

Effectiveness of Copyright Regimes in the Knowledge Society. Empirical evidence for panel data

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Abstract:

The concurrence of copyright and competition law is one of the main controversies in copyright economics given the market power which copyright endows the owner with over the protected work. The keys to this trade-off are grounded on a series of convergent and divergent aspects. Amongst the former, one issue concerns the weakness of the two institutions regarding their application to the Knowledge Society. Exploring the link between copyright and competition policy, as well as the former's effectiveness within the context of the Knowledge Society, constitutes the subject matter of the present study. By applying panel data techniques, a positive link is seen to emerge between the effectiveness of each doctrine.

Keywords: copyright economics; copyright; competition policy; Knowledge Society; panel data techniques

1. Introduction

Intellectual property regimes play a key role in regulating knowledge. Copyright seeks to reward and encourage creativity, which is the driving force behind creative or knowledge goods and services. The analysis and implications of this right forms the basis of “copyright economics”.

As an economic discipline, copyright economics first emerged in the work of Arnold Plant “The Economic Aspects of Copyrights in Books” in 1934. Aside from said work, certain references concerning the issue may be found in the literature of classical economists such as Adam Smith. However, it was not until the mid 19th that copyright began to gain ground in the analysis of intellectual property (Hurt and Schuman, 1966; Breyer, 1970; Novos and Waldman, 1984; Johnson, 1985¹; Liebowitz, 1985; Landes and Posner, 1989), with industrial property, and specifically patents, forming the focus of the bulk of the analysis.

¹ Cited in Towse *et al* (2011).

One crucial area in the study of copyright economics is that of creative goods or knowledge goods (Chen and Png, 2003; Bomsel and Ranaivoson, 2011; Audley and Boyer, 2011) which has come to determine the economic analysis of copyright. Such goods display the following particular features (Torrent, 2009; Shapiro and Varian, 2000:2): such goods are expensive to produce but cheap to reproduce, they are experience goods, managed through intellectual property, with lock-in or costs arising from changes in technology and network externalities that generate positive feedback, fostering dominance of a single technology.

However, various streams of thought coexist within the discipline feeding a series of controversies that both hinder and at the same time enrich the research agenda. Towse *et al* (2011) specify four:

- a) **Intellectual property rights and public goods.** This approach analyses goods protected by copyright as public goods, copyright acts as a mechanism to prevent free-riders.
- b) **Economic analysis of copyright.** This approach analyses copyright doctrines (protection of expression, derived works, rented works, duration and limitations) applying economic analysis (pricing theory, welfare economics, public choice theory).
- c) **Alternatives to copyright and rejection of intellectual property law.** Most of the authors who champion this approach agree that copyright is not an efficient mechanism, given the fact that the power which it confers on the owner to set a monopoly price and discriminate in prices leads to inefficient social monopoly known as “intellectual monopoly” (Boldrin and Levine, 2002).
- d) **Political economics with regard to monopoly.** Copyright confers a position of privilege on the owner of the work similar to a “legal” monopoly thereon, contravening the principles of the doctrine of competition, whilst at the same time proving necessary in order to reward the author.

This latter approach is both one of the dilemmas of this discipline which, according to Watt (2011a) will have to add the following:

- a) Consumer access *vs* creator incentives. According to cost structure of knowledge goods, market power is required to fix a price above the marginal cost that will serve as an incentive to the creator. Yet, this then restricts access for those consumers who are not willing to pay said price.
- b) Static *vs* dynamic effects. This dilemma relates to the accumulative aspect of creation; on the one hand, sufficient level of protection is required to encourage creation, whilst on the other, over protection may stifle accumulative creation.
- c) Duration, depth and scope. An optimal combination needs to be achieved for these three dimensions; in most countries; the predicament is sparked by the fact that there is a very fine line between what is optimal and what is not, necessitating a specific solution to be found.

Given the importance of competition policy has on the copyright economics, the present work seeks to explore this relation between copyright and competition policy and their effectiveness in the Knowledge Society context.

In line with the goal pursued, the structure of the present work is as follows.

We first focus on one of the main trade-offs within copyright economics, the link between competition policy and copyright. These two institutions embrace elements which are both convergent and divergent, they are keys in the seed of this controversy. However, they converge in some elements; one of these convergent elements is that these institutions are weak when applied in the context of the Knowledge Society. Sections 3 and 4 will aim to outline the role of copyright and competition policy play in the digital context and the challenges they face.

In order to verify the hypothesis that copyright protection and competition policy are complementary mechanisms, we conduct an empirical analysis drawing on panel data for the period 2006-2011, where, for four contrasting copyright regimes, we explore the link between the two institutions in addition to the relation between copyright and other variables associated to Knowledge Society.

Finally some conclusions are outlined.

2. Copyright *versus* competition policy

As it grows the importance of intellectual property rights (hereinafter IPR) in the Knowledge Economy and that several countries are claiming or expanding the role of national competition policy authorities, attention has been focused on interconnection between intellectual property and competition policy.

IPR is the institution *par excellence* in the New Economy, these are necessary to encourage creativity and knowledge, but they granted a privileged position of holders of IPR similar to the figure of monopoly rule.

The most common disputes that arise between competition policy and intellectual property relate mostly to patents. This is because it is difficult to find a good substitute that does not infringe the protected right, the development of technology has more limitations that writing a play or creating a painting.

The copyright does not prevent competitors create products with the same functional characteristics but it does not allow that another author make an exact copy of a work.

What is the trade-off between copyright and competition policy? These rights grant the author certain privileges over the protected good, specifically to exercise monopoly and fix prices above the marginal cost until such time as the protected good enters the public domain, thus breaching the principle of market competition and violating the basis of competition policy (“intellectual monopoly”).

In general, economic doctrine considers that, except in certain circumstances, copyright does not confer a monopoly, since the market power it generates is less than that produced by absolute monopoly. Nevertheless, access to products protected by copyright is not optimal given its cost structures (high fixed costs as opposed to practically non-existent marginal costs), which means that in order to recover costs the price is established above the marginal cost leading to a loss of efficiency.

