

# Copyright Duration and the Supply of Creative Work: Evidence from the Movies

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September 2006

## *Abstract*

At various dates between 1991-2002, nineteen OECD countries extended the duration of copyright, typically from the author's life plus 50 years to author's life plus 70 years. We study the impact of the extensions on the production of movies.

We find that the extensions were associated with an increase in movie production ranging between 8.51% ( $\pm 4.60\%$ ) and 10.4% ( $\pm 4.89\%$ ). The increase was higher in countries where piracy was lower.

These findings were robust to various specifications, including concomitant changes in government funding of movie production.

The extension of copyright duration applied retrospectively to owners of existing film libraries and might have reduced their cost of capital. However, studios with larger libraries did not increase movie production relatively more than smaller studios.

Our results suggest that contrary to received thinking among leading economists and lawyers, extensions of copyright duration far in the future did have economically significant effects on the production of movies.

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## 1. Introduction

Generally, copyright law must strike a delicate balance between two considerations:

- Broader and longer protection increases the return to creators of new work, and in the long term, encourages more creative work;
- Narrower and shorter protection increases the use of existing creative work, and hence, raises the benefit to end-users and also facilitates new creations that build upon earlier work.<sup>1</sup>

There is no disagreement about the directions of these two considerations (Plant 1934; Nordhaus 1969; Gallini and Scotchmer 2002). However, debate on the trade-off has been controversial. Many scholars argue that the scope and duration of copyright were (are) already excessive (Hurt and Schuchman 1966; Lessig 2001; Boldrin and Levine 2002). Others argue in favor of more protection (Landes and Posner 1989; Miller 1995).

Within the debate on copyright law, a key issue is the impact of copyright law on the production of creative work. Effective 1995, the European Union extended the duration of copyright from author's life plus 50 years to author's life plus 70 years. Other European countries – members of the European Free Trade Area and applicants to join the EU – also extended copyright duration. In 1998, the United States followed and passed the Sonny Bono Copyright Term Extension Act (CTEA).

In 2002, the U.S. Supreme Court heard the *Eldred* case, which challenged the CTEA.<sup>2</sup> Seventeen distinguished economists, including five Nobel laureates, filed an *amici curiae* brief against the CTEA (Akerlof et al. 2002). The brief noted that, in present value terms, a 20-year increase in copyright term from author's life plus 50 years to author's life plus 70 years provided a very small return. Hence, the brief concluded that, "The CTEA's longer copyright for new works provides at most a very small additional incentive" for creation of new works. Further, the brief argued against the *retrospective* extension of duration to works already in existence.

In a trenchant criticism, Liebowitz and Margolis (2005) argued that Akerlof et al. (2002) had skirted the central issue: "The present value of additional revenues to authors might be heavily discounted (and small), but this need not imply that the impact of these

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<sup>1</sup> An alternative is to replace intellectual property rights with a system of rewards for inventors and creators (Shavell and van Ypersele 2001).

revenues on the creation of works is small ... The change in the number of new titles depends on the additional reward received by authors and on the elasticity of creation with respect to reward” (pp. 443, 445-446). They noted that, of a sample of 236 titles reviewed by *Book Review Digest* in the 1920s, 41% were still in print 58 years later.<sup>3 4</sup>

The controversies continue to rage in part because there has been very little systematic empirical evidence on either the long-term impact of copyright on the creation of new work or the short-term impact on the use and re-use of existing work. “In the formation of copyright policy, the lack of empirical data and the inability to quantify important variables ... preclude precise evaluation of the impact of any significant changes in the degree of copyright protection” (Bard and Kurlantzick (1999) page 3).

In this paper, we study a panel of twenty-six OECD countries over the period 1991-2002. During this time, twenty countries extended the duration of copyright, typically from author’s life plus 50 years to author’s life plus 70 years. We use the panel to address the key policy question: By exactly how much does an increase in copyright duration affect the creation of new work, specifically, movies?

We find that, on average, the extension of copyright duration was associated with an increase in movie production ranging between 8.51% ( $\pm 4.60\%$ ) and 10.4% ( $\pm 4.89\%$ ). Importantly, the increase in production was higher in countries with lower rates of piracy.

These findings were robust to various specifications. We measured the number of movie titles in two different ways – one adjusting for co-production among countries and the other excluding co-productions. In a sub-sample of several European countries, we included government funding of movie production, and still found that the extension of copyright duration was associated with higher movie production.

The extensions of copyright duration applied retrospectively and hence enriched studios with existing film libraries. With increased capital, these studios might have responded by investing in more movies. However, we found that studios with larger libraries did not increase movie production relatively more than smaller studios.

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<sup>2</sup> Eric Eldred et al., v. John D. Ashcroft, Attorney General, U.S. Supreme Court, No. 01-618.

<sup>3</sup> Landes and Posner (1989) offered a different justification for the extension of copyright duration: “a long trend toward lengthening the term of copyright ... is consistent with the fact that the cost of copying has fallen over this period” (page 363). By implication, the extension of copyright duration serves to compensate authors for income lost to improved copying technologies.

