pointed out, collection of PCR at origin (*i.e.* establishing an exemption of PCR charges on imported goods) would generate significant negative economic effects. Therefore, the only possibility to design an effective PCR mechanism is to collect PCR charges at destination. This implies that, for those goods not manufactured domestically in the country of sale, the collection of PCR must be undertaken at import of those goods.

The burden of satisfying PCR charges on the *first sale* of the ICT and CE goods *within a given market* affects equally domestic manufacturers and importers of these goods, so that they all compete on an equal footing in selling the products to intermediaries or to final consumers in that market. There is no basis for the argument that charging PCR at import discriminates against importers or imposes any significant economic barrier to imports, as the first sale of an ICT or CE product is equally subject to PCR payment, regardless of the origin of the product.

Therefore*, in and for itself, the fact that importers of ICT or CE products must pay PCR at import of those products (i.e. at destination) does not impose any significant economic barrier to the import of those goods, nor to the free movement of the same.*

7.3.2. Self-reporting obligations placed on the importer

Since the importer must pay the PCR charge, he or she must also report sales to the PCR administrator of the destination country. It must be acknowledged that this administrative obligation imposes an additional burden on the importer. But this is unavoidable; it is hard to see how any third party could be in a better position than the importer herself to report the information. It must be acknowledged that this administrative obligation generates an additional

[35] Along the same lines, GESAC's Private Copy Task Force has come up with some proposals that may improve the current system and render the PCR charge at destination principle more effective. The proposals are well-oriented in terms of reduction of the enforcement and information costs of the system. However, the proposals are complex and mainly of a legal nature and, therefore, require an analysis and debate that falls outside of the scope of this Study. See GESAC Private Copy Task Force, *GESAC proposals for the adequate application of remuneration schemes for private copying in the Internal Market*. Brussels, 20th July 2007. Available at www.gesac.org.

burden to the importer. But it must be equally acknowledged that an obligation to report sales data on a periodic basis shall not be considered disproportionately burdensome to the importer, especially for those with larger sales figures. When the cost of reporting is split up over a large volume of products, the economic impact would tend to be negligible.

7.3.3. Deductibility / refunding of the PCR paid at origin

Double collection of PCR on internal imports of devices and carriers within the EU has been considered a threat to the development of the internal market for ICT and CE products—as, indeed, it might be, if it were common. Therefore, a mechanism for refunding of the amounts paid at origin or making them deductible by the importer (at or after payment of the PCR at destination) is key in avoiding unwanted restrictive effects.

However, most Member States with a PCR system in place have already expressly exempted from the payment of PCR at origin any ICT and CE goods intended to be exported. Therefore, the risk of double collection of PCR is very limited as long as exporters are aware of the exemption and adequately report their purchases as being for export purposes. Even if the sales were initially misreported and PCR were paid at origin, the exporter would in most cases be able to regularise the situation in following reports and recover or be compensated for the amounts unduly paid. In any case, the consequences of incorrectly reporting sales ought to be assumed by the party incorrectly reporting them, and not borne or compensated by the system as a whole.

Table 17: Existence of PCR Express Export Exemption in the 20 Member States that had PCR in place in 2005

AU	BE	CZ	DE	DK	EE	EL	ES	FI	FR	HU	IT	LV	LT	NL	PL	PT	SK	SI	SE
X	X	X	X	X	n/a		X	X	X	X	X	X	X	X	X	X		X	X

Source: own elaboration, based in Stichting de Thuiskopie (2006). n/a indicates that there was no information available for these countries in the report.

It must be acknowledged that there is a residual risk of double collection on imports originating in the few EU Member States that have not expressly exempted exports (regulated the export exemption (*i.e.* Greece and Slovakia). In these cases, amendments to the applicable laws to make such an exception are probably needed. In any case, the absence of this regime in these countries (given their relative economic importance vis-à-vis the other Member States) does not seem to pose a significant barrier to the development of the internal market for ICT and CE products.

7.4. Diverging PCR regulations across the EU Member States cannot be considered a barrier to the free movement of ICT and CE products whose suppression is justified on economic grounds

We have shown above that differences in PCR regulations are justified by diverse economic and socio-cultural particularities of the Member States that require a separate treatment of PCR in each of their economies. Divergences in the main criteria used to set the level of PCR (such as the level of rent, consumers' willingness to pay, or private copying intensity) require the amounts charged to be adjusted for each particular market. Otherwise, the economic rationale of the PCR system would be lost, its effectiveness jeopardised, the value of IPR reduced, and, ultimately, the incentives to cultural and creative activities diminished – with a corresponding threat to the growth of IPR-related sectors and, particularly, of the ICT and CE industries. Therefore, harmonisation of PCR regulations across Europe is not advisable, given the current stage of development of the internal market.

We have also shown that, in themselves, these diverging systems do not constitute a barrier to the free movement of ICT and CE goods in the EU internal market. In their current design, PCR mechanisms provide equal treatment to domestic sales and imports of ICT and CE products. Further, although it may be true that certain ancillary obligations imposed on importers (mainly, the self-reporting obligation) generate red tape costs, their economic impact does not seem to be significant (at least for importers of a certain size). In any case, the administrative burden is proportionate to the protection of IPR in the internal market.

Furthermore, *not charging PCR at the level set in the country of sale (particularly in those countries that impose relatively higher charges) would generate significant negative economic effects, such as i) distortions in the remuneration of IPR holders in both the country of origin and the country of destination, (ii) closure of markets with relatively low PCR to producers or importers from countries with relatively high PCR charges, and (iii) generation of incentives to 'grey imports' and a consequent increase in the enforcement costs of the system, at the expense both of IPR holders and of compliant competitors in the affected ICT and CE markets.*

For these reasons, even if PCR can be formally seen as a restriction on the free movement of goods, it qualifies as an '*instrumental restriction*', in the sense that it generates a net contribution to the development of the European economy (through increased production of IPR-protected goods) and, in the end, to the development of the internal market. Under current conditions, there is no economic justification for suppressing or completely harmonising the existing PCR mechanisms. Perhaps the main adjustment required by the current system is introducing an express exemption from PCR charges for ICT and CE products aimed at export in those countries that currently lack it. Also, current mechanisms to subject cross-border sales of CE products to the PCR applicable at the country of destination might be insufficient and still give room to improvements in the legal system in order to foster the application of this "PCR charge at destination" principle, which would contribute to increase the efficiency of the current system, especially in terms of reduction of information and enforcement costs.

8. FINAL REMARKS AND CONCLUSIONS

Technological changes have affected the traditional structure of Intellectual Property ...

The technological changes that led to the development of the so-called Information Society have undoubtedly brought up very significant changes across economic sectors and its impact has been particularly significant in the consumer electronics, telecommunications, cultural and entertainment sectors. The technological developments and innovation have also brought forward some very relevant economic issues. Particularly, the impact of the underlying 'technological revolution' on fundamental institutions such as property rights still requires economic analysis. By their very nature, Intellectual Property Rights (IPR) are directly affected by the technological shift, and changes in remuneration schemes and protection devices may be required.

... but have not altered their economic rationale.

Indeed, IPR are generally found in need for an adaptation to the new digital environment if they are to continue bringing significant advantages in the Information Society. Changes on the previous design of IPR infrastructure of rights, remuneration schemes and protection devices may be required. But digitalisation has not generated a situation in which IPR shall be completely erased, nor shall new mechanisms to promote and protect cultural and creative activities be created from scratch.

IPR institutions and regulations are intended to generate economic incentives for creating information goods that otherwise would not be produced in amounts optimal for society as a whole. In general, these regulations grant creators exclusive control over their works, except for copies made within the user's "private sphere." And most IPR regulations have also attempted to compensate the authors for this limitation of their control, through private copy remuneration (or PCR), a fee charged on the acquisition of devices and carriers that allow private copying. This system implicitly recognises that even the protection of the consumer's "private sphere" does not entirely trump protection of the creator's rights to his or her intellectual property.

The system of private copy exception plus PCR, further than enhancing consumer welfare through increased freedom to use IPR protected goods, reduces the aggregate transaction and enforcement costs of the IPR infrastructure and, consequently, increases social welfare. PCR re-establishes the economic equilibrium between producers and consumers of IPR protected goods and establishes a fairer distribution of the costs and benefits of the IPR system.

Digitalisation requires an adaptation of the system of Intellectual Property Rights ...

The proliferation of types of electronic devices that are capable of storing and playing IPR-protected content has increased the uses and therefore the value of that content. At the same time, however, the high quality and low cost of copying digital content has substantially increased private copying, so that, without an effective system of PCR charges on digital electronic devices, none of this increased value would go to content creators.

... with major implications for the development of the Information Society.

Creation of IPR-protected goods is one of the most significant drivers of economic growth for advanced economies. In 2003, the turnover of the cultural and creative sector in Europe amounted to € 654.3 billion, 2.6% of Europe's GDP. The sector's accumulated growth in the period 1999 – 2003 was 12.3%. And this is not a European peculiarity.

The complementarity between Intellectual Property and Consumer Electronics is fundamental ...

In particular, the use of protected content is key to the development of the information and communications technologies (ICT) and consumer electronics (CE) industries. Without desirable content, there is no demand for storage and playing devices.

... but currently altered by the lack of adjustment of the IPR system to the digital environment.