According to Oliveira and Fujiwara (2010) for a conflict to arise between competition policy and IPR two conditions must be met: a) a trade-off between competition (short-term allocative efficiency) and innovation (dynamic long-term efficiency); b) contradictory objectives between the two institutions (intellectual property encourages innovation through market power whereas competition policy restricts the use of market power). Whether such conditions are fulfilled is debatable (Oliveira and Fujiwara, 2010; Ganslandt, 2008).

The hypothesis defended in the present work is that we are faced with two institutions that pursue a common goal, namely encouraging creativity and innovation and creating greater social welfare. Nevertheless, the means that each uses to achieve this end are contradictory. Whereas competition policy removes practices and behaviour which restrict competition, copyright favours the creation of legal monopolies altering the competitive paradigm.

These two institutions embrace elements which are both convergent and divergent, accounting for the difficulty involved in analysing the interrelation between competition policy and copyright (Ramello, 2002) and potentially sparking certain tension between them.

In order to get to the heart of the debate, the particularities of each doctrine must be explored in depth. For this purpose, a series of aspects where copyright and competition policy differ have been pinpointed.

a) Origin

The seeds for competition policy were first sown in the 1890 Sherman Law in the United States of America (USA) in response to alliances to emerge among large firms working in the same line of business. The origins of copyright date back to the 18th century in Great Britain with the Statute of Anne in 1709 whose main goal was motivate art, literature, and science. In general, both institutions share a political basis in their *raison d'être*. In addition, there are those who hold that in their beginnings both pursued the same goal, namely to combat monopoly (Nicita and Ramello, 2006). In its early days, the Statute of Anne seems to have contributed more to weakening the market power of printers and distributors than to giving authors just remuneration and incentives to create works.

b) Internationalization

This is where one of the major weaknesses of competition policy lies. Unlike copyright through the Berne Convention, competition policy has no text setting out the basis for regulating competition policy at an international scale. One collateral problem emerges when applying the principle of the “national treatment” of IPR set out in the TRIPS². Said principle states that foreign owners of IPR must ex ante be afforded the same rights as nationals. The problem arises when the government authorities in each country might feel tempted to redistribute revenue from foreigners to nationals by applying competition policy ex post.

c) Market failure supporting its existence

The *raison d’être* of competition policy is to combat monopolistic behaviour, which sparks irretrievable loss of efficiency for society by establishing prices above the marginal cost as stipulated in competitive behaviour and a reduction in the amount available. Copyright also acts as a mechanism to correct inefficiencies in the market by internalising the problems to emerge from the non-rival and non-excludable nature of knowledge goods.

d) Does copyright/competition policy lead to market failure?

No empirical evidence whatsoever exists to suggest that competition policy leads to market inefficiency. The same cannot be said, however, of copyright. The existence of these property rights grants the owner of the protected work a legal monopoly and certain market power which might lead to anticompetitive behaviour, the area of application of competition policy (Ramello, 2002).

e) Area of operation

Whereas competition policy acts by regulating business behaviour and structures, copyright intervenes at a structural level by defining the author’s rights vis-à-vis the areas where protection is offered, as well as the duration and limits thereof.

f) Time scale

In order to analyse this dimension, in the issue of competition policy we must resort to the streams of economic thinking that have championed the definition of this institution. The Harvard school fixes the objectives as short-medium term, whereas the long term is the horizon set by the Chicago and Austrian schools. In the case of copyright, the long-term time horizon prevails for achieving its ultimate objective, namely fostering creativity and innovation for enhancing social welfare.

² Agreement on Trade Related Aspects of Intellectual Property Rights.

g) Intertemporal commitment

Once again, two alternative applications coexist as regards competition policy: ex ante and ex post. Whereas “defending” competition is an ex post activity, “promoting” it is applied ex ante. If copyright is to achieve its aim of encouraging innovation and creativity, it must be applied ex ante. The problem might arise when the competition authorities feel tempted to restrict or repeal copyright protection if it leads to significant market power.

h) Area of law

While competition policy belongs to the public law due to the administrative nature of the actions of competition authorities; copyright is regulating by private law, civil law specifically.

i) Weaknesses

The adaptation of competition policy and copyright regimes to the new needs posed by the Knowledge Society is questionable; it generates a series of challenges for both institutions. We now explore it.

3. Copyright in the digital era

Copyright is the institution *par excellence* in the creative industries. Yet, it is in the digital environment where its function is most called into question. If intellectual property regimes are justified by the need to encourage creativity and knowledge, and yet if these are undertaken in a different milieu dominated by the Internet and digital technologies, legislation must perforce adjust to the current context.

One result of this imbalance is Shapiro and Varian’s belief (2000: 79) that many view the Internet as “*one giant out-of-control copying machine*”. Said authors are echoing how little intellectual property has adapted to the new digital era. New technologies have made it possible to digitise copyrighted goods and have led to the dematerialisation of their distribution thanks to Internet. Together with the existing loopholes in the digital domain, this accounts for the increasing number of copyright infringements (Bomsel and Ranaivosson, 2011).

Shapiro and Varian’s claim opens up a number of debates, one being the clash between two of the main rights covered by the Universal Declaration of Human Rights (UDHR), free access to information and knowledge, and the right for owners to be paid for their work. What is paradoxical is that the two come under the same article, article 27 of the UDHR. If free access to knowledge is the essence of the Knowledge Society and if intellectual property encourages knowledge, which prevails?

In this context, associations of authors, performers, and writers as well as the music and film industry, and publishing companies are fighting to further copyright protection in the face of the “threat” posed by Internet and the digital world. At the other end of the scale, some users call for an end to IPR.