<sup>4</sup> See also Tor and Oliar (2002).

Our results suggest that contrary to received thinking among leading economists and lawyers, extensions of copyright duration far in the future did have economically significant effects on the production of movies.

## **2. Previous Research**

Surprisingly, despite the persistent controversy, there has been little empirical study of the impact of copyright on the production of creative work. The little extant work mostly provides only indirect evidence. We first review research into the impact of copyright duration on creators' earnings.

Under U.S. law, registration of copyright is not mandatory. However, the law provides an incentive for registration, as the owner must register (or, under the 1976 Copyright Act, apply to register) before the infringement or within three months of first publication if the owner seeks statutory damages and attorney fees.

Rappaport (1998) studied the commercial value in 1998 of movies first copyrighted in the period 1922-1941. He found two trends. More recently created movies were more likely to be still played commercially: the rate of commercial survival was 11% among movies created in 1926-1928, 40% among movies created in 1929-1932, and 65%, among movies created in 1933-1941. Further, more recently created movies were relatively more valuable: the average commercial value was \$175,000 among movies created in 1926-1930, \$250,000 among movies created in 1931-1934, and \$400,000 among movies created in 1935-1941.

Landes and Posner (2003) studied the pattern of renewals of registration with the U.S. Copyright Office during the period 1910-91. Until 1962, renewals were effective for an additional 28 years, while from 1962, the renewal was for 47 years. Generally, the renewal rate increased from a low of 3% in 1914 to a high of 22% in 1991, and the renewal rate was highest for music, lower for books, and lowest for graphic-arts works. Assuming that works were not renewed because the expected future earnings fell below the cost of renewal (\$10 plus the time and effort), Landes and Posner (2003) concluded that almost 80% of copyrighted works had little economic value after the initial term.

By contrast, Liebowitz and Margolis (2005) studied a sample of 236 titles reviewed by *Book Review Digest* in the 1920s. Fifty-eight years later, 41% were still in print.

In assessing the value of copyright protection, it is important to note that, at the

point in time where the creator incurs the cost of creative effort, she will not know whether her work will turn into a blockbuster. Hence, copyright and copyright registration should be valued as real options rather than absolute amounts.<sup>5</sup>

Second, we review research into the creators' elasticity of supply. For most of the 19<sup>th</sup> century, U.S. copyright law did not protect British authors. Then, in 1891, Congress passed the International Copyright Act, which extended copyright protection to foreign authors, and through reciprocal recognition, extended international copyright protection to U.S. authors. However, passage of the Act did not substantially affect the number of full-time authors in the United States (Khan 2004).<sup>6</sup>

Hui and Png (2002) studied the impact of the CTEA on U.S. production of movies. They found that the CTEA had a positive but insignificant effect. However, consultants to the motion picture industry criticized this study on two grounds: "relies upon such a small sample (11 years), with only two after the extension" and "ignores the significant lead time that movies require before production, and hence is likely to understate the incentives in the initial years after extension" (Allen Consulting Group (2003), page 27).

Landes and Posner (2003) studied the impact of the 1962 extension of copyright term and the 1998 CTEA on all U.S. copyright registrations between 1910 and 2000. They found that both changes had positive but insignificant effects: "It is not surprising that the term-extension variables (in 1962 and 1998) are insignificant; the expected commercial life of a copyrighted work is so much shorter than the copyright term that it makes a lengthening of the term irrelevant to most potential registrants" (Landes and Posner (2003), page 247). Three categories accounted for 70 percent of all registrations with the Copyright Office – books, music, and graphic arts. As noted above, these three categories varied in their expected commercial life. Further, as already mentioned, copyright registration is not compulsory.

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<sup>5</sup> Baker and Cunningham (2004) conducted an event study of changes in U.S. copyright law on the stock-market value of companies in copyright-related industries. They considered both case and statutory law, and found that increases in copyright protection were associated with an average US\$4 - 8.4 million increase in the market value of these companies.

<sup>6</sup> An important margin on which copyright law affects the supply of creative work is that between part- and full-time creative activity (Liebowitz and Margolis 2005). Towse (2001) observed that that: "Estimates suggest artists' elasticity of supply to arts work is high and so a relatively small financial reward ... can have a greater than proportionate impact on creativity". Unfortunately, no empirical evidence was provided.

Accordingly, the impact of copyright protection generally and the duration of copyright specifically on the creation of new work continues to be an open question.

### 3. Context

The Berne Convention specifies minimum durations of copyright as follows:<sup>7</sup>

“(1) The term of protection granted by this Convention shall be the life of the author and fifty years after his death.

(2) However, in the case of cinematographic works, the countries of the Union may provide that the term of protection shall expire fifty years after the work has been made available to the public with the consent of the author, or, failing such an event within fifty years from the making of such a work, fifty years after the making.”