The development of this "bundle" of complementary industries has recently displayed opposing trends that run against economic intuition. In Western Europe, the digital consumer electronics segment of the ICT industry has grown dramatically, while the music industry has been continually losing revenues. The gap between CE sales growth (+ 114%) and music industry revenues decrease (-17%) multiplied at least by three during the period 2002 – 2005.

The 'digital adaptation' of the PCR system should reverse the unbalanced development of IPR and CE industries ...

The obvious reason underlying the imposition of PCR on the sales of CE products is that, because these devices and carriers provide consumers with very refined tools for copying, they are a suitable proxy for the level of copying. Without PCR, all of the increased value that this copying signifies would be appropriated by consumers and by the CE industry. Thus PCR should be seen not only as a way to compensate IPR holders for the greatly increased use of their work, but also as a way to balance the developments of the ICT and CE industries with the development of the content (particularly music) industry.

... and will generate positive effects on total welfare and economic growth.

Any economic analysis of the impact of the PCR charges needs to take into account the positive effect, both for the CE and the ICT industries, of more and better content for digital devices. From a purely static point of view, each 1 euro collected under the PCR system causes a decrease in welfare for consumers and producers of 1.08 euros – which is far from the 2:1 proportion previously reported and indicates a very moderate short-term effect of PCR on total welfare, of around 8%.

We also find that the incentives put in place by the PCR system should translate into an increase in the stock of music titles of around 1.5 percent in a period of 25 years. This increase would in turn compensate for the short-term negative effects on the joint welfare of consumers and producers of CE products, increasing total welfare by around 2.8 percent in a period of 25 years, although most of the positive effects would already be in place after a period of 5 years. In sum, the economic impact of the PCR system is not negative and could increase total welfare.

The 'digital adaptation' should follow four basic principles ...

Full monitoring of the use of information goods is economically unfeasible and socially undesirable. But some of the underlying economic principles of full monitoring device can be defined and used to evaluate alternative systems:

- *Remuneration of right holders should be a function of the social value of their work*
- *Information, transaction, and enforcement costs of the system should be minimised*
- *Who copies more should pay more*
- *Distortions and spillovers on the economy should be minimised*

Some trade-offs between these principles are required, and ranking them is virtually impossible, so they must be used cumulatively.

... and not depart much from the current PCR system "as is", ...

Current PCR schemes balance the interests of IPR holders, manufacturers and importers of ICT and CE products, and consumers. PCR is not completely free of defects, but its net effect is positive.

... as modifications of the system reduce its economic efficiency ...

Capping PCR charges would run against economic rationality by disregarding the fact that IPR-protected goods and consumer electronics goods are subject to different production technologies with different effects of scale and learning curves. Since the actual social value of intellectual property cannot be capped, capping the remuneration of authors would run against the principle that remuneration of authors should be a function of social value of their works. Also, capping PCR collection would not minimise distortions and spillovers on the economy as a whole.

Exempting certain consumers from PCR payment would vastly increase the system's information, transaction, and enforcement costs, both to the intended beneficiaries of the exemption and to the PCR administrators.

... and no proposed alternative is superior to the current PCR devices.

Digital Rights Management is far from assuring full coverage of all IPR-protected goods, and will remain so for the foreseeable future, especially as it is encountering strong consumer resistance. The current combination of DRM with the PCR system requires the level of PCR charges to be adjusted in light of the actual level of music distributed under DRM protection, increasing the information and enforcement costs of the system. Finally, DRM has serious spillover effects on competition, and is likely to lead either to a near-monopolistic situation or to fragmented markets with reduced network economies.

Taxation of original copies or original carriers of IPR-protected goods, rather than CE devices (which are better proxies for private copying), would generate economically irrational cross-subsidies among consumers, benefiting only those who make the most private copies. It would also encourage piracy.

Public subsidies or State funds. Pure public financing of intellectual property production divorces remuneration from the market value of creations.

Global licensing of internet flat fees. This system is designed to tackle piracy, not private copying. Also, it would erase any relationship between private copying intensity and rights holders' remuneration.

Alternative systems of IPR distribution. Copyleft and creative commons licenses are largely limited to the scientific and IT communities, and are in any case merely variationsQuite as a particular phenomenon of the scientific and IT communities, some alternative systems to copyright (and, indirectly, of PCR) have been proposed. However, copyleft and creative commons are based on traditional copyright regulations.

PCR is not a significant barrier to the development of the internal market.

Even if PCR can be seen as restricting trade, it qualifies as an '*instrumental restriction*' that generates a net contribution to the development of the European economy. Differences in PCR are justified by particular economic and socio-cultural traits of different EU member states, such as level of rent, consumers' willingness to pay, and private copying intensity. Adjusting the PCR charged to the level set in the country of sale avoids significant negative economic effects, while the additional obligations imposed on economic agents (charges at import and self-reporting duties) are not unbearable and, in most cases, not particularly significant in economic terms. However, there is still room for practical improvements in the legal system that would contribute to reduce information and enforcement costs.

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10. LIST OF ABBREVIATIONS USED

CE	Consumer electronics
CE industry	Consumer electronics industry
CE products	Consumer electronic products
ICT	Information and Communications Technology
ICT industry	Information and Communications Technology industry
ICT products	Information and Communications Technology products
IPR	Intellectual Property Rights
IPR holders	Owners of Intellectual Property Rights
IPR protected goods/works	Intellectual works or creations covered by IPR protection; given the scope of the Study, it mainly always refers to music.
PCR	Private Copy Remuneration
PCR system	Body of regulations that set up the PCR regime

11. LIST OF TABLES, GRAPHS AND FIGURES

12. APPENDIXES

Mathematical Appendix 1

The increase in consumer prices will satisfy:

$dp/dt = \varepsilon_d^{-1}[\varepsilon_d^{-1} - \frac{p-t}{p}\varepsilon_s^{-1}]^{-1}$ [see Hixon and Ramsey (1972)].

This formula can be first order approximated by:

$$dp/dt = \frac{\varepsilon_S}{\varepsilon_D + \varepsilon_S}$$

And the excise tax paid by the manufacturer will be *1-dp/dt.*

With this methodology we compute country by country the static losses for consumers, the static losses of producers and total static welfare cost. For this we need to compute and find information about the following variables per product:

-PCR, *t*, : We take it from update of levies overview December 2006 by EICTA.

-Market price before PCR, p_{BL} : We take the same price as in Economic Impact Study Private Copying Levies on Digital Equipment and Media elaborated by Nathan Associates.

-Market Price after PCR:, p_{AL} . We use a first order approximation of (1) and we compute this price by:

$$p_{AL} = p_{BL} + t\frac{\varepsilon_S}{\varepsilon_S + abs(\varepsilon_D)} \qquad (2)$$

Note that when ε_S is infinity then $p_{AL} = p_{BL} + t$. On the contrary if demand elasticity goes to infinity $p_{AL} = p_{BL}$.

-Market quantity sold after PCR has been charged, Q_{AL} : We take these quantities from Levies Collection Study elaborated by the Copyright_Levies_Reform_Alliance that have obtained this information from *Understanding and Sollution* reports.

-Market quantity sold without the PCR, Q_{BL} : Using the demand elasticity formula:

$$Q_{BL} = Q_{AL} - Q_{AL}\frac{p_{BL} - p_{AL}}{p_{AL}}\varepsilon_d$$

-Loss of static welfare from decreased consumer surplus.

$LCS = \int_{Q_{AL}}^{Q_{BL}} x^{\varepsilon_d} dx - p_{BL}Q_{BL} = [\frac{x^{\varepsilon_d+1}}{\varepsilon_d+1}]_{Q_{AL}}^{Q_{BL}} - p_{BL}Q_{BL}$ we approximate this using the triangle.

- Loss of supplier surplus

$LPS = p_{BL}Q_{BL} - \int_{Q_{AL}}^{Q_{BL}} x^{\varepsilon_s} dx = p_{BL}Q_{BL} - [\frac{x^{\varepsilon_S+1}}{\varepsilon_S+1}]_{Q_{AL}}^{Q_{BL}}$ we approximate this using the triangle.

-Loss of consumer surplus that goes to authors: This is equal to the increase in price multiplied by quantity.

-Loss of producer profits that goes to authors: This is the decrease in real price received by the producers multiplied by the final market quantity.

- Supply elasticity: In a competitive market the supply function is determined by the equality between price and marginal cost. Assuming a cost function of the form:

$C(y) = Ay^{\gamma}$ *(2)*

where y is output,C(y) is cost as a function of output and *A* and γ are parameters. In this case the supply function is $p = A\gamma y^{\gamma-1}$ and therefore the supply elasticity *(dy/y)/(dp/p)=1/(γ-1).* Therefore once we have an estimation of the parameter of the cost function γ we obtain an estimate of the supply elasticity. We use article of JPE that estimate that in the US Economy the ratio Average Cost to Marginal Cost for non-durable manufacturers is 0.73. With the specification in *(2)* , the ratio of Average Cost to Marginal cost is *1/γ.* Therefore the JPE article implies an estimation of γ=1.37. We use this number to estimate an elasticity of supply of 2.70.

Mathematical Appendix 2

In a Cournot-Nash oligopoly model, following Fullerton & Metcalf (2002) the effect of a PCR per unit *t* on consumer prices, *p*, will follow the formula:

$$\frac{dp}{dt} = t\frac{N}{\eta + N + k}$$

Where N represents the Number of competitors in the industry, η represents the elasticity of the slope of the inverse demand function and $k = 1 - \frac{c''}{p'}$ that measures the relative slopes of the demand and marginal cost curves. In our empirical estimation we use a N=9 for all industries since in the report "Digital Distribution of Entertainment Content Watch" elaborated by Understanding and Solutions they report nine companies in Western Europe with more than 1% market share in the market of MP3 players (Apple, Samsung, Creative Labs, iRiver, Packard Bell, Philips, MP Man, Sony and Trekstor).