3.1. The paradox of the Internet

Based on the approach of Demsetz (1967)³ digital technologies in Internet can be said to spark a paradox in the world of copyright (Michel, 2011; Peitz and Waelbroeck, 2011; WIPO, (2013). Internet allows the cost of creating, reproducing, and distributing to be slashed, thereby facilitating access to a wider range of creative goods and enhancing social welfare. Likewise, it enables performers and creators to reduce their dependence on intermediaries in such areas as the music and publishing companies, thereby achieving greater competitiveness. This is counterbalanced by the ever-growing unauthorised use of copyrighted works, which entails a greater cost in copyright protection.

The conclusion is that there is a relation between the growth of the Internet and piracy. Bomsel and Ranaivosson (2011) base said connection on network effects. In other words, new technologies increase the network effects and with this the possible unauthorised use of copyrighted material.

3.2. The new philosophy of copyright: the problem

Faced with this new situation, intellectual property regimes need to be redefined. The context in which these have developed is not the same as was true for the industrial era. Internet has crafted a new philosophy of intellectual property. Listed below are the main consequences which, according to Garrote (2001: 10), digitisation has had on copyright:

1. Easy reproduction (in time and cost).
2. Easy distribution of reproductions.
3. High quality reproductions.
4. Equivalence of works in digital format, facilitating the convergence of works (literary, musical, audiovisual) as they are defined in the same means of transmission.
5. Malleability of works in digital format by users who need have only basic IT skills.
6. Ease with which copies may be distributed without this involving the transferring party having to release a copy.

³ Said author states that “if the main function of allocating property rights is to internalize the beneficial and harmful effects, then the appearance of property rights can be better understood due to their link with the appearance of new beneficial or harmful effects” (Demsetz, 1967: 350). Demsetz, H. (1967): “Towards a Theory of Property Rights.” *American Economic Review*, 57, pages 347-359. Quoted in the Allen Consulting Group (2003).

3.3. The challenges facing the adaptation of copyright to the digital era

Adapting copyright regimes to the new digital reality is by no means problem free. Garrote (2001: 55) highlights ten areas where difficulties arise when attempting to accommodate copyright to digital networks:

1. Distinguishing between the original and the derived work. An analysis needs to be conducted of whether the elements that make up a work, when considered individually, may be deemed intellectual creation by the author and, therefore, subject to protection.
2. For the case of collaborative or collective works (more commonplace in the digital society), is it possible to apply to the production of digital works the assumption of transfer of ownership rights applied to the creators of cinematographic and other audiovisual works?
3. Which law should be applied in digital transmissions given the universal nature thereof?
4. The need to reform moral rights given the numerous possibilities for manipulating the work in digital format.
5. The difficulty in adapting ownership rights to digital transmissions, particularly the right of reproduction, given the importance acquired by the private copy.
6. The need to balance the limits of ownership rights (digital reproduction of private use and access to digital content of libraries).
7. Responsibility of online service providers for users' actions, when the latter may prove difficult to trace.
8. Clash between copyright and contract law in the new technological setting. How to apply operation contracts for works in analogue format to digital format. In this line, so-called e-procurement is already in existence.
9. Applying technological means to safeguard copyright or similar rights enables owners to exercise a high degree of control over their works, calling into question the nature of exclusive ownership rights.
10. In the new digital environment, should copyright be managed differently? There are three alternatives for long-term handling of Internet copyright: individual administration, the owner grants the user a licence through e-procurement (online-procurement); administration through management companies, controlling how much the work is actually used by means of electronic copyright management systems; clearing houses, centralising the copyright procurement procedure so as to facilitate the work of those producing multimedia works.

3.4. Copyright approaches in the digital era

The problems involved in adapting copyright regimes to the digital era have been pointed out. In this sense, many authors have voiced their views as to how such problems should be addressed. According to Garrote (2001: 67), these authors may be classed into three groups: neo-classicist, minimalist, and eclectic. Listed below are the main ideas each group expresses.

a) Neo-classical

Comprising mainly members of industry and US politicians, neo-classicists advocate toughening up copyright so as to prevent it being destroyed by the Internet. Under the doctrine of economic liberalism, neo-classicists feel that copyright not only encourages intellectual creation but that it also generates wealth. To achieve this, the market will efficiently handle the creation and destruction of intellectual production.

Authors such as Gordon, Posner and Landes are followers of said doctrine, which influenced the 1996 WIPO Treaties (*WIPO Copyright Treaty* and the *WIPO Performances and Phonograph Treaty*) as well as the European Union (DASI⁴ and the Green Paper on “Copyright in the knowledge economy”⁵), whilst at a national level in Spain, the IPL⁶ is the principal legal benchmark governing copyright in the Knowledge Society. Added to this are two of the most controversial laws to have emerged to date, the blank media tax and the so-called *Sinde-Wert Law*.

Neo-classicists defend the market and private regulation, although within this particular stream there are authors whose ideas are less extreme, and who may be termed moderate neo-classicists.

b) Minimalist

This stream of thought is deemed to comprise authors who react against any toughening of copyright proposed by neo-classicists, as they feel that it restricts access to works.

Here, the most relevant mechanisms to emerge are copyleft and Creative Commons licences:

⁴ European Parliament and Council Directive 2001/29/CE of 22 May 2001 addressing the harmonisation of certain aspects of copyright and rights related to copyright in the information society seeks to harmonise member state regulations concerning copyright and related rights as well as implement a system to ensure respect for property rights, freedom of expression, and the general interest.

⁵ The Green Paper aims to respond to the role played by copyright in the knowledge economy. In this sense, it faces the challenge of merging strict copyright protection, aimed at encouraging creativity, and the dissemination of knowledge.

⁶ Law 23/2006, of 7 July, amending the reworked text of the Intellectual Property Law, approved by Royal Legislative Decree 1/1996, of 12 April.

- Copyleft licences are those which allow users to use, copy, change, and distribute a work freely as well as any modified versions thereof, under the sole condition that the same rights which protect the original work should be preserved in modified versions.
- The role of Creative Commons licences vis-à-vis author and user is to mediate between the two, in the sense that they authorise all the exploitation rights held by the owner of the right. It is up to the author to authorise or not the commercial use as well as modification and transfer of the work, such that it entails creator control over their work. One difference with regard to copyleft is the authors' ability to decide over what rights they reserve and which they offer freely. In copyleft, all the rights are reserved for the author.