On October 29, 1993, the Council of the European Union issued Directive 93/98/CEE to harmonize the term of exclusivity in copyright and related rights with effect from July 1, 1995.<sup>8</sup> In the case of literary, dramatic, musical and artistic works, the Directive specified a term of author’s life plus 70 years. In the case of audiovisual works, the Directive specified a term of 70 years following the death of the last survivor among the principal director, the screenplay and dialogue authors, and the music composer. Significantly, the extension of term applied *retroactively* to any existing work with copyright still in force.

At the time of the Directive, the copyright laws of Austria and Germany specified duration of the author’s life plus 70 years, which was the longest among the European Union (EU) member states. The Union decided to increase the duration elsewhere to match the copyright duration in Austria and Germany. Politically, this was the most convenient choice (Dworkin 1993). At various times between 1994-1997, the European Union member states revised their copyright laws to conform with the Directive.

The EU Directive had a broader impact, beyond the EU member states. Notably, pursuant to the Agreement on the European Economic Area of May 2, 1992, member states of the European Free Trade Area (EFTA) had to conform with the EU (Gotzen 1998).<sup>9</sup> In addition, the various Central and East European countries seeking admission to the EU, such as the Czech Republic, Hungary, Poland, and Slovakia, also had to conform.

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<sup>7</sup> Berne Convention for the Protection of Literary and Artistic Works (Paris Text 1971).

<sup>8</sup> Directive 93/98, *OJ* No. L 290 of 24 November 1993.

<sup>9</sup> Agreement on the European Economic Area of 2 May 1992 (*OJ* No. K 1 of 3 January 1994), Protocol No. 28.

Further, the United States also aligned its copyright duration with the European Union. In 1998, Congress passed the Sonny Bono Copyright Term Extension Act (CTEA), extending copyright duration to author's life plus 70 years.<sup>10</sup> U.S. copyright owners could then enjoy reciprocal extension of copyright duration in EU member countries. Applying leverage through free trade negotiations, the United States has pressed other countries to conform. Singapore and Australia complied in 2004.

Through extensive legal research, we compiled Table 1, which reviews legal changes, if any, with respect to the duration of copyright protection in 29 jurisdictions between 1991 and 2004.

Owing to data limitations, we confined our empirical analysis to the period 1991-2002 and Organisation for Economic Co-operation and Development (OECD) member countries. Referring to Table 1, the following nineteen OECD countries extended copyright duration during the period: Belgium, Czech Republic, Denmark, Finland, France, Greece, Hungary, Ireland, Italy, Netherlands, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States. The following seven OECD countries did not extend copyright duration during the period: Australia, Austria, Canada, Germany, Japan, Korea, and New Zealand.<sup>11</sup>

#### 4. Model

We model the production of creative work as being subject to monopolistic competition. Each creator  $i$  invests  $k_i Q_i$ , where  $k_i$  is the investment per work and  $Q_i$  is the number of titles created. The creator then receives revenue  $R_{it}(k_i, Q_i)$  in periods  $t = 0, \dots, T$ , where  $T$  is the last year of copyright protection. For simplicity, we assume that, upon expiry of copyright, the creator receives zero revenue. The cost of production is  $k_i Q_i$ . Further, let the time-discount factor be  $\delta_t$ , which possibly varies with time.

Suppose that the creator chooses  $k_i$  and  $Q_i$  to maximize the net present value,

$$\Pi_i = \sum_{t=1}^T \delta_t R_{it}(k_i, Q_i) - k_i Q_i . \quad (1)$$

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<sup>10</sup> Conveniently for the Disney Company, the CTEA went into effect on October 27, 1998, four years before the copyright on Mickey Mouse would have expired (Wasko 2001).

<sup>11</sup> In 1994, both Canada and New Zealand extended copyright duration but the extensions were minimal, so we ignored these.

The first-order conditions with respect to  $k_i$  and  $Q_i$  are, respectively,

$$\sum_{t=1}^T \delta_t \frac{\partial R_{it}}{\partial k_i} = Q_i, \quad (2)$$

$$\sum_{t=1}^T \delta_t \frac{\partial R_{it}}{\partial Q_i} = k_i. \quad (3)$$

With extension of copyright duration from  $T$  to  $T + e$ , the first-order conditions would become,

$$\sum_{t=1}^{T+e} \delta_t \frac{\partial R_{it}}{\partial k_i} = Q_i^*, \quad (4)$$

$$\sum_{t=1}^{T+e} \delta_t \frac{\partial R_{it}}{\partial Q_i} = k_i^*. \quad (5)$$

Comparing (2)-(3) with (4)-(5), the extension of copyright duration would lead to an increase in the profit-maximizing levels of both number of titles and investment per work. Note from (4)-(5) that, owing to the discount factor, each additional year of copyright protection increases the discounted revenue by a proportionately smaller amount, as emphasized by Akerlof et al. (2002).

In this study, we focus on the quantity produced, and associate “production” with the number of titles. Accordingly, by (2) and (4), our estimating equation is

$$\text{PRODUCTION} = f(\text{COPYRIGHT\_LAW}, X), \quad (6)$$

where  $X$  is a vector of other variables that might possibly affect the producer’s revenue over the duration of copyright.