Assuming a demand function with constant elasticity ε_d. Then we can write

$$\eta = \frac{1-\varepsilon_d}{\varepsilon_d} \qquad \text{(Y1)}.$$

If we further assume that the cost function, *C*, depends on output *Y* following an exponential form: $C(Y) = AY^{\gamma}$, then $C'(Y) = \gamma AY^{\gamma-1}$ and $C''(Y) = \gamma(\gamma-1)AY^{\gamma-2}$. This means that

$C''(Y) = (\gamma-1)C'(Y)/Y$ (Y2).

From the First Order Condition of the profit maximization problem of a representative firm we obtain $C'(y) = p'y + p$. (Y3),

where *Y=Ny*. Combining (Y1)(Y2) and (Y3):

$$\eta + k = 1 - (\gamma - 1) - N\varepsilon_d + \frac{1-\varepsilon_d}{\varepsilon_d}$$

With this we obtain that the effect of a PCR per unit on final consumer prices is

$$\Delta p = t\frac{N}{N + 1 - (\gamma-1) - N\varepsilon_d + \frac{1-\varepsilon_d}{\varepsilon_d}}$$

Now to compute the producer surplus we can estimate:

$$\frac{C}{Y} = \frac{c'}{\gamma} = \frac{1}{\gamma}\left(p + \frac{1}{N\varepsilon_d}\right)$$

Mathematical Appendix 3

In order to estimate the impact of a larger stock of music titles available on the consumer electronics market we use a log-linearization of supply and demand cost functions with constant elasticity:

- Supply function of consumer electronics market: $\log q_S = \log p^{\varepsilon_S}$ *(Y1)*

where q_S is quantity supplied p represents market price and ε_S is a parameter that represents the price-elasticity of supply.

- Demand function of consumer electronics market: $\log q_D = \log T^{Edi} + \log p^{\varepsilon_D}$ *(Y2)* where q_D is quantity demanded at prices p, ε_D is a parameter that represents the price-elasticity of demand, T represents the number of music titles available and E_{DI} is a parameter that represents the demand elasticity with respect to the number of music titles.

Using the fact that in equilibrium $q_S = q_D = q$, we get that:

$$\log p = \frac{E_{DI}}{\varepsilon_S + |\varepsilon_D|} \log T \quad \textit{(Y3)}$$

$$\log q = \varepsilon_S \frac{E_{DI}}{\varepsilon_S + |\varepsilon_D|} \log T \quad \textit{(Y4)}$$

Note that knowing ε_D , ε_S *and* E_{DI} we can estimate equilibrium market prices and quantities as a function of the number of music titles T using (*Y3*) and (*Y4*).

With this functional form, for each consumer electronic industry we take the demand and supply elasticities detailed in Table Statistical Appendix 5. For E_{DI} we use the estimates of Clements and Ohashi (2005) that study the effects of larger availability of videogame titles on the market of consoles. They found that the effect on console penetration rates of an increase of 1% in the number of music titles was equivalent to a decrease in 2.3% in the prices of hardware. Based on this study, we take that $E_{DI} = 2|\varepsilon_D|$ in all consumer electronic industries.

With these parameters we estimate the effect on equilibrium price and quantities, consumer surplus and producer profits of changes in the stock of music of titles available by the following procedure that we apply to each consumer electronic industry:

1. We take the pre-PCR quantity market and we fit (Y1) and (Y2) to find price index p and stock of titles index T that are consistent with the functional forms that we are assuming for our demand and supply functions.

2. We estimate a single PCR charge by industry computing a weighted average of all PCR charges applied in the nine European countries that we study. The weights used to compute the weighted average are the country market quantities divided by total quantity in the nine countries in our sample. We also assume that the ratio between the PCR charge and the pre-PCR real market price is the same than the ratio between the PCR charge and the price index computed in 1.

3. We estimate the effect of the PCR charges computed in 2 on price, quantities, consumer surplus, and producer surplus using the same methodology detailed in appendix 1.

4. For each year *t+i, i=1 to 26*, we assume that the stock of titles available is equal to the stock of titles index computed in 1 multiplied by the corresponding percent increase in the stock of titles consistent with the second column of table 12.

5. With the stock of titles computed in 4 for each year, we compute also for each year the equilibrium price and quantities using (*Y3*) and (*Y4*).

6. We compute the consumer surplus for each year as the area below the inversed of the demand function depicted in (Y2) between zero and the market quantity of equilibrium computed in 5 minus the equilibrium price multiplied by the equilibrium quantity both of them estimated in 5[36].

7. We compute the producer profits as the product of the equilibrium price multiplied by the equilibrium quantity minus the area below the inversed supply curve depicted in (Y1) between zero and the quantity of equilibrium.

[36]Since we are using a log linera demand function the area between zero and any positive quantitive is infinity, to bypass this technical problem waht we really compute is the area below the inverse demand function between the equilibrium quantity computed in 5 and a quantity equal to 0,0001.

Statistical Appendix 1

Table A1: CD-R: Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	37,00	0,16	0,34	0,46	46,61	12,58	12,39	1,82
Belgium	49,50	0,16	0,12	0,26	57,33	5,94	5,59	0,82
Finland	21,00	0,16	0,20	0,33	25,38	4,20	4,04	0,59
France	200,00	0,16	0,35	0,47	252,48	70,00	69,03	10,15
Germany	630,00	0,16	0,07	0,22	699,58	44,10	40,57	5,97
Italy	220,00	0,16	0,25	0,38	270,75	55,00	53,48	7,86
Netherlands	115,50	0,16	0,14	0,28	135,49	16,17	15,32	2,25
Spain	250,00	0,16	0,24	0,37	306,67	60,00	58,24	8,56
Sweden	46,40	0,16	0,11	0,26	53,36	5,10	4,78	0,70

Table A2: CD-RW: Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	1,10	1,16	0,34	1,46	1,19	0,37	0,34	0,05
Belgium	2,60	1,16	0,12	1,26	2,69	0,31	0,28	0,04
Finland	0,74	1,16	0,20	1,33	0,78	0,15	0,13	0,02
France	13,60	1,16	0,35	1,47	14,73	4,76	4,32	0,64
Germany	18,00	1,16	0,07	1,22	18,36	1,26	1,11	0,16
Italy	8,50	1,16	0,25	1,38	9,04	2,13	1,91	0,28
Netherlands	4,70	1,16	0,14	1,28	4,88	0,66	0,58	0,09
Spain	5,50	1,16	0,24	1,37	5,84	1,32	1,19	0,17
Sweden	1,60	1,16	0,18	1,32	1,68	0,29	0,26	0,04

Table A3: DVD-R: Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	16,00	0,47	0,54	0,94	19,20	8,64	8,29	1,22
Belgium	23,00	0,47	0,59	0,98	27,81	13,57	13,07	1,92
Finland	9,00	0,47	0,60	0,99	10,90	5,40	5,20	0,77
France	30,00	0,47	1,27	1,58	38,42	38,10	37,88	5,57
Germany	278,00	0,47	0,17	0,62	304,66	47,26	43,18	6,35
Italy	93,50	0,47	0,58	0,98	112,88	54,23	52,18	7,67
Netherlands	40,20	0,47	0,60	0,99	48,67	24,12	23,24	3,42
Spain	15,20	0,47	1,20	1,52	19,40	18,24	18,10	2,66
Sweden	20,00	0,47	0,36	0,78	23,20	7,20	6,78	1,00

Table A4: DVD+R: Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	13,00	0,44	0,54	0,91	15,69	7,02	6,75	0,99
Belgium	18,00	0,44	0,59	0,95	21,88	10,62	10,26	1,51
Finland	9,50	0,44	0,60	0,96	11,56	5,70	5,51	0,81
France	34,00	0,44	1,27	1,55	43,73	43,18	43,03	6,33
Germany	225,00	0,44	0,17	0,59	247,68	38,25	35,03	5,15
Italy	56,00	0,44	0,58	0,95	67,98	32,48	31,34	4,61
Netherlands	55,10	0,44	0,40	0,79	64,84	22,04	20,91	3,08
Spain	17,00	0,44	1,20	1,49	21,79	20,40	20,29	2,98
Sweden	21,00	0,44	0,36	0,75	24,50	7,56	7,14	1,05

Table A5: DVD+RW: Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	2,25	0,59	0,54	1,17	2,70	1,22	1,43	0,16
Belgium	4,70	0,59	0,59	1,22	5,67	2,77	3,29	0,33
Finland	1,50	0,59	0,60	1,23	1,81	0,90	1,07	0,11
France	17,80	0,59	1,27	1,95	22,77	22,61	27,67	1,30
Germany	30,90	0,59	0,17	0,77	33,82	5,25	5,91	1,14
Italy	9,30	0,59	0,58	1,21	11,21	5,39	6,39	0,66
Netherlands	14,00	0,59	0,40	1,02	16,36	5,60	6,52	0,86
Spain	7,00	0,59	1,20	1,88	8,92	8,40	10,26	0,52
Sweden	3,30	0,59	0,58	1,21	3,98	1,91	2,27	0,23