This approach encompasses alternative business models to copyright when the latter is not effective (Varian, 2005):

- Setting the price of the original below that of the copy such that making copies does not prove appealing.
- The price of the copy is greater than that of the original due to the increased cost of copying.
- Sales of physical accessories not available to those purchasing a copy.
- Sale of complementary information.
- Subscriptions.
- Sale of personalised versions such that copies available to others have no value.
- The possibility of advertising, facilitating online access to a product that can also be available in various physical formats at a price.
- Advertising other products in order to cover costs.
- Follow-up of copyrighted products accessible in public places and counting up the copyrights which are then divided amongst members.
- Licences for institutions.
- Taxing various mediums. This takes the form of a tax imposed on a physical product which is an accessory to the information product so as to compensate content producers.
- Rescue. This allows potential readers to bid for content. If the sum of the bids is high enough, the content of the information is provided.
- Pure public supply. Creators are paid by the state, funded by general revenue.
- Awards, contests and commissions.

c) Eclectics

This group of authors express a range of ideas on the issue, yet concur on one point: they defend the essence of copyright but are aware that it needs to undergo certain changes if it is to adapt to technological progress.

Within this stream, three positions may be highlighted. The first views copyright as part of the right to information. Copyright would only be one area of digital network law.

A second stream of thought expresses its faith in the flexibility of copyright to adapt to the new digital reality. The principles on which intellectual property is based would therefore be valid. This is a purely European notion.

The third stream holds that copyright is a tool of the state to bolster democracy, which is achieved by economic rewards, encouraging the creative force of a sector that remains independent from state subsidies, and fostering individual creativity which favours the expressive diversity of creators.

3.5. Obstacles hindering copyright research in the digital era

When compared to other areas of intellectual property, copyright emerges as the one to have been the subject of the least amount of research, particularly with regard to empirical analysis. In one of its latest documents, the WIPO (2013) has sought to provide an answer to this by pinpointing five factors which hinder research into the topic:

- The difficulty in obtaining information on creative goods given that registering goods protected by copyright is not compulsory.
- The difficulty in objectively appraising the value of the copyrighted goods.
- The lack of information concerning the total amount of revenue derived from copyright, how this has been distributed amongst creators, creative industries, and other intermediaries.
- Scant information concerning transaction and administrative costs and to what extent these pose an obstacle.
- Details are required concerning the prices and consumption of creative goods in order to gauge the restrictions which copyright imposes.

4. The challenges facing competition policy in the Knowledge Society

The role played by competition policy in the EU (European Union) has gradually increased since it was first introduced through the Treaty of Rome in 1957. In a globalised world dominated by technological progress, competition policy emerges as one of the main cornerstones of the EU. Given such a context, as Joaquín Almunia states in his speech on competition policy in the Knowledge Society (2012), regulations governing competition must adapt to the new digital environment:

“The principles of competition-law enforcement do not change when we leave the realm of brick-and-mortar but we have to adjust our methods to the specific features of these new sectors.”

As with intellectual property, in the case of knowledge goods, competition policy is not applied in the same way. As a result, the question which arises in this regard is whether competition policy adjusts to the new needs posed by the Knowledge Society. This emerges from the intrinsic nature of knowledge goods, which makes the information technology sector prone to monopolies (Gual and Jódar, 2001). In this sense, the technological complexity of new goods and services, coupled with the growing sophistication of new markets, pose a challenge to competition policy (Palma, 2008).

Shapiro and Varían (2000: 10) express their faith in the flexibility of competition laws to adjust to circumstances. They quote the Sherman Law, which exhibits enormous flexibility vis-à-vis preventing monopolies from stifling innovations. Yet, despite its gradual convergence, EU competition policy differs in certain aspects from US antitrust laws. The authors point to three areas where the competitive strategies of the knowledge economy clash with competition laws (Shapiro and Varian, 2000: 17): mergers and takeovers, agreements between firms, and abuse of a dominant position.

With regard to the former, the situation becomes more acute in the field of information technologies, since they are able to exert control over access to the market and to impose their own standards in the industry, thereby enabling the merged firm to strengthen its grip on the market acquired or on other related markets.

In the case of agreements among firms, the most common in this area are: (1) those which establish common standards (deriving from the complementarity which tends to exist among knowledge products) increasing the likelihood of coordination amongst firms; (2) distribution and licences (involving transfer of IPR), the clauses which such agreements impose on the signatory parties may restrict their behaviour; (3) interconnection (firms may share their networks and avoid overlap between them), the danger being that the new infrastructure closes the market off to competitors outside the agreement; (4) electronic markets (markets where purchasers and sellers can get in touch with relative ease and at little cost), where there is the risk of controlling the entry of potential newcomers into the market and the problem of access to reserved information concerning company strategy.

Finally, in the context of the Knowledge Society, practices which may give rise to an abuse of a dominant position lead to rejecting possible transmission, access to networks, to providing content or granting licences, as well as the unilateral creation of standards or product linking.

In such a framework where increased European economy competitiveness cannot be founded on a strategy of low cost production, and where innovation and knowledge become the key factors in growth, and where the main EU initiatives in recent years focus on the Lisbon Strategy and on the Europe 2020 Strategy, the question arises as to what is the link with competition policy. Competition policy emerges as a strategic tool for achieving the goals set out in said strategies.

5. Effectiveness of copyright regimes in the Knowledge Society. Empirical evidence

In order to gauge the relation between competition policy and copyright, we draw on econometric analysis. We also study the link between copyright and other variables which we feel to be crucial with regard to how effective the former is in the digital context.