## 5. Data and Specification

Copyrightable works include books, illustrations, photographs, sound recordings, audio-visual works, and software. Among these, so far as we are aware, audio-visual works is the only category about which there is comprehensive international information over a reasonable period of time. These are contained in the Internet Movie Database (“IMDb”).

The IMBb proclaims itself to be “Earth’s biggest movie database” and is sponsored by Amazon.com. The bulk of its information is submitted by industry members and website visitors. Indeed, about 70% of the IMDb staff is dedicated to processing the



information received and adding to the database. The database is segmented into “IMDb” and “IMDbPro”. Searches in the IMDbPro may exclude video games and short films, and hence are better defined.

Using the IMDbPro, we extracted information about various characteristics of movies created in the twenty-six OECD member countries during the period 1991-2002. To gauge the reliability of the IMDbPro, we compared it with the Film Index International, published by the British Film Institute, which also publishes movie data. The correlation between the movie data in the Film Index International and IMDbPro was 93%.

Referring to Table 2, for each country and year, we obtained information from the OECD and Euromonitor International’s Global Market Information Database about other national characteristics that might possibly affect the demand for movies and hence movie production – population, GDP per capita, and real interest rates.

We specified the model as a least-squares regression with the dependent variable being the number of movies created in that country-year, and the independent variables being an indicator variable of whether copyright law had been changed to extend duration (= 0 if not, = 1 if yes) and other variables that might possibly influence movie production. Among these other variables, to minimize multi-collinearity, all national aggregates other than population were specified on a per capita basis. All specifications included country fixed effects.

An immediate concern is that all of the changes in copyright duration were in the same direction. General changes in technology, such as digitization, and financial conditions, such as a secular fall in real interest rates, might have increased the incentive to produce movies at the same time as the extensions of copyright duration. Hence, any increase in movie production might be due to improvements in technology and easier financial conditions rather than the extended copyright duration.

We addressed this concern by including seven countries that did *not* extend copyright duration during the entire period of study. They serve to distinguish the impact of copyright extension from any contemporaneous changes in technology or financial conditions that might have also affected the incentive to produce movies.

-- Figure 1: Average number of co-producing countries per movie –

Another concern is that there was a secular trend in the movie industry towards

more international co-production, as illustrated by Figure 1, which shows the average number of co-producing countries per movie over the period 1991-2002. To account for this trend, we specified the dependent variable in two alternative ways – one was to adjust the number of movies by the number of countries of production, e.g., if a movie was produced in the U.S. and Germany, then it would contribute 0.5 to the number of movies created in the U.S. and Germany respectively for that year, while the other way was to disregard movies with co-production.<sup>12</sup>

Figure 2 illustrates the average movie production per capita, by country and year, with production adjusted by the number of countries of production.

-- Figure 2: Movie production per capita --

## 6. Results

We first applied a very simple approach, regressing the number of movies produced on GDP per capita, population, country fixed effects, a time trend, and the copyright law indicator. Table 3, column (a), reports the results. The coefficients of GDP per capita and population were positive and significant. The coefficient of the copyright law indicator was positive and significant. Based on the mean number of movies produced, 76.74, the increase in movie production associated with the extension of copyright duration was 10.4% ( $\pm 4.89\%$ ).

We next estimated a specification including one more explanatory variable – the real long-term interest rate. Unfortunately, data on real long-term interest rates were not available for half or more of the sample period for the Czech Republic, Greece, Hungary, Poland, Slovakia, and Turkey. This limited our sample to 251 including 23 countries. Table 3, column (b), reports the results. The coefficients of GDP per capita and population were positive and significant, but the coefficient of the real long-term interest rate was not significant. The coefficient of the copyright law indicator was positive and significant, albeit slightly lower than in specification (a).

One concern is that the extensions of copyright duration occurred together with changes in laws or regulations that improved the overall investment climate across the entire economy. Specifically, the European Union harmonized the copyright duration as

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<sup>12</sup> To collect the data, we queried the IMDbPro by country and year, and then matched movies by title. Accordingly, we could only adjust for co-production among the 26 countries in the sample.

part of its single-market initiative, and Central and East European countries extended their copyright duration in anticipation of joining the European Union. Hence, any increase in movie production might be due to market expansion rather than the extended copyright duration.

To control for these general economy-wide changes in the return to investment, we included an additional variable – per capita R&D expenditure. Any market expansion would have increased the incentive to invest in R&D as well as the incentive to produce movies, hence per capita R&D expenditure seems a reasonable moderating variable. Unfortunately, data on R&D expenditure was not available for Switzerland. This further reduced our sample to 239 including 22 countries.

Table 3, column (c), reports the results. The coefficients of GDP per capita and population were positive and significant, while the coefficients of the real long-term interest rate and per capita R&D expenditure were not significant. The coefficient of the copyright law indicator was slightly higher than in specification (a) and statistically significant.