Table A6: DVD-RW: Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	0,75	0,89	0,54	1,36	0,85	0,41	0,38	0,06
Belgium	2,10	0,89	0,59	1,40	2,41	1,24	1,16	0,17
Finland	0,51	0,89	0,60	1,41	0,59	0,31	0,29	0,04
France	6,80	0,89	1,27	2,00	8,31	8,64	8,36	1,23
Germany	10,80	0,89	0,17	1,04	11,42	1,84	1,65	0,24
Italy	3,20	0,89	0,58	1,40	3,66	1,86	1,74	0,26
Netherlands	1,80	0,89	0,60	1,41	2,07	1,08	1,01	0,15
Spain	2,10	0,89	1,20	1,94	2,55	2,52	2,43	0,36
Sweden	1,10	0,89	0,58	1,40	1,26	0,64	0,60	0,09

Table A7: DVD Recorder: Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	0,16	309,62	30,00	335,79	0,18	4,80	4,40	0,64
Belgium	–	309,62	–	–	–	–	–	–
Finland	0,16	309,62	45,00	348,88	0,18	7,20	6,75	0,99
France	4,50	309,62	15,00	322,71	4,74	67,50	60,47	8,85
Germany	2,44	309,62	18,42	325,69	2,60	44,94	40,49	5,92
Italy	0,63	309,62	9,29	317,72	0,65	5,85	5,19	0,76
Netherlands	–	309,62	–	–	–	–	–	–
Spain	0,70	309,62	6,61	315,39	0,72	4,63	4,09	0,60
Sweden	0,70	309,62	38,89	343,55	0,79	27,22	25,31	3,70

Table A8: Flash MP3 Player: Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	0,61	80,48	6,00	85,71	0,66	3,66	3,32	0,49
Belgium	–	–	–	–	–	–	–	–
Finland	0,61	80,48	1,71	81,97	0,62	1,04	0,92	0,13
France	8,70	80,48	4,00	83,97	9,18	34,80	31,20	4,56
Germany	14,30	80,48	2,56	82,71	14,81	36,61	32,51	4,76
Italy	2,55	80,48	2,41	82,58	2,64	6,15	5,45	0,80
Netherlands	–	–	–	–	–	–	–	–
Spain	3,00	80,48	0,60	81,00	3,03	1,80	1,58	0,23
Sweden	2,30	80,48	0,23	80,68	2,31	0,53	0,46	0,07

Table A9: MP3 players with hard disk: Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	0,19	182,80	12,00	188,17	0,20	2,28	1,04	0,26
Belgium	–	–	–	–	–	–	–	–
Finland	0,19	182,80	1,71	183,57	0,19	0,32	0,15	0,04
France	1,83	182,80	20,00	191,75	1,94	36,60	16,89	4,07
Germany	2,07	182,80	2,56	183,95	2,09	5,30	2,38	0,60
Italy	0,69	182,80	5,48	185,25	0,70	3,78	1,71	0,43
Netherlands	–	–	–	–	–	–	–	–
Spain	0,47	182,80	0,60	183,07	0,47	0,28	0,13	0,03
Sweden	0,41	182,80	27,00	194,88	0,44	11,07	5,16	1,22

Table A10: Flash Card: Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	0,36	34,29	6,00	39,52	0,42	2,16	2,05	0,30
Belgium	–	–	–	–	–	–	–	–
Finland	–	–	–	–	–	–	–	–
France	1,85	34,29	4,00	37,78	2,08	7,40	6,85	1,00
Germany	no data available	34,29	0,50	34,73	–	–	–	–
Italy	–	–	–	–	–	–	–	–
Netherlands	–	–	–	–	–	–	–	–
Spain	no data available	34,29	0,96	35,13	–	–	–	–
Sweden	–	–	–	–	–	–	–	–

Table A11: SD Card: Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	1,05	33,38	6,00	36,07	1,15	6,30	2,96	0,70
Belgium	–	–	–	–	–	–	–	–
Finland	–	–	–	–	–	–	–	–
France	5,90	33,38	4,00	35,17	6,30	23,60	10,92	2,64
Germany	no data available	33,38	0,50	33,60	–	–	–	–
Italy	–	–	–	–	–	–	–	–
Netherlands	–	–	–	–	–	–	–	–
Spain	no data available	33,38	0,96	33,81	–	–	–	–
Sweden	–	–	–	–	–	–	–	–

Table A12: Set top box with HDD functionality: Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	0,16	1097,36	9,20	1105,39	0,16	1,47	1,29	0,19
Belgium	–	–	–	–	–	–	–	–
Finland	0,05	1097,36	15,00	1110,45	0,05	0,75	0,66	0,10
France	0,59	1097,36	15,00	1110,45	0,60	8,85	7,78	1,14
Germany	–	–	–	–	–	–	–	–
Italy	–	–	–	–	–	–	–	–
Netherlands	–	–	–	–	–	–	–	–
Spain	–	–	–	–	–	–	–	–
Sweden	–	–	–	–	–	–	–	–

Table A13: Mobile phone with MP3 function: Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	1,69	242,53	12,00	253,00	1,78	20,28	18,18	2,66
Belgium	–	–	–	–	–	–	–	–
Finland	no data available	242,53	1,71	244,02	–	–	–	–
France	no data available	242,53	4,00	246,02	–	–	–	–
Germany	13,65	242,53	2,56	244,76	13,82	34,94	30,67	4,49
Italy	12,13	242,53	7,28	248,88	12,54	88,26	78,30	11,46
Netherlands	–	–	–	–	–	–	–	–
Spain	9,23	242,53	0,60	243,05	9,26	5,54	4,84	0,71
Sweden	9,23	242,53	0,69	243,13	9,26	6,37	5,56	0,81

Statistical Appendix 2

Table B1: CD-R: Non-Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	37,00	0,16	0,34	0,47	46,81	12,58	13,18	2,67
Belgium	49,50	0,16	0,12	0,27	57,61	5,94	5,94	2,12
Finland	21,00	0,16	0,20	0,34	25,50	4,20	4,30	1,19
France	200,00	0,16	0,35	0,48	253,54	70,00	73,40	14,59
Germany	630,00	0,16	0,07	0,22	702,59	44,10	43,13	18,76
Italy	220,00	0,16	0,25	0,39	272,01	55,00	56,87	13,91
Netherlands	115,50	0,16	0,14	0,29	136,16	16,17	16,29	5,41
Spain	250,00	0,16	0,24	0,38	308,11	60,00	61,93	15,52
Sweden	46,40	0,16	0,11	0,26	53,61	5,10	5,09	1,88

Table B2: CD-RW: Non-Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	1,10	1,16	0,34	1,47	1,19	0,37	0,36	0,06
Belgium	2,60	1,16	0,12	1,27	2,69	0,31	0,29	0,05
Finland	0,74	1,16	0,20	1,34	0,78	0,15	0,14	0,02
France	13,60	1,16	0,35	1,48	14,79	4,76	4,59	0,71
Germany	18,00	1,16	0,07	1,22	18,38	1,26	1,18	0,22
Italy	8,50	1,16	0,25	1,39	9,07	2,13	2,03	0,33
Netherlands	4,70	1,16	0,14	1,29	4,89	0,66	0,62	0,11
Spain	5,50	1,16	0,24	1,38	5,85	1,32	1,26	0,21
Sweden	1,60	1,16	0,18	1,33	1,68	0,29	0,27	0,05

Table B3: DVD-R: Non-competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	16,00	0,47	0,54	0,97	19,30	8,64	8,81	1,26
Belgium	23,00	0,47	0,59	1,02	27,94	13,57	13,90	1,90
Finland	9,00	0,47	0,60	1,02	10,95	5,40	5,53	0,75
France	30,00	0,47	1,27	1,64	38,57	38,10	40,27	3,59
Germany	278,00	0,47	0,17	0,63	305,87	47,26	45,89	10,14
Italy	93,50	0,47	0,58	1,01	113,43	54,23	55,49	7,66
Netherlands	40,20	0,47	0,60	1,02	48,91	24,12	24,72	3,36
Spain	15,20	0,47	1,20	1,58	19,47	18,24	19,24	1,78
Sweden	20,00	0,47	0,36	0,80	23,32	7,20	7,21	1,24

Table B4: DVD+R: Non-Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	13,00	0,44	0,54	0,94	15,76	7,02	7,18	1,03
Belgium	18,00	0,44	0,59	0,99	21,99	10,62	10,91	1,50
Finland	9,50	0,44	0,60	0,99	11,62	5,70	5,86	0,80
France	34,00	0,44	1,27	1,61	43,89	43,18	45,74	4,05
Germany	225,00	0,44	0,17	0,60	248,69	38,25	37,23	8,39
Italy	56,00	0,44	0,58	0,98	68,31	32,48	33,34	4,61
Netherlands	55,10	0,44	0,40	0,81	65,17	22,04	22,24	3,68
Spain	17,00	0,44	1,20	1,55	21,87	20,40	21,57	1,98
Sweden	21,00	0,44	0,36	0,77	24,62	7,56	7,59	1,32

Table B5: DVD-RW: Non-Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	0,75	0,89	0,54	1,39	0,86	0,41	0,40	0,06
Belgium	2,10	0,89	0,59	1,35	2,38	1,24	1,02	0,20
Finland	0,51	0,89	0,60	1,35	0,58	0,31	0,25	0,05
France	6,80	0,89	1,27	1,87	8,23	8,64	7,38	1,16
Germany	10,80	0,89	0,17	1,02	11,36	1,84	1,46	0,36
Italy	3,20	0,89	0,58	1,34	3,63	1,86	1,53	0,30
Netherlands	1,80	0,89	0,60	1,35	2,05	1,08	0,89	0,17
Spain	2,10	0,89	1,20	1,82	2,53	2,52	2,15	0,34
Sweden	1,10	0,89	0,58	1,34	1,25	0,64	0,53	0,10