To do this, we use a linear regression model for the period 2006 to 2011. Eight different economies have been taken (Spain, Italy, France, Germany, United Kingdom, and USA). The dependent variable is a copyright index which evaluates the intensity of the protection this institution affords. The dependent variables belong to five different categories: competition policy, education, innovation, culture, and wealth of an economy.

The (dependent and independent) study variables are first presented. The initial hypotheses are then established, before moving on to their verification based on the proposed model. The results obtained are then given.

5.1. Model variables

One goal of the present work, namely exploring the link between competition policy and copyright, supports the need for a variable or index which directly reflects the level of protection of copyright regimes for each of the economies considered in the analysis.

For the case in hand, we base our approach on the International Property Rights Index (IPRI)⁷ with the aim of constructing a copyright indicator. The items considered in the IPRI are: (1) IPR protection; (2) protection of patents; (3) copyright piracy. In our case, we chose to replace the second item for copyright protection. This reflects how intensely copyright is applied by assessing five standards: (1) cover; (2) copyright restrictions; (3) duration of the protection; (4) application; (5) membership of international treaties.

In accordance with these criteria established by the IPRI, Zekos (2012) posit a technique for drawing up a copyright index which measures their economic impact accurately and objectively. With this purpose in mind, it provides the weights and variables to be used when constructing the index. Said index would form part of a general IPR index.

The method chosen to devise the copyright index merges the general lines of the IPRI with the weights and variables proposed by Zekos (2012) to specifically assess copyright protection. Annex I details its structure.

The range of the index constructed varies between “0” and “1”; the higher the score a country obtains, the more intense the copyright protection and vice-versa.

⁷ Indicator drawn up each year by the Property Rights Alliance (USA). It gauges, on a scale of 0 to 10, the level of copyright protection at an international scale by analysing ten variables split into three criteria: legal and political context; physical property rights, and IPR.

Regarding the independent variables, Annex II sums up the variables initially used in the study. These belong to five different categories which might impact the level of copyright protection in the Knowledge Society: education, innovation and culture. It is important the link between protection of copyright and wealth of an economy, so it is also included in the study.

In order to obtain a better fit which has greater explanatory power and also to remove any collinearity problem, the number of regressors is reduced, keeping one variable for each block mentioned. To achieve this, variable selection techniques were used, specifically the stepwise procedure. If we also consider the quality of the variables initially proposed to achieve a good fit and one which can offer as much explanatory power as possible, the independent variables that will form part of our study are those shown in table 1:

TABLE 1: Description of the study variables

Variable	Obs	Mean	Std. Dev.	Min	Max
AntitrustE	48	5.27928	.6797167	3.703527	6.192313
RD	48	2.404663	.8982045	1.127324	3.938342
Cult	48	9.70531	1.554551	7.151312	12.22573
Educ	48	11.08333	1.14545	8	13
lnGDPpc	48	10.61894	.1642611	10.24084	10.9465

Where *AntitrustE* is the effectiveness of the antitrust policy; *Educ* is the length of compulsory education; *RD* corresponds to spending on R&D over GDP; *Cult* reflects household spending on cultural and recreational activities over total spending; *GDPpc* is per capita GDP.

5.2. Initial hypothesis

The econometric analysis to be conducted is based on the following foundations:

a) Copyright vs competition policy

Throughout section 2 a bibliographical review has been offered highlighting the complementarity between copyright and competition policy. Despite the conflicts which might emerge between them, the two do actually pursue the same ultimate goal of enhancing social welfare (Ramello, 2002; Nicita and Ramello, 2006; Ganslandt, 2008; Katz and Veel, 2013; Zekos, 2013). The initial hypothesis is the existence of a positive relation between the effectiveness of the competition policy and the intensity of copyright protection.

b) Copyright *vs* education

This hypothesis is based on the empirical analysis carried out by Rodríguez Andrés (2006) comparing the piracy variable to variables related to those of IPR, education, R&D, trade and the wealth of the various countries. What is key in this sense is the link between piracy and IPR, with an inverse relation emerging. Based on this finding, the link between IPR (specifically copyright) and education may be established. The result for the relation between piracy and the variable reflecting a country's level of educational attainment displays a negative sign, such that a convergent relation between IPR and the education variable may be said to have been established (Ginarte and Park, 1997; Scalise, 1997; Marron and Steel, 2000)⁸. The findings of Dias Gomes (2014), who explores the link between piracy and variables associated to education, among others, reach the same conclusion; namely a divergence between piracy and education; in other words complementarity between copyright and education. As mentioned earlier, the variable chosen for this category is the duration of compulsory education, the suggestion therefore being that the longer the period of a country's compulsory education, the more intense the copyright protection.

c) Copyright *vs* investment in R&D

We once again turn to the findings to emerge from the analysis by Rodríguez Andrés (2006) to establish the hypothesis concerning the existence of a positive relation between copyright and a country's investment in R&D. Frame (1987), and Ginarte and Park (1997)⁹ posit that a country with intense R&D activity offers greater incentives for boosting intellectual property. In our case, the hypothesis conjectured is that the greater the weight of R&D over GDP, the more intense the copyright protection will be.

d) Copyright *vs* culture

There is no empirical evidence available on which to base our verification of these variables. It is obvious that IPR, specifically copyright, play a major role in the cultural and creative industries. Copyright functions as a mechanism to (partially) correct the problem of free-riders given the non-rival and non-excludable nature of goods protected by copyright. Copyright thus constitutes a source of funding and acts as an incentive to artistic and cultural production. Based on this notion, it may be said that the greater the existing protection of creative (cultural) goods, the more this will spur cultural activity. Yet, the relation between greater copyright protection and higher spending is by no means clear, since strong protection might discourage people from spending and result in their engaging in activities outside the law. The sign of the hypothesis must therefore be left unresolved.

⁸ Cited in Rodríguez Andrés (2006).

⁹ Cited in Rodríguez Andrés (2006).

e) Copyright vs a country's wealth

Broadly speaking, the literature consulted concurs in pointing to a positive relation between protection of IPR and national wealth (Husted, 2000; Rodríguez Andrés, 2006; Ganslandt 2008; Yvan and Domon, 2010; Dias Gomes, 2014). A positive link is assumed to exist between an economy's per capita GDP growth and the intensity of copyright protection.