The Motion Picture Association of America (MPAA) (2006) has vigorously denounced piracy: “Film theft has an enormous impact on filmmakers everywhere from New Zealand to South Africa jeopardizing the creative process and robbing local economies of the benefits derived from having a healthy film industry”. If copyright law is important to creators of movies, then, movie production should be lower where piracy is higher.

Unfortunately, we were unable to procure the relevant data on movie piracy from the MPAA or elsewhere. However, we managed to obtain music CD piracy rates from the International Federation of the Phonographic Industry (IFPI). In the next specification, we included the music CD piracy rate.

Table 3, column (d), reports the results. The coefficients of GDP per capita and population were positive and significant, while the coefficients of the real long-term interest rate and per capita R&D expenditure were not significant. Consistent with the MPAA’s pronouncement, the coefficient of piracy was negative and significant at the 87% level. As for our central issue, the coefficient of the copyright law indicator was slightly higher than in specifications (a) and (c), and statistically significant.

Besides directly affecting the production of movies, piracy should also have an

indirect effect through the extensions of copyright duration. Specifically, in countries where piracy is higher, the extension of copyright duration ought to have a smaller effect on movie production. Accordingly, in specification (e), we included another variable – the interaction of the copyright law indicator with the piracy rate.

Table 3, column (e), reports the results. Consistent with prediction, the coefficient of the interaction variable,  $-89.25 (\pm 50.86)$ , was negative and statistically significant. The mean piracy rate was 0.04507, with a standard deviation of 0.0635. Hence, in a country whose piracy rate is higher by one standard deviation, the impact of the extension of copyright duration would be lower by  $89.25 \times 0.0635 = 5.67$  movies. This result is quite compelling: apart from the incentive effect of copyright law, there seems to be no other good reason why extensions of copyright duration should have smaller effects in countries with higher piracy.<sup>13</sup>

Among specifications (a)-(e), the extension of copyright duration was associated with an increase in movie production ranging between 8.51% ( $\pm 4.60\%$ ) and 10.4% ( $\pm 4.89\%$ ).

To check the robustness of the results in Table 3, we also did the following. First, to account for the influence of possible outliers, we re-estimated specification (d) another 22 times, omitting one country in turn.<sup>14</sup> Figure 3 shows the effects of the extension of copyright duration on movie production with one country omitted in turn. Specifically, Figure 3 shows the estimated increase in movie production associated with the extension of copyright duration, and the corresponding 95% and 90% confidence intervals. Evidently, the result was robust to the exclusion of any one country.

-- Figure 3: Impact of copyright duration on movie production, excluding one country --

Second, we estimated specifications (a)-(e) with the dependent variable specified as all movies *excluding co-productions* rather than movies adjusted for co-productions. Table 4 reports the results. The coefficient of the copyright law indicator was positive and significant, and about the same magnitude as in Table 3. In specification (e), the coefficient of the interaction between the copyright law indicator and the piracy rate was

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<sup>13</sup> We also estimated a similar specification using IFPI statistics on music cassette piracy rather than music CD piracy, and obtained very similar results.

<sup>14</sup> Owing to missing data on the real interest rate for Hungary, Poland, and Turkey, and on R&D expenditure for Switzerland, the sample for specification (d) comprised only 22 countries.

negative and statistically significant at the 88% level.

Owing to the exclusion of co-productions, the mean movie production was lower than in Table 3. Hence, with similar magnitudes for the coefficient of the copyright law indicator, the estimated impact on movie production was larger. It ranged between 10.16% ( $\pm 3.88\%$ ) and 12.65% ( $\pm 5.23\%$ ).

By the results reported in Tables 3 and 4, we conclude that the extension of copyright duration was associated with a positive and statistically significant increase in movie production.

## **7. Other Explanations**

In light of the arguments put forth by Akerlof et al. (2002), our estimates of the increase in movie production associated with the extension of copyright duration might seem rather large.

What factors might we have overlooked? One criticism is that we ignored government policy specific to the movie industry. In particular, as part of national and regional cultural policy, European countries systematically targeted movie production with government funding and tax incentives (Lange and Westcott 2004; Haase 2005).

The only source of data on government incentives for movie production that we could find was the European Audiovisual Observatory's KORBA online database. However, this provides only information about government funding, and the coverage for the years prior to 1995, the year in which EU Directive 93/98/CEE took effect, is fragmentary. The KORBA database covers only Austria, Germany, and Poland from 1991 onward, and Denmark and France from 1994 onward.

Nevertheless, we repeated the regressions of specifications (a)-(e) on this more limited sample, with government funding as an additional explanatory variable. The regressions of specifications (b)-(e) excluded Poland as we did not have any information on its real interest rate.

Table 5 reports the results. In all specifications, government funding was associated with a positive and significant increase in movie production. With regard to our central issue, in all specifications, the extension of copyright duration was also associated with a positive and significant increase in movie production.

Another possible criticism of our results is that the extension of copyright duration might have affected the production of new movies through an indirect “capital effect”. The supply of capital is crucial to movie production (Vogel 2001). Generally, the extensions of copyright duration were retrospective, and so benefited owners of existing movies, especially those with copyright about to expire. The extension of copyright duration would have reduced their cost of capital, and might have induced them to increase investment generally, and specifically, in making movies.