Table B6: DVD+RW: Non-Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	2,25	0,59	0,54	1,09	2,66	1,22	1,23	0,17
Belgium	4,70	0,59	0,59	1,14	5,60	2,77	2,81	0,38
Finland	1,50	0,59	0,60	1,14	1,79	0,90	0,91	0,12
France	17,80	0,59	1,27	1,76	22,54	22,61	23,69	2,17
Germany	30,90	0,59	0,17	0,75	33,50	5,25	5,06	1,05
Italy	9,30	0,59	0,58	1,13	11,07	5,39	5,46	0,75
Netherlands	14,00	0,59	0,40	0,96	16,16	5,60	5,58	0,89
Spain	7,00	0,59	1,20	1,70	8,83	8,40	8,78	0,83
Sweden	3,30	0,59	0,58	1,13	3,93	1,91	1,94	0,27

Table B7: DVD Recorder: Non-Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	0,16	309,62	30,00	323,05	0,168845	4,8	2,20776973	0,53
Belgium	–	309,62	–	–	–	–	–	–
Finland	0,16	309,62	45,00	329,76	0,17299738	7,2	3,35347144	0,79
France	4,50	309,62	15,00	316,33	4,62702266	67,5	30,6380884	7,60
Germany	2,44	309,62	18,42	317,86	2,5241706	44,9448	20,4633909	5,05
Italy	0,63	309,62	9,29	313,78	0,64110177	5,851818	2,64223755	0,66
Netherlands	–	309,62	–	–	–	–	–	–
Spain	0,70	309,62	6,61	312,58	0,70881177	4,627	2,08399037	0,52
Sweden	0,70	309,62	38,89	327,03	0,7495537	27,223	12,6157632	3,01

Table B8: Flash MP3 Player: Non-Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	0,61	80,48	6,00	83,17	0,64	3,66	1,67	0,41
Belgium	–	–	–	–	–	–	–	–
Finland	0,61	80,48	1,71	81,25	0,62	1,04	0,47	0,12
France	8,70	80,48	4,00	82,27	8,95	34,80	15,80	3,93
Germany	14,30	80,48	2,56	81,63	14,57	36,61	16,54	4,15
Italy	2,55	80,48	2,41	81,56	2,59	6,15	2,77	0,70
Netherlands	–	–	–	–	–	–	–	–
Spain	3,00	80,48	0,60	80,75	3,01	1,80	0,81	0,21
Sweden	2,30	80,48	0,23	80,58	2,30	0,53	0,24	0,06

Table B9: MP3 players with hard disk: Non-Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	0,19	182,80	12,00	188,17	0,20	2,28	1,04	0,26
Belgium	–	–	–	–	–	–	–	–
Finland	0,19	182,80	1,71	183,57	0,19	0,32	0,15	0,04
France	1,83	182,80	20,00	191,75	1,94	36,60	16,89	4,07
Germany	2,07	182,80	2,56	183,95	2,09	5,30	2,38	0,60
Italy	0,69	182,80	5,48	185,25	0,70	3,78	1,71	0,43
Netherlands	–	–	–	–	–	–	–	–
Spain	0,47	182,80	0,60	183,07	0,47	0,28	0,13	0,03
Sweden	0,41	182,80	27,00	194,88	0,44	11,07	5,16	1,22

Table B10: Flash Card: Non-Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	0,36	34,29	6,00	39,84	0,38	2,16	2,05	0,23
Belgium	–	–	–	–	–	–	–	–
Finland	–	–	–	–	–	–	–	–
France	1,85	34,29	4,00	37,99	1,92	7,40	6,98	0,83
Germany	no data available	34,29	0,50	34,75	–	–	–	–
Italy	–	–	–	–	–	–	–	–
Netherlands	–	–	–	–	–	–	–	–
Spain	no data available	34,29	0,96	35,18	–	–	–	–
Sweden	–	–	–	–	–	–	–	–

Table B11: SD Card: Non-Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	1,05	33,38	6,00	38,93	1,11	6,30	5,99	0,68
Belgium	–	–	–	–	–	–	–	–
Finland	–	–	–	–	–	–	–	–
France	5,90	33,38	4,00	37,08	6,14	23,60	22,26	2,64
Germany	no data available	33,38	0,50	33,84	–	–	–	–
Italy	–	–	–	–	–	–	–	–
Netherlands	–	–	–	–	–	–	–	–
Spain	no data available	33,38	0,96	34,27	–	–	–	–
Sweden	–	–	–	–	–	–	–	–

Table B12: Set top box with HDD functionality: Non-Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	0,16	1097,36	9,20	1101,48	0,16	1,47	0,66	0,17
Belgium	–	–	–	–	–	–	–	–
Finland	0,05	1097,36	15,00	1104,07	0,05	0,75	0,34	0,09
France	0,59	1097,36	15,00	1104,07	0,59	8,85	3,98	1,00
Germany	–	–	–	–	–	–	–	–
Italy	–	–	–	–	–	–	–	–
Netherlands	–	–	–	–	–	–	–	–
Spain	–	–	–	–	–	–	–	–
Sweden	–	–	–	–	–	–	–	–

Table B13: Mobile Phone with MP3 function: Non-Competitive Case

Country	2006 Market Quantity with PCR (millions)	Price Before PCR (€ per unit)	PCR (€ per unit)	Price after PCR (€ per unit)	Market Quantity without PCR (millions)	Total revenue collected (€ millions)	Total loss of consumer surplus (€)	Total loss of producer profits (€)
Austria	1,69	242,53	12,00	247,90	1,74	20,28	9,21	2,28
Belgium	–	–	–	–	–	–	–	–
Finland	no data available	242,53	1,71	243,30	–	–	–	–
France	no data available	242,53	4,00	244,32	–	–	–	–
Germany	13,65	242,53	2,56	243,68	13,74	34,94	15,69	3,97
Italy	12,13	242,53	7,28	245,79	12,34	88,26	39,85	9,99
Netherlands	–	–	–	–	–	–	–	–
Spain	9,23	242,53	0,60	242,80	9,24	5,54	2,48	0,63
Sweden	9,23	242,53	0,69	242,84	9,25	6,37	2,85	0,73

Statistical Appendix 3

Dynamic Tables: Estimation of percentage of sales by year of release of the album for the year 2006 and adjustment of data in order to find an estimation of music consumption according to titles age

For a proxy of the distribution of music consumption according to the year the music was released, we use the webpage http://www.ciao.es/, which provides information about music available according to the year of release. Using the age distribution of titles available at www.ciao.es has a number of problems. Since we ignore sales per title, it might well be the case that even if titles released in year 1985 represent only 0.07 percent of all titles available they represent a larger proportion of sales, because older titles sell more units than newer titles. We try to correct for this problem in the following manner.

According to *Billboard*, sales from albums 36 months old or older represent approximately 27% of all album sales, and sales of albums between 18 months and 36 months old were just 12%. The rest of sales represent albums 18 months old or less. We adjust the numbers to try to take into account this difference in sales per title. In particular:

- Since albums with age 18 months or less should represent 61 percent of sales and since there are 8264 new music titles in 2006 and 6279 music tittles in 2005, we assume that titles corresponding to the year 2006 represent 34.6 percent of total sales - 0.61*8274(8274+6279) -of albums corresponding to 2005 represent 26.4 percent – 0.61*6279/(8274+6279) of total sales.
- Since albums with age between 18 months and 36 months should represent 12% of total sales, and this category should be confined between years 2004 and 2003 in our sample, we assume that album titles released in 2004 sold 5.4% of total music sales in 2007 - 0.12*5726/(5726+7029)- 6% and album titles released in 2003 sold 6.6%.
- Finally, since albums older than 36 months represent 27% of total sales, each year we distribute this market share according to the percentage of titles available released each year between 1981 and 2002.

Music sales by year of release are displayed in Table 13. If we assume that this age distribution is more or less constant across time, we can estimate the effect of a constant increase in the annual creation of new titles by applying the formula

$$E_t = \sum_{i=1}^{26} increase_{t-i} * s_i$$

where E_t is the increase in the stock of music available in year t, $increase_{t-i}$ is the increase in the number of titles in year $t-_i$, and s_i is the market share of music created in year t-i ,as displayed in Table 14. For simplification we take the effect on music at the beginning of each calendar year.

Dynamic Tables: Dynamic effect of PCR charges introduced at time t+1on consumer electronics product by type of product as a proportion of initial quantities, prices, consumer surplus and producers profits before the introduction of the PCR charge.