5.3. Proposed model

We opted for panel data analysis with the following characteristics:

- Given that the dependent variable is associated to copyright protection, eight countries were chosen covering the two intellectual property reference models (Montoro and Cuadrado, 2008): Anglo-American (USA and UK) and Continental Europe. The latter has been subdivided into three models: continental (Germany and France); Mediterranean (Spain and Italy), and Nordic (Finland and Sweden).
- The study covers the period 2006 to 2011.

The following model merges all the ideas and observations established in the preceding points:

$$\text{Copyright}I_{it} = \alpha_i + \beta_1 \text{Antitrust}E_{it} + \beta_2 \text{Educ}_{it} + \beta_3 \text{RD}_{it} + \beta_4 \text{Cult}_{it} + \beta_5 \ln(\text{GDPpc})_{it} + \varepsilon_{it}, (1)$$

where *CopyrightI* is the copyright index for country *i* during year *t*; the remaining variables are described in point 5.1. Parameter α_i reflects the specific individual effects, whilst ε_{it} is the error term. The empirical analysis is conducted in various stages. First, a pool of data for years and countries is constructed applying the Ordinary Least Squares model (OLS) where the behaviour of the dependent variable is also analysed. Panel data analysis commences at the second stage by estimating parameters under the fixed effects model (FE) and random effects model (RE). The third stage evaluates the suitability of the panel data models using the Hausman test. The fourth stage gauges the quality of the estimation model selected by analysing heteroskedasticity, autocorrelation, and contemporary correlation, where necessary. Finally, the results are discussed.

5.4. Results and analysis

The results of the econometric analysis are summed up in table 2.

TABLE 2: Estimated models

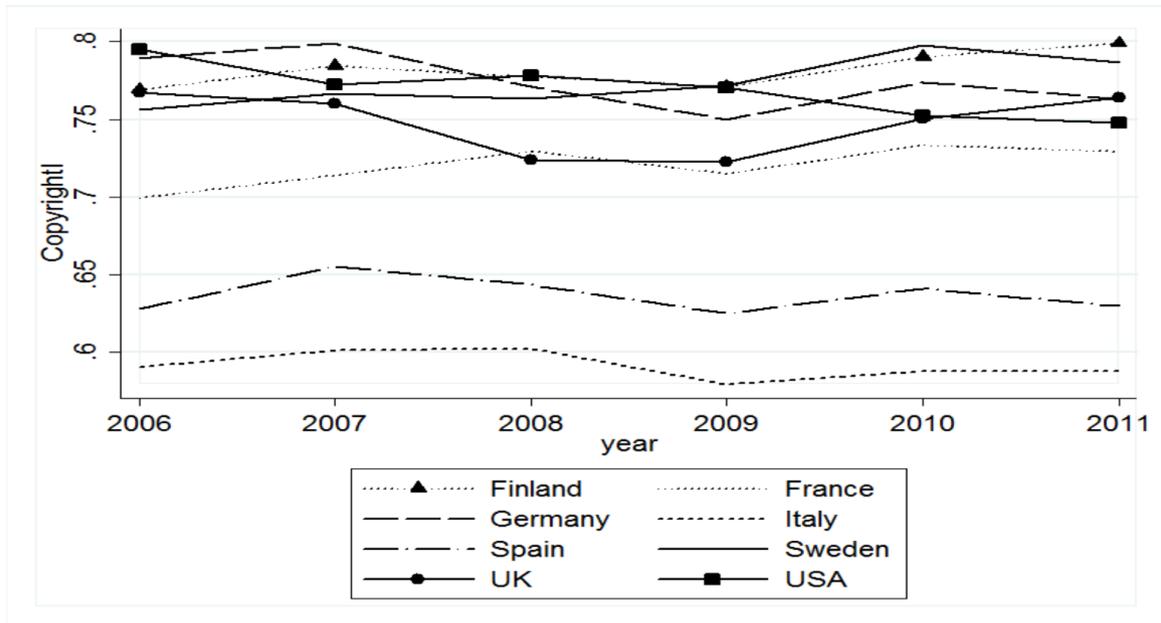
Variable	OLS_co~y	OLS	OLS_rob	FE	FE_rob	RE	RE_rob	FE_AR1	FE_HET	FE_HET-1
cont	.132837 .009841 13.4982 3.0e-17									
nord	.163422 .009841 16.6062 1.4e-20									
anglo	.144422 .009841 14.6755 1.5e-18									
AntitrustE		.038871 .006882 5.64831 1.3e-06	.038871 .006232 6.23683 1.8e-07	.031766 .010087 3.149 .003344	.031766 .015492 2.05051 .079471	.039613 .007459 5.31091 1.1e-07	.039613 .008107 4.8866 1.0e-06	.039613 .008107 4.8866 1.0e-06	.039613 .008107 4.8866 1.0e-06	.039613 .008107 4.8866 1.0e-06
RD		.026815 .005194 5.1622 6.3e-06	.026815 .004976 5.38899 3.0e-06	-.026616 .0215 -1.23793 .223981	-.026616 .026361 -1.00965 .346281	.029572 .0062 4.76933 1.8e-06	.029572 .004562 6.48198 9.1e-11	.029572 .004562 6.48198 9.1e-11	.029572 .004562 6.48198 9.1e-11	.029572 .004562 6.48198 9.1e-11
Cult		.004932 .002474 1.9937 .052705	.004932 .002743 1.7979 .079383	-.032563 .008705 -3.74054 .000657	-.032563 .008369 -3.89069 .00597	.003403 .003299 1.03145 .302329	.003403 .0024 1.41758 .156314	.003403 .0024 1.41758 .156314	.003403 .0024 1.41758 .156314	.003403 .0024 1.41758 .156314
Educ		.016525 .002645 6.2489 1.7e-07	.016525 .002962 5.57844 1.6e-06	.005679 .006909 .821954 .416667	.005679 .001616 3.51484 .009795	.015533 .003277 4.74058 2.1e-06	.015533 .002708 5.73691 9.6e-09	.015533 .002708 5.73691 9.6e-09	.015533 .002708 5.73691 9.6e-09	.015533 .002708 5.73691 9.6e-09
lnGDpPc		.07849 .023228 3.37915 .001579	.07849 .017703 4.43369 .000065	.042971 .02415 1.77936 .083867	.042971 .016409 2.61867 .034476	.066584 .02592 2.56881 .010205	.066584 .015805 4.21277 .000025	.066584 .015805 4.21277 .000025	.066584 .015805 4.21277 .000025	.066584 .015805 4.21277 .000025
_cons	.614274 .006959 88.2745 3.7e-51	-.609747 .236058 -2.58304 .013366	-.609747 .183727 -3.31876 .001875	.417533 .278325 1.50016 .14254	.417533 .222333 1.87796 .102473	-.468033 .263659 -1.77515 .075874	-.468033 .155336 -3.01304 .002586	-.468033 .155336 -3.01304 .002586	-.468033 .155336 -3.01304 .002586	-.468033 .155336 -3.01304 .002586
N	48	48	48	48	48	48	48	48	48	48
r2	.886614	.950894	.950894	.434021	.434021					
r2_a	.878883	.945048	.945048	.239971	.366643					
F	114.685	162.657	205.487	5.36795	.					
chi2						405.289	1451.62	1451.62	1451.62	1451.62