While this alternative explanation is plausible, it seems to be inconsistent with the data. Figure 4 graphs the trends in the number of studios and the average number of movies produced per studio in the entire sample of 26 countries. The figure shows a secular decline in average production per studio and an upward trend in the number of studios.

-- Figure 4: Number of studios and average movie production --

Evidently from figure 4, any increase in movie production over time has mainly been the result of the entry of new studios, rather than increased production by existing studios. Yet, it is only the existing studios, and, in particular, those such as the Disney Company, with large libraries of old movies, that benefited from the retrospective extension of copyright duration. Figure 4 suggests that the increase in movie production cannot be explained by any capital effect.

The pattern in the U.S. movie industry was similar. Figure 5 depicts the average production of major vis-a-vis independent studios. The majors were Walt Disney, Universal Studios, 20<sup>th</sup>. Century Fox, Warner Brothers, Paramount Pictures, Sony Picture Studios, and New Line Cinema.<sup>15</sup> Clearly, the passage of the CTEA in 1998 did not induce the majors to increase movie production relative to other studios.<sup>16</sup>

-- Figure 5: U.S. studios: Average movie production --

Average production by the major studios, as depicted in Figure 5, seems rather low. Perhaps the major studios had outsourced production, while retaining control over distribution. To take account of any such structural changes in the movie industry, Figure

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<sup>15</sup> Metro-Goldwyn-Mayer was omitted because of its complicated history of merger and sale and repurchase of its film library.

<sup>16</sup> While these figures suggest that the wealth effect did not induce studios to increase movie production, it is still possible that the wealth effect led studios to increase their average investment per movie.

6 graph the trends in the average number of movies *distributed* by major and other studios for a longer period, starting in 1980 and ending in 2005. Among the majors, there was an increasing trend in the average number of movies distributed during the 1980s, but this stabilized in the low twenties by 1990, well before the CTEA was passed in 1998.

-- Figure 6: U.S. studios: Average movies distributed --

To further investigate the capital effect, we needed data on film libraries. The only relevant information that we could find were the sizes of film libraries of six majors – Disney, Fox, Paramount, Sony, Universal, and Warner – in the years 1994 and 1997 (Vogel 1994 and 1997). We then estimated specification (d) at the studio level, with an additional explanatory variable – the interaction between the indicator for the extension of copyright duration and the size of the studio’s film library in 1994 or 1997. The capital effect implies that the coefficient of this interaction term would be positive.

Table 6 reports the results. With the dependent variable being movie production (columns (k) and (l)), the coefficient of the copyright law indicator was not significant. Regarding the capital effect, the coefficient of the interaction between the copyright law indicator and studio’s film library size was not significant.

With the dependent variable being movie distribution (columns (m) and (n)), the coefficient of the copyright law indicator was positive but not significant. Regarding the capital effect, the coefficient of the interaction between the copyright law indicator and studio’s film library size was positive but not significant.

Based on Figures 4-6 and Table 6, we reject the explanation that the extension of copyright duration increased movie production by reducing the studios’ cost of capital.

## **8. Concluding Remarks**

From the experience of twenty-six OECD countries, of which nineteen extended the duration of copyright during the period 1991-2002, we found that the extension of copyright duration was associated with a significant increase in movie production.

The results were robust to alternative specifications, including controlling for the measurement of movie production and government funding of movie production. Further, the increase in movie production was not due to the retrospective extension of copyright duration increasing the supply of capital. The increase in movie production was due to the

entry of new studios, rather than expansion of production by existing studios.

We are left with the conclusion that the elasticity of movie production may be quite high. This would be consistent with Rappaport's (1998) observation that, in 1988, 65% of movies created over forty-five years earlier, in the period 1933-1941, still had commercial value of about \$400,000. It would also be consistent with the observation of Liebowitz and Margolis (2005) that, of a sample of 236 titles reviewed by *Book Review Digest* in the 1920s, 41% were still in print fifty-eight years later.

The most obvious direction for future work is to study the impact of changes in copyright duration on the production of other creative work such as books and sound recordings. What is the elasticity of production in these other creative activities?

The next direction for future work is to study the production of creative work more deeply, to better understand the intermediate links between copyright law and creative output. How does copyright law affect investment in creative activity on two margins – the number of titles and the investment in each title? And, how do these investments translate into the quantity and quality of creative output such as movies, books, and recorded music?

The other direction for future work is to measure the impact of copyright law on the use of existing creative work, and specifically, on the benefit to end-users and also investment in creations that build upon earlier work.

With the results from these studies, it would then be possible to gauge the fundamental trade-off in copyright law between the incentive to create new work and the loss from restricting use of existing work. However, the key challenge in all of these directions for future work is to acquire the relevant data.