Table C1: Dynamic Effects: CD-R

Year	Price	Quantity	Consumer Surplus	Producer Surplus
t-1	100	100	100	100,00
t	198,08	80,19	97,28	54,17
t+1	198,34	80,48	98,33	54,88
t+2	198,54	80,70	99,14	55,43
t+3	198,58	80,75	99,30	55,54
t+4	198,63	80,80	99,51	55,68
t+5	198,66	80,84	99,63	55,76
t+6	198,69	80,87	99,73	55,83
t+7	198,71	80,90	99,84	55,90
t+8	198,74	80,92	99,95	55,97
t+9	198,76	80,95	100,04	56,04
t+10	198,78	80,97	100,12	56,09
t+11	198,79	80,98	100,17	56,12
t+12	198,80	80,99	100,20	56,15
t+13	198,81	81,00	100,24	56,17
t+14	198,82	81,01	100,27	56,19
t+15	198,82	81,02	100,29	56,20
t+16	198,82	81,02	100,30	56,21
t+17	198,83	81,02	100,31	56,22
t+18	198,83	81,03	100,32	56,23
t+19	198,83	81,03	100,33	56,23
t+20	198,83	81,03	100,33	56,23
t+21	198,83	81,03	100,33	56,24
t+22	198,83	81,03	100,33	56,24
t+23	198,83	81,03	100,34	56,24
t+24	198,83	81,03	100,34	56,24
t+25	198,83	81,03	100,34	56,24
t+26	198,83	81,03	100,34	56,24

Table C2: Dynamic Effects: CD-RW

Year	Price	Quantity	Consumer Surplus	Producer Surplus
t-1	100	100	100	100,00
t	115,03	94,77	99,98	92,02
t+1	115,18	95,12	101,02	92,55
t+2	115,30	95,38	101,82	92,96
t+3	115,32	95,43	101,98	93,05
t+4	115,35	95,49	102,18	93,15
t+5	115,37	95,53	102,30	93,21
t+6	115,38	95,57	102,41	93,26
t+7	115,40	95,60	102,51	93,32
t+8	115,41	95,64	102,62	93,37
t+9	115,43	95,67	102,71	93,42
t+10	115,44	95,69	102,79	93,46
t+11	115,45	95,71	102,84	93,48
t+12	115,45	95,72	102,87	93,50
t+13	115,46	95,73	102,91	93,52
t+14	115,46	95,74	102,94	93,53
t+15	115,46	95,75	102,95	93,54
t+16	115,47	95,75	102,97	93,55
t+17	115,47	95,75	102,98	93,55
t+18	115,47	95,76	102,99	93,56
t+19	115,47	95,76	103,00	93,56
t+20	115,47	95,76	103,00	93,56
t+21	115,47	95,76	103,00	93,57
t+22	115,47	95,76	103,00	93,57
t+23	115,47	95,76	103,00	93,57
t+24	115,47	95,76	103,00	93,57
t+25	115,47	95,76	103,00	93,57
t+26	115,47	95,76	103,01	93,57

Table C3: Dynamic Effects: DVD-R

Year	Price	Quantity	Consumer Surplus	Producer Surplus
t-1	100	100	100	100,00
t	179,76	82,25	99,22	61,87
t+1	180,00	82,55	100,27	62,55
t+2	180,18	82,78	101,07	63,07
t+3	180,22	82,82	101,23	63,17
t+4	180,26	82,88	101,43	63,30
t+5	180,29	82,91	101,55	63,38
t+6	180,31	82,94	101,65	63,45
t+7	180,34	82,97	101,76	63,52
t+8	180,36	83,00	101,87	63,58
t+9	180,38	83,03	101,96	63,64
t+10	180,40	83,05	102,04	63,69
t+11	180,41	83,06	102,09	63,73
t+12	180,42	83,07	102,12	63,75
t+13	180,43	83,08	102,16	63,77
t+14	180,43	83,09	102,19	63,79
t+15	180,44	83,10	102,21	63,80
t+16	180,44	83,10	102,22	63,81
t+17	180,44	83,10	102,23	63,82
t+18	180,44	83,10	102,24	63,82
t+19	180,44	83,11	102,25	63,83
t+20	180,45	83,11	102,25	63,83
t+21	180,45	83,11	102,25	63,83
t+22	180,45	83,11	102,25	63,83
t+23	180,45	83,11	102,25	63,83
t+24	180,45	83,11	102,26	63,83
t+25	180,45	83,11	102,26	63,83
t+26	180,45	83,11	102,26	63,83

Table C4: Dynamic Effects: DVD+R

Year	Price	Quantity	Consumer Surplus	Producer Surplus
t-1	100	100	100	100,00
t	187,18	81,37	99,26	58,72
t+1	187,43	81,66	100,31	59,41
t+2	187,62	81,89	101,10	59,94
t+3	187,66	81,93	101,27	60,05
t+4	187,70	81,99	101,47	60,18
t+5	187,73	82,02	101,59	60,26
t+6	187,75	82,05	101,69	60,33
t+7	187,78	82,08	101,80	60,40
t+8	187,80	82,11	101,90	60,47
t+9	187,83	82,14	102,00	60,53
t+10	187,84	82,16	102,07	60,58
t+11	187,86	82,17	102,12	60,62
t+12	187,86	82,18	102,16	60,64
t+13	187,87	82,19	102,20	60,66
t+14	187,88	82,20	102,22	60,68
t+15	187,88	82,20	102,24	60,69
t+16	187,89	82,21	102,26	60,70
t+17	187,89	82,21	102,27	60,71
t+18	187,89	82,21	102,27	60,71
t+19	187,89	82,22	102,28	60,72
t+20	187,89	82,22	102,29	60,72
t+21	187,89	82,22	102,29	60,72
t+22	187,89	82,22	102,29	60,72
t+23	187,89	82,22	102,29	60,73
t+24	187,89	82,22	102,29	60,73
t+25	187,89	82,22	102,29	60,73
t+26	187,89	82,22	102,29	60,73

Table C5: Dynamic Effects: DVD-RW

Year	Price	Quantity	Consumer Surplus	Producer Surplus
t-1	100	100	100	100,00
t	164,65	84,29	99,96	68,44
t+1	164,87	84,60	101,00	69,09
t+2	165,03	84,83	101,79	69,58
t+3	165,07	84,88	101,96	69,68
t+4	165,11	84,94	102,16	69,81
t+5	165,13	84,97	102,28	69,88
t+6	165,16	85,00	102,38	69,95
t+7	165,18	85,03	102,48	70,01
t+8	165,20	85,06	102,59	70,08
t+9	165,22	85,09	102,68	70,13
t+10	165,23	85,11	102,76	70,18
t+11	165,24	85,12	102,81	70,21
t+12	165,25	85,14	102,85	70,24
t+13	165,26	85,15	102,88	70,26
t+14	165,26	85,15	102,91	70,27
t+15	165,27	85,16	102,93	70,29
t+16	165,27	85,16	102,94	70,29
t+17	165,27	85,17	102,95	70,30
t+18	165,28	85,17	102,96	70,31
t+19	165,28	85,17	102,97	70,31
t+20	165,28	85,17	102,97	70,31
t+21	165,28	85,17	102,97	70,32
t+22	165,28	85,17	102,97	70,32
t+23	165,28	85,17	102,98	70,32
t+24	165,28	85,17	102,98	70,32
t+25	165,28	85,17	102,98	70,32
t+26	165,28	85,17	102,98	70,32

Table C6: Dynamic Effects: DVD - RW

Year	Price	Quantity	Consumer Surplus	Producer Surplus
t-1	100	100	100	100,00
t	191,61	80,88	99,82	56,86
t+1	191,87	81,17	100,86	57,56
t+2	192,06	81,39	101,65	58,09
t+3	192,10	81,44	101,82	58,20
t+4	192,15	81,49	102,02	58,34
t+5	192,18	81,52	102,14	58,42
t+6	192,20	81,55	102,24	58,49
t+7	192,23	81,58	102,35	58,56
t+8	192,25	81,61	102,45	58,63
t+9	192,27	81,64	102,54	58,69
t+10	192,29	81,66	102,62	58,74
t+11	192,30	81,67	102,67	58,78
t+12	192,31	81,68	102,71	58,80
t+13	192,32	81,69	102,74	58,83
t+14	192,33	81,70	102,77	58,84
t+15	192,33	81,70	102,79	58,86
t+16	192,34	81,71	102,80	58,87
t+17	192,34	81,71	102,81	58,87
t+18	192,34	81,71	102,82	58,88
t+19	192,34	81,72	102,83	58,88
t+20	192,34	81,72	102,83	58,89
t+21	192,34	81,72	102,84	58,89
t+22	192,34	81,72	102,84	58,89
t+23	192,34	81,72	102,84	58,89
t+24	192,34	81,72	102,84	58,89
t+25	192,34	81,72	102,84	58,89
t+26	192,34	81,72	102,84	58,89

Table C7: Dynamic Effects: DVD recorder

Year	Price	Quantity	Consumer Surplus	Producer Surplus
t-1	100	100	100	100,00
t	102,42	96,86	99,12	96,48
t+1	102,56	98,03	100,48	97,82
t+2	102,66	98,92	101,53	98,83
t+3	102,68	99,11	101,75	99,05
t+4	102,70	99,33	102,01	99,30
t+5	102,72	99,47	102,17	99,46
t+6	102,73	99,58	102,30	99,59
t+7	102,75	99,70	102,44	99,72
t+8	102,76	99,82	102,58	99,86
t+9	102,77	99,93	102,70	99,98
t+10	102,78	100,01	102,81	100,08
t+11	102,79	100,07	102,87	100,14
t+12	102,79	100,11	102,92	100,19
t+13	102,80	100,15	102,97	100,23
t+14	102,80	100,18	103,00	100,27
t+15	102,80	100,20	103,03	100,29
t+16	102,81	100,22	103,05	100,31
t+17	102,81	100,23	103,06	100,33
t+18	102,81	100,24	103,07	100,34
t+19	102,81	100,25	103,08	100,35
t+20	102,81	100,25	103,09	100,35
t+21	102,81	100,26	103,09	100,36
t+22	102,81	100,26	103,09	100,36
t+23	102,81	100,26	103,09	100,36
t+24	102,81	100,26	103,09	100,36
t+25	102,81	100,26	103,09	100,36
t+26	102,81	100,26	103,09	100,36