Legend: b/se/t/p

As indicated, grouped data are first analysed. Studying the evolution of the dependent variable over the period for each country is important (graph 1).

Significant differences seem to exist between countries. Which countries offer the strongest copyright protection? To answer this question a series of dummies have been created regarding the categories of countries previously established (Anglo-American, continental Europe, Nordic, and Mediterranean) including them as regressors with regard to the dependent variable (*CopyrightI*). The result of the OLS regression (column of table 2) indicates that there are significant differences between the groups of countries, with the Mediterranean countries (Spain and Italy) affording least copyright protection, whereas the Nordic countries (Finland and Sweden) exhibit the strongest copyright regimes.

GRAPH 1: Evolution of the copyright index



Returning to table 2, the fixed effects model is the most suitable (FE) according to contrasts made (test of significance of the fixed effects, Breusch and Pagan, Hausman). However it suffers from heteroskedasticity and autocorrelation problems that have tried to correct, with the resulting model corresponding to the last column.

Having reached this point, we are in a position to establish the following relations with regard to the level of copyright protection (*CopyrightI* in our analysis):

TABLE 3: Results of the variables relation

Variable	Sign found
Effectiveness of anti-monopoly policy	(+)
Duration of compulsory education	(+)
R&D/GDP	(+)
Household spending on culture (% total spending)	(?)
lnGDPpc	(+)

6. Final conclusions

Although the earliest seeds of copyright economics as a particular branch of economics date back to the 1930s, the bulk of the research and progress has emerged over the last two decades.

One of the most controversial issues to arise in this area (and which has sparked one of the most heated debates) is the link between copyright and competition policy. The particular features of creative goods make copyright an institution which is prone to generating monopolistic behaviour whilst at the same time one which grows stronger thanks to its ability to promote innovation. We face two institutions that pursue a common goal, namely enhanced social welfare. Yet, the coexistence of convergent and divergent elements in the link between the two accounts for the difficulty involved in analysing them. The basis for this controversy is grounded on the particularities of each doctrine.

The Knowledge Society poses a challenge to this trade-off by increasing the number of situations in which tension between the two institutions is likely to occur. Both copyright and competition policy regimes were conceived for an environment which bears little if indeed any resemblance to today's setting, which is dominated by new technologies and Internet. These factors increase the risk of copyright infringement, such that legislation must adapt to current situation. As a result, the debate facing copyright in the digital era is the one between neo-classicists and minimalists. As regards adapting competition policy to the current context, it is important to remember that the particular features of knowledge goods create the need for more flexible legislation.

The present work explores the extent to which competition policy, together with variables linked to the development of the Knowledge Society (education, innovation and culture) and a country's wealth, might determine the level of copyright protection. For this purpose, panel data analysis has been chosen.

The findings to emerge support the initial hypothesis of a complementarity between copyright and competition policy.

Likewise, the initial hypotheses concerning wealth, education and innovation are also borne out. The higher a country's per capita rent, educational and innovation standards, the more intense the copyright protection.

The link with regard to culture indicator does not prove significant. This finding supports the need for research over the role of copyright as a means of funding the cultural sector.

Differences between groups of countries with regard to intensity of copyright protection prove significant, in that it is the Nordic countries who afford the greatest copyright protection, followed by Anglo-American countries, continental Europe and Mediterranean countries.

In an effort to improve the quality of the analysis and obtain more meaningful findings, a more detailed study of each category is necessary. This requires the timescale to be extended and for further progress to be made in the econometric analysis.

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Annex

Annex I: Methodology copyright index

COPYRIGHT PROTECTION INDEX	(1/3) IPR protection	IRRI (GCI)		(0-1)
	(1/3) Non-pirated software	Non-pirated software		(0-1)
	(1/3) Copyright protection	(1/5) Coverage	(1/5) Literary Works	Available: 1 Not available: 0
			(1/5) Sound recordings	Available: 1 Not available: 0
			(1/5) Cinema	Available: 1 Not available: 0
			(1/5) Broadcasting	Available: 1 Not available: 0
			(1/5) Cyberspace	Available: 1 Not available: 0
		(1/5) Restrictions	(1/2) Government use	Does not exist: 1 Exists: 0
			(1/2) Private use	Does not exist: 1 Exists: 0
		(1/5) Duration	Duration: Full period is 70 years after the death of the author	Full: 1 Partial: 0
		(1/5) Enforcement	(1/3) Litigation	Available: 1 Not available: 0
			(1/3) Infringement-damages	Available: 1 Not available: 0
			(1/3) Injunctions	Available: 1 Not available: 0
		(1/5) WIPO Copyright Treaties	(1/7) Berne C. (1886)	Membership: 1 Non-membership: 0
			(1/7) Rome C. (1961)	Membership: 1 Non-membership: 0
			(1/7) WIPO C. (1967)	Membership: 1 Non-membership: 0
			(1/7) Genoa C. - Phonograms (1971)	Membership: 1 Non-membership: 0
			(1/7)C. Brussels (1974)	Membership: 1 Non-membership: 0
			(1/7) WIPO C. - WCT (1996)	Membership: 1 Non-membership: 0
			(1/7) WIPO T. - WPPT (1996)	Membership: 1 Non-membership: 0