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**Table 1: Changes in copyright duration, 1991-2004**

<b>Country</b>	<b>Effective year of copyright extension</b>	<b>Remarks</b>
<b>Australia</b>	2004	Copyright Legislation Amendment Act, 2004.
<b>Austria</b>	None	Copyright duration extended in 1972.
<b>Belgium</b>	1995	Law of 30 June 1994.
<b>Canada</b>	None	<i>De minimus</i> change in 1994: From author's life plus 50 years to author's life plus remainder of the calendar year of death plus 50 years.
<b>Czech Republic</b>	2000	Law No. 121/2000 Coll. of 7 April 2000.
<b>Denmark</b>	1995	L395 of 13 June 1995.
<b>Finland</b>	1995	Law No. 1654 of 22 December 1995.
<b>France</b>	1995	Law of 27 March 1997 s.L123-1.
<b>Germany</b>	None	Copyright duration extended in 1965.
<b>Greece</b>	1995	Law of 24 December 1997.
<b>Hong Kong (China)</b>	None	Author's life plus 50 years (Copyright Ordinance, Chapter 528, Section 19).
<b>Hungary</b>	1994	Act VII of 1994.
<b>India</b>	1992	Extended from 50 years from first publication to 60 years from first publication (Copyright Amendment Bill, 1992).
<b>Ireland</b>	1995	S.I. 158 of 1995.
<b>Italy</b>	1995	D. Lgs. N. 654 of 26 May 1997.
<b>Japan</b>	2003	Copyright Law of Japan, Article 54, which was passed on June 12, 2003.
<b>Netherlands</b>	1995	Law 652 of 21 December 1995.
<b>New Zealand</b>	None	<i>De minimus</i> change in 1994: Extended from 50 years from making to 50 years from <i>later of</i> making or first publication (Copyright Act, 1994).
<b>Poland</b>	2000	Amendment to the Act on Copyright and Neighboring Rights, which was passed on 9 June 2000.
<b>Portugal</b>	1995	D.L. 334/97 of 27 November 1997.

<b>Singapore</b>	2004	Intellectual Property (Miscellaneous Amendments) Act, 15 June 2004.
<b>Slovakia</b>	1997	Copyright Act of 5 December 1997.
<b>South Korea</b>	None	Author's life plus 50 years.
<b>Spain</b>	1995	Law of 12 April 1996.
<b>Sweden</b>	1995	Act on Copyright in Literary and Artistic Works, amended 7 December 1995.
<b>Switzerland</b>	1993	Copyright Act (July 1993).
<b>Turkey</b>	1995	Copyright Act (Consolidation), 05/12/1951 (07/06/1995), No. 5846 (No. 4110).
<b>United Kingdom</b>	1995	The Duration of Copyright and Rights in Performances Regulations (S.I. 1995 No. 3297).
<b>United States</b>	1998	Extended to 95 years from publication or 120 years from creation for audiovisual works made for hire (Sonny Bono Copyright Term Extension Act, 1998).

**Table 2: Descriptive statistics (26 countries)**

<b>Variable</b>	<b>Unit</b>	<b>Source</b>	<b>Mean</b>	<b>Min</b>	<b>Max</b>	<b>Std dev</b>
Movies	–	IMDB	90.51	2	1077	170.7
Movies excl. co-production	–	IMDB	66.57	0	927	146.1
Movies adjusted for co-production	–	IMDB	76.74	1	995.5	157.0
GDP	Million USD at PPP	GMID	847418	39998	10357362	1620041
Population	‘000	GMID	38691	3495	279807	54696
Real long-term interest rate <sup>1</sup>		IMF	0.04320	-0.03412	0.1506	0.02140
Copyright_Law	–	Table 1	0.5325	0	1	0.4998
R&D expenditure <sup>2</sup>	Million USD at PPP	OECD	20832	359.3	268368	46518
Piracy	%	IFPI	7.1%	0	48.53%	9.41%
Time	–	–	1996.57	1991	2002	3.43

## Notes:

1. Real long-term interest rate was calculated as long-term interest rate less year-to-year change in the consumer price index. The real interest rates of Czech Republic, Greece, Hungary, Poland, Slovakia, and Turkey were missing for some years.
2. Real long-term interest rate calculated as long-term interest rate less change in year-to-year the consumer price index.