Table C8: Dynamic Effects: Flash MP3 players

Year	Price	Quantity	Consumer Surplus	Producer Surplus
t-1	100	100	100	100,00
t	102,88	96,27	98,98	95,82
t+1	103,02	97,44	100,34	97,15
t+2	103,12	98,33	101,37	98,17
t+3	103,14	98,51	101,59	98,38
t+4	103,17	98,73	101,85	98,64
t+5	103,18	98,87	102,01	98,79
t+6	103,20	98,98	102,14	98,92
t+7	103,21	99,10	102,28	99,06
t+8	103,23	99,22	102,42	99,20
t+9	103,24	99,32	102,54	99,31
t+10	103,25	99,41	102,64	99,41
t+11	103,25	99,47	102,71	99,48
t+12	103,26	99,51	102,75	99,52
t+13	103,26	99,55	102,80	99,57
t+14	103,27	99,58	102,83	99,60
t+15	103,27	99,60	102,86	99,63
t+16	103,27	99,61	102,88	99,65
t+17	103,27	99,62	102,89	99,66
t+18	103,27	99,63	102,90	99,67
t+19	103,27	99,64	102,91	99,68
t+20	103,27	99,65	102,92	99,69
t+21	103,27	99,65	102,92	99,69
t+22	103,27	99,65	102,92	99,69
t+23	103,27	99,65	102,92	99,69
t+24	103,27	99,65	102,92	99,69
t+25	103,27	99,65	102,92	99,69
t+26	103,27	99,65	102,92	99,69

Table C9: Dynamic Effects: MP3 Players with Hard disk

Year	Price	Quantity	Consumer Surplus	Producer Surplus
t-1	100	100	100	100,00
t	104,98	93,69	98,17	92,88
t+1	105,12	94,82	99,53	94,20
t+2	105,23	95,69	100,57	95,21
t+3	105,25	95,86	100,79	95,42
t+4	105,27	96,08	101,05	95,68
t+5	105,29	96,21	101,21	95,83
t+6	105,30	96,33	101,34	95,96
t+7	105,32	96,44	101,48	96,10
t+8	105,33	96,56	101,62	96,23
t+9	105,34	96,66	101,74	96,35
t+10	105,35	96,74	101,85	96,45
t+11	105,36	96,80	101,91	96,51
t+12	105,36	96,83	101,96	96,56
t+13	105,37	96,87	102,00	96,60
t+14	105,37	96,90	102,04	96,64
t+15	105,38	96,92	102,06	96,66
t+16	105,38	96,94	102,08	96,68
t+17	105,38	96,95	102,10	96,69
t+18	105,38	96,96	102,11	96,70
t+19	105,38	96,97	102,12	96,71
t+20	105,38	96,97	102,12	96,72
t+21	105,38	96,98	102,13	96,72
t+22	105,38	96,98	102,13	96,72
t+23	105,38	96,98	102,13	96,72
t+24	105,38	96,98	102,13	96,72
t+25	105,38	96,98	102,13	96,72
t+26	105,38	96,98	102,13	96,72

Table C10: Dynamic Effects: Flash Cards

Year	Price	Quantity	Consumer Surplus	Producer Surplus
t-1	100	100	100	100,00
t	109,33	96,59	99,9993	94,99
t+1	109,48	96,94	101,0401	95,51
t+2	109,59	97,20	101,83	95,91
t+3	109,61	97,26	102,00	95,99
t+4	109,64	97,32	102,20	96,09
t+5	109,65	97,36	102,32	96,15
t+6	109,67	97,40	102,42	96,20
t+7	109,68	97,43	102,53	96,25
t+8	109,70	97,47	102,63	96,30
t+9	109,71	97,50	102,72	96,35
t+10	109,72	97,52	102,80	96,39
t+11	109,73	97,54	102,85	96,41
t+12	109,73	97,55	102,89	96,43
t+13	109,74	97,56	102,92	96,45
t+14	109,74	97,57	102,95	96,46
t+15	109,74	97,58	102,97	96,47
t+16	109,74	97,58	102,98	96,48
t+17	109,74	97,58	102,99	96,48
t+18	109,75	97,59	103,00	96,49
t+19	109,75	97,59	103,01	96,49
t+20	109,75	97,59	103,01	96,49
t+21	109,75	97,59	103,02	96,49
t+22	109,75	97,59	103,02	96,49
t+23	109,75	97,59	103,02	96,49
t+24	109,75	97,59	103,02	96,50
t+25	109,75	97,59	103,02	96,50
t+26	109,75	97,59	103,02	96,50

Table C11: Dynamic Effects: SD cards

Year	Price	Quantity	Consumer Surplus	Producer Surplus
t-1	100	100	100	100,00
t	109,40	96,56	100,00	94,95
t+1	109,55	96,91	101,04	95,47
t+2	109,66	97,18	101,83	95,87
t+3	109,68	97,23	102,00	95,95
t+4	109,71	97,30	102,20	96,05
t+5	109,72	97,34	102,32	96,11
t+6	109,74	97,37	102,42	96,16
t+7	109,75	97,41	102,53	96,21
t+8	109,77	97,44	102,63	96,27
t+9	109,78	97,47	102,72	96,31
t+10	109,79	97,50	102,80	96,35
t+11	109,80	97,51	102,85	96,38
t+12	109,80	97,53	102,89	96,39
t+13	109,81	97,54	102,92	96,41
t+14	109,81	97,55	102,95	96,42
t+15	109,81	97,55	102,97	96,43
t+16	109,82	97,56	102,98	96,44
t+17	109,82	97,56	102,99	96,45
t+18	109,82	97,56	103,00	96,45
t+19	109,82	97,57	103,01	96,45
t+20	109,82	97,57	103,01	96,46
t+21	109,82	97,57	103,02	96,46
t+22	109,82	97,57	103,02	96,46
t+23	109,82	97,57	103,02	96,46
t+24	109,82	97,57	103,02	96,46
t+25	109,82	97,57	103,02	96,46
t+26	109,82	97,57	103,02	96,46

Table C12: Dynamic Effects: Set top boxes with hard disk functionality

Year	Price	Quantity	Consumer Surplus	Producer Surplus
t-1	100	100	100	100,00
t	101,10	98,55	99,51	98,39
t+1	101,24	99,74	100,95	99,72
t+2	101,34	100,65	102,06	100,75
t+3	101,36	100,84	102,29	100,96
t+4	101,38	101,07	102,57	101,22
t+5	101,40	101,21	102,74	101,37
t+6	101,41	101,33	102,88	101,50
t+7	101,42	101,45	103,03	101,64
t+8	101,44	101,57	103,18	101,78
t+9	101,45	101,67	103,30	101,90
t+10	101,46	101,76	103,41	102,00
t+11	101,47	101,82	103,48	102,06
t+12	101,47	101,86	103,53	102,11
t+13	101,47	101,90	103,58	102,15
t+14	101,48	101,93	103,62	102,19
t+15	101,48	101,95	103,65	102,21
t+16	101,48	101,97	103,66	102,23
t+17	101,48	101,98	103,68	102,24
t+18	101,48	101,99	103,69	102,25
t+19	101,48	102,00	103,70	102,27
t+20	101,49	102,01	103,71	102,27
t+21	101,49	102,01	103,71	102,27
t+22	101,49	102,01	103,71	102,28
t+23	101,49	102,01	103,71	102,28
t+24	101,49	102,01	103,72	102,28
t+25	101,49	102,01	103,72	102,28
t+26	101,49	102,01	103,72	102,28

Table C13: Dynamic Effects: Mobile Phones with MP3 function

Year	Price	Quantity	Consumer Surplus	Producer Surplus
t-1	100	100	100	100,00
t	101,23	98,38	99,57	98,20
t+1	101,36	99,57	100,93	99,54
t+2	101,47	100,48	101,97	100,56
t+3	101,49	100,67	102,18	100,77
t+4	101,51	100,90	102,44	101,03
t+5	101,53	101,04	102,60	101,18
t+6	101,54	101,15	102,74	101,32
t+7	101,55	101,27	102,87	101,45
t+8	101,57	101,40	103,01	101,59
t+9	101,58	101,50	103,13	101,71
t+10	101,59	101,59	103,24	101,81
t+11	101,59	101,65	103,30	101,87
t+12	101,60	101,69	103,35	101,92
t+13	101,60	101,73	103,39	101,96
t+14	101,61	101,76	103,43	102,00
t+15	101,61	101,78	103,46	102,02
t+16	101,61	101,80	103,47	102,04
t+17	101,61	101,81	103,49	102,06
t+18	101,61	101,82	103,50	102,07
t+19	101,61	101,83	103,51	102,08
t+20	101,61	101,83	103,52	102,08
t+21	101,61	101,84	103,52	102,09
t+22	101,62	101,84	103,52	102,09
t+23	101,62	101,84	103,52	102,09
t+24	101,62	101,84	103,52	102,09
t+25	101,62	101,84	103,52	102,09
t+26	101,62	101,84	103,52	102,09