Source: Own based on Property Rights Alliance (2012) and Zekos (2012)

Annex II: Study variables

- Category 1: Competition policy

VARIABLE	SOURCE	DEFINITION	MEASURE	PERIOD
Local competition	World Economic Forum	Intensity of competition in local markets	Ranges from 1 to 7: - 1: Null intensity - 7: Extreme intensity	2006-2011
Market dominance	World Economic Forum	Extending domination in markets	Ranges from 1 to 7: - 1: Dominated by a minority of business groups - 7: Domination spread around many firms	2006-2011
Antitrust effectiveness	World Economic Forum	Extent to which competition policy fosters competition.	Ranges from 1 to 7: - 1: Does not promote it - 7: Promotes it effectively	2006-2011
Business procedures	World Economic Forum	Number of procedures required to set up a business	Units	2006-2011
Business days	World Economic Forum	Number of days required to set up a business	Units	2006-2011
Trade barriers	World Economic Forum	Extent to which non-tariff barriers restrict the capacity of the goods imported to compete in the domestic market	Ranges from 1 to 7: - 1: Severe restrictions - 7: No restrictions	2006-2011
Economic freedom	Heritage Foundation	Assesses the economic freedom in an economy in accordance with four pillars: rule of law, restrictions on government, regulatory efficiency, and open markets	Ranges from 0 to 100: - 0: No economic freedom - 100: Total economic freedom	2006-2011
Business freedom	Heritage Foundation	Extent of freedom in business. It forms part of one of the pillars of economic freedom index	Ranges from 0 to 100: - 0: No freedom - 100: Total freedom	2006-2011

- Category 2: Innovation and R&D

VARIABLE	SOURCE	DEFINITION	MEASURE	PERIOD
Innovation capacity	World Economic Forum	Extent to which firms in a country have the capacity to innovate	Ranges from 1 to 7: - 1: Zero capacity - 7: Great capacity	2006-2011
Quality of research institutions	World Economic Forum	Quality of a country's scientific research institutes compared to the rest of the countries in the world	Ranges from 1 to 7: - 1: Amongst the worst in the world - 7: Amongst the best in the world	2006-2011
University-industry collaboration	World Economic Forum	The extent to which universities and firms cooperate in R&D	Ranges from 1 to 7: - 1: Zero cooperation - 7: Full cooperation	2006-2011
Scientists and engineers	World Economic Forum	Availability of scientists and engineers in a country	Ranges from 1 to 7: - 1: No availability - 7: Wide availability	2006-2011
Internet use	World Economic Forum	Individuals who use Internet	%	2006-2011
Internet subscriptions	World Economic Forum	Wideband Internet users	Units per 100 inhabitants	2006-2011
R&D	OECD	Total spending on R&D over GDP	% of GDP	2006-2011
R&D personnel	OECD	Employees in the R&D sector	Units per 1000 employees	2006-2011

- Category 3: Education

VARIABLE	SOURCE	DEFINITION	MEASURE	PERIOD
Duration of compulsory education	UNCTAD	Years of compulsory education in each country	Years	2006-2011
Public spending on education	World Development Indicators	Total public spending (current and capital) on education, expressed as a percentage of GDP in a given year	% GDP	2006-2011
School enrolment, tertiary	World Development Indicators	Total enrolment in tertiary education expressed as a percentage of the total population of the five-year age group following on from secondary school leaving.	%	2006-2011
Tertiary graduates	OECD	Graduates in tertiary education and advanced research programmes	Units	2006-2011

- Category 4: Culture

VARIABLE	SOURCE	DEFINITION	MEASURE	PERIOD
Public spending on culture	OECD	Public spending devoted to cultural and recreational activities	National currency, millions	2006-2011
Public spending on culture GDP	Authors' own based on OECD	Public spending devoted to cultural and recreational activities over GDP	% of GDP	2006-2011
Household spending on culture	Authors' own based on OECD	Household spending on cultural and recreational activities	National currency, millions	2006-2011
Household spending on culture/total spending	Authors' own based on OECD	Household spending on cultural and recreational activities over total spending	% of total spending	2006-2011
Household spending on culture GDP	Authors' own based on OECD	Household spending on cultural and recreational activities over GDP	% GDP	2006-2011
Film production	UNCTAD	Number of short films made in a country	Units	2006-2011
HICP index	EUROSTAT	Mean annual price index of cultural and recreational activities	Base index = 100	2006-2011
HICP index	EUROSTAT	Mean price variation rate of cultural and recreational activities	No variation = 0	2006-2011

- Category 5: Wealth

VARIABLE	SOURCE	DEFINITION	MEASURE	PERIOD
GDP	OECD	Gross national product of an economy or country	National currency, current prices, millions	2006-2011
Population	UNCTAD	Number of inhabitants in a country	Thousands	2006-2011
GDP pc	World Development Indicators	GDP divided by the country's population half way through the year	Current dollars (\$)	2006-2011
GINI index	OECD	Extent to which the distribution of an economy's income between individuals or households differs from a perfectly equitable distribution	Ranges from 0 to 100: - 1: Perfect equity - 7: Total inequity	2006-2010