Statistical Appendix 4: Computation of PCR rates

Table D1: AUSTRIA

Product	PCR in €	Details of the Computation of PCR per unit
CD-R	0.34	Assuming 80 minute duration (80/60)*0.18€/hr
CD-RW	0.34	Assuming 80 minute duration (80/60)*0.18€/hr
DVD-R	0.54	Assuming 120 minute duration (120/60)*0.18€/hr
DVD+R	0.54	Assuming 120 minute duration (120/60)*0.18€/hr
DVD+RW	0.54	Assuming 120 minute duration (120/60)*0.18€/hr
DVD-RW	0.54	Assuming 120 minute duration (120/60)*0.18€/hr
DVD video recorders	30	Assuming the representative DVD recorder has an average of 250 GB of storage capacity
Flash MP3 players	6.00	Assuming an average of 512 MB capacity
MP3 players with HDD functionality	12.00	Assuming an average of 60 GB capacity
Digital Satellite set top box with HDD functionality	9.20	Assuming an average capacity of 250GB and assuming maximum capacity charges as DVD recorder
SD card	6.00	Assuming an average of 512 MB capacity
Flash card	6.00	Assuming an average of 512 MB capacity
Mobile phone with MP3 function	12.00	Assuming an average of 1.5 GB of capacity and assuming same rates as MP3

Information from "International Survey on Private Copying Law and Practice", 17th revision 2006

Table D2: BELGIUM

Product	PCR in €	Details of the Computation of PCR per unit
CD-R	0.12	Assuming 80 minute duration (80/60)*0.12€/hr
CD-RW	0.12	Assuming 80 minute duration (80/60)*0.12€/hr
DVD-R	0.59	
DVD+R	0.59	
DVD+RW	0.59	
DVD-RW	0.59	
DVD video recorders		
Flash MP3 players		
MP3 players with HDD functionality		
Digital Satellite set top box with HDD functionality		
SD card		
Flash card		
Mobile phone with MP3 function		

Information from "International Survey on Private Copying Law and Practice", 17th revision 2006

Table D3: FINLAND

Product	PCR in €	Details of the Computation of PCR per unit
CD-R	0.20	
CD-RW	0.20	
DVD-R	0.60	
DVD+R	0.60	
DVD+RW	0.60	
DVD-RW	0.60	
DVD video recorders	45.00	
Flash MP3 players	1.71	Assuming a capacity of 512 MB
MP3 players with HDD functionality	1.71	Assuming a capacity of 60 GB
Digital Satellite set top box with HDD functionality	15	
SD card		
Flash card		
Mobile phone with MP3 function	1.71	Assuming an average of 1.5 GB of capacity and assuming same rates as MP3

Information from "International Survey on Private Copying Law and Practice", 17th revision 2006

Table D4: FRANCE

Product	PCR in €	Details of the Computation of PCR per unit
CD-R	0.35	Assuming a capacity of 700 MB (700/650)*0.3278€/650 MB
CD-RW	0.35	Assuming a capacity of 700 MB (700/650)*0.3278€/650 MB
DVD-R	1.27	
DVD+R	1.27	
DVD+RW	1.27	
DVD-RW	1.27	
DVD video recorders	15	Assuming the representative DVD recorder has an average of 250 GB of storage capacity
Flash MP3 players	4	Assuming an average of 512 MB capacity
MP3 players with HDD functionality	20	Assuming an average of 60 GB capacity
Digital Satellite set top box with HDD functionality	15	Assuming an average capacity of 250GB
SD card	4.00	
Flash card	4.00	
Mobile phone with MP3 function	4.00	Assuming equal charges as MP3 players

Information from "International Survey on Private Copying Law and Practice", 17th revision 2006

Table D5: GERMANY

Product	PCR in €	Details of the Computation of PCR per unit
CD-R	0.0288	CD-R 700 MB / 80 min
CD-RW	0.0288	CD-R 700 MB / 80 min
DVD-R	0.174	
DVD+R	0.174	
DVD+RW	0.174	
DVD-RW	0.174	
DVD video recorders	18.42	Assuming the representative DVD recorder has an average of 250 GB of storage capacity; without storage capacity 9,21
Flash MP3 players	2.56	
MP3 players with HDD functionality	2.56	
Digital Satellite set top box with HDD functionality	18,42	
SD card	0.00	
Flash card	0.00	
Mobile phone with MP3 function	0.00	

Information from "International Survey on Private Copying Law and Practice", 17th revision 2006

Table D6: ITALY

Product	PCR in €	Details of the Computation of PCR per unit
CD-R	0.25	Assuming 700 MB of average capacity (700/650)*0.23€/650 MB
CD-RW	0.25	Assuming 700 MB of average capacity (700/650)*0.23€/650 MB
DVD-R	0.58	
DVD+R	0.58	
DVD+RW	0.58	
DVD-RW	0.58	
DVD video recorders	3% of retail price	
Flash MP3 players	3% of retail price	
MP3 players with HDD functionality	3% of retail price	
Digital Satellite set top box with HDD functionality		
SD card		
Flash card		
Mobile phone with MP3 function	3% of retail price	Assuming same rate as MP3 players

Information from "International Survey on Private Copying Law and Practice", 17th revision 2006

Table D7: THE NETHERLANDS

Product	PCR in €	Details of the Computation of PCR per unit
CD-R	0.14	
CD-RW	0.14	
DVD-R	0.60	Assuming 4.7 GB of capacity
DVD+R	0.40	Assuming 4.7 GB of capacity
DVD+RW	0.40	Assuming 4.7 GB of capacity
DVD-RW	0.60	Assuming 4.7 GB of capacity
DVD video recorders		
Flash MP3 players		
MP3 players with HDD functionality		
Digital Satellite set top box with HDD functionality		
SD card		
Flash card		
Mobile phone with MP3 function		

Information from "International Survey on Private Copying Law and Practice", 17th revision 2006

Table D8: SPAIN

Product	PCR in €	Details of the Computation of PCR per unit
CD-R	0.24	Assuming 80 minute duration (80/60)*0.18€/hr
CD-RW	0.24	Assuming 80 minute duration (80/60)*0.18€/hr
DVD-R	1.20	Data: Assuming 120 minute duration (120/60)*0.30€/hr
DVD+R	1.20	Assuming 120 minute duration (120/60)*0.30€/hr
DVD+RW	1.20	Assuming 120 minute duration (120/60)*0.30€/hr
DVD-RW	1.20	Assuming 120 minute duration (120/60)*0.30€/hr
DVD video recorders	6.61	
Flash MP3 players	0.60	
MP3 players with HDD functionality	0.60	
Digital Satellite set top box with HDD functionality		Assuming an average capacity of 250GB.
SD card	0.96	
Flash card	0.96	
Mobile phone with MP3 function	0.60	

Information from "International Survey on Private Copying Law and Practice", 17th revision 2006

Table D9: SWEDEN

Product	PCR in €	Details of the Computation of PCR per unit
CD-R	0.11	
CD-RW	0.18	
DVD-R	0.36	
DVD+R	0.36	
DVD+RW	0.58	
DVD-RW	0.58	
DVD video recorders	38.89	Assuming average capacity of 250 GB 112,5=0.45€/GB*250 but adjusted rates apply
Flash MP3 players	0.23	Assuming an average of 512 MB capacity, 2.58=512*0.00045€/MB
MP3 players with HDD functionality	27	Assuming an average of 60 GB of capacity 60*0.45€/GB
Digital Satellite set top box with HDD functionality		
SD card		
Flash card		
Mobile phone with MP3 function	0.69	Assuming same rates as MP3 and average capacity of 1.5 GB.

Information from "International Survey on Private Copying Law and Practice", 17th revision 2006

Statistical Appendix 5: Demand and Supply Elasticities

Product	Supply elasticity	Demand elasticity	Demand elasticity (2)
Data CD-R	2.72[1]	0.4[2]	
Data CD-RW	2.72[1]	0.4[2]	
Audio CD-R-RW	2.72[1]	0.4[2]	
Minidisc	2.72[1]	0.4[2]	
DVD-R	2.72[1]	0.4[2]	
DVD+R	2.72[1]	0.4[2]	
DVD+RW	2.72[1]	0.4[2]	
DVD-RW	2.72[1]	0.4[2]	
DVD video recorders	9.09[4]	1.33[3]	6.30[5]
Flash MP3 players	9.09[4]	1.33[3]	6.30[5]
MP3 players with HDD functionality	9.09[4]	1.33[3]	6.30[5]
Digital Satellite set top box with HDD functionality	9.09[4]	1.33[3]	6.30[5]
Memory stick	9.09[4]	1.33[3]	6.30[5]
SD card	9.09[4]	1.33[3]	6.30[5]
Flash card	9.09[4]	1.33[3]	6.30[5]
Mobile phone with MP3 function	9.09[4]	1.33[3]	6.30[5]
Personal computers	9.09[4]	1.33[3]	6.30[5]
Printers	9.09[4]	1.33[3]	6.30[5]
Multi-Functional devices	9.09[4]	1.33[3]	6.30[5]

[1] Obtained from estimation of the cost function in the non-durable manufacture industry in Basu & Fernald (1997).

[2] Obtained from estimates of demand elasticity of cell phone usage in the USA by Hausman (1997).

[3] Obtained from estimates of demand elasticity of computers in USA by Brynjolfsson (1996).

[4] Obtained from estimates of cost function in the Japanese Television Industry in Karp & Perloff (1996).

[5] Obtained from Stavins (1997) average estimation of demand elasticity for personal computers.