**Table 3**  
**Movie Production (Adjusted for Co-productions)**

Independent variables	(a)	(b)	(c)	(d)	(e)
Constant	-1842*** (162.87)	-2142*** (175.77)	-2146*** (178.75)	-2145*** (179.29)	-2120*** (180.23)
GDP at PPP per capita	5.654*** (1.661)	1.875*** (0.643)	1.668*** (0.626)	1.585*** (0.608)	1.382** (0.634)
Population	0.01476*** (0.001363)	0.01770*** (0.001387)	0.01773*** (0.001395)	0.01772*** (0.001399)	0.01758*** (0.001403)
Real interest rate	n.a.	15.81 (38.07)	3.121 (51.52)	-10.73 (50.57)	-23.41 (50.88)
Copyright_Law	7.997** (3.756)	7.611* (4.115)	8.354* (4.368)	8.515* (4.385)	12.08** (5.241)
Piracy	n.a.	n.a.	n.a.	-39.73 (26.07)	27.86 (49.80)
Copyright_Law*Piracy	n.a.	n.a.	n.a.	n.a.	-89.25* (50.86)
R&D expenditure per capita	n.a.	n.a.	6.00 (13.85)	10.13 (14.01)	4.92 (12.95)
Time	-5.989*** (1.511)	-2.838*** (0.828)	-2.860*** (0.897)	-2.808*** (0.881)	-2.561*** (0.883)
Country fixed effects	Included	Included	Included	Included	Included
No. of observations	308	251	239	239	239
Adjusted-R <sup>2</sup>	0.9861	0.9913	0.9912	0.9912	0.9913
F-statistic	750.0	1058.1	997.7	962.5	936.7
Mean movie production	76.74	89.48	93.09	93.09	93.09
Mean Piracy	n.a.	n.a.	n.a.	n.a.	0.04507
Increase in movie production associated with extension of copyright duration					
	10.42% ** (±4.89%)	8.51% * (±4.60%)	8.97% * (±4.69%)	9.15% * (±4.71%)	8.66% * (±4.63%)

\*\*\*\* significant at 99.9%; \*\*\* significant at 99%; \*\* significant at 95%; \* significant at 90%.

Notes:

1. In column (b), some data are missing for Czech Republic, Greece, Hungary, Poland, Slovakia, and Turkey; in column (c), some data are missing for Australia, Czech Republic, Greece, Hungary, Luxembourg, New Zealand, Poland, Slovakia, Switzerland, and Turkey.
2. Japan was omitted from the country fixed effects.
3. Standard errors computed using White's (1980) heteroscedasticity adjustment.
4. Standard errors of the increase in movie production in the last row, columns (d) and (e), were calculated as  $\sqrt{\text{var}(b_1) + 2\mu \text{cov}(b_1, b_2) + \mu^2 \text{var}(b_2)}$ , where  $b_1$  and  $b_2$  are the coefficients of the copyright law indicator and the interaction of the copyright law indicator with the music CD piracy rate, and  $\mu$  is the mean rate of music CD piracy.

**Table 4**  
**Movie Production (Excluding Co-productions)**

Independent variables	(a)	(b)	(c)	(d)	(e)
Constant	-1689*** (153.15)	-1969*** (160.99)	-1981*** (164.26)	-1980*** (164.82)	-1958*** (165.64)
GDP at PPP per capita	5.089*** (1.489)	1.829*** (0.565)	1.549*** (0.516)	1.475*** (0.499)	1.295** (0.526)
Population	0.01358*** (0.001274)	0.01629*** (0.001269)	0.01636*** (0.001278)	0.01635*** (0.001282)	0.01623*** (0.001285)
Real interest rate	n.a.	1.458 (35.50)	-16.50 (46.95)	-28.69 (46.17)	-39.96 (46.68)
Copyright_Law	8.422** (3.485)	7.664** (3.844)	8.286** (4.070)	8.427** (4.087)	11.60** (4.922)
Piracy	n.a.	n.a.	n.a.	-34.96 (23.74)	25.09 (44.97)
Copyright_Law*Piracy	n.a.	n.a.	n.a.	n.a.	-79.31* (47.18)
R&D expenditure per capita	n.a.	n.a.	15.95 (12.98)	19.59 (13.25)	14.95 (12.28)
Time	-5.861*** (1.370)	-3.252*** (0.746)	-3.429*** (0.802)	-3.384*** (0.786)	-3.164*** (0.784)
Country fixed effects	Included	Included	Included	Included	Included
No. of observations	308	251	239	239	239
Adjusted-R <sup>2</sup>	0.9865	0.9916	0.9915	0.9915	0.9916
F-statistic	772.3	1091.0	1032.9	996.0	968.5
Mean movie production	66.57	72.57	75.45	75.45	75.45
Mean Piracy	n.a.	n.a.	n.a.	n.a.	0.04956
Increase in movie production associated with extension of copyright duration					
	12.65%*** (±5.23%)	10.56%** (±5.30%)	10.98%*** (±4.65%)	11.17%*** (±4.65%)	10.16%*** (±3.88%)

\*\*\*\* significant at 99.9%; \*\*\* significant at 99%; \*\* significant at 95%; \* significant at 90%.

Notes:

1. In column (b), some data are missing for Czech Republic, Greece, Hungary, Poland, Slovakia, and Turkey; in column (c), some data are missing for Australia, Czech Republic, Greece, Hungary, Luxembourg, New Zealand, Poland, Slovakia, Switzerland, and Turkey.
2. Japan was omitted from the country fixed effects.
3. Standard errors computed using White's (1980) heteroscedasticity adjustment.
4. Standard errors of the increase in movie production in the last row, columns (d) and (e), were calculated by same method as in Table 3.

**Table 5**  
**Movie Production and Government Funding**

Independent variables	(a)	(b)	(c)	(d)	(e)
Constant	495.5 (548.1)	-612.3 (745.3)	-151.1 (787.1)	-157.9 (798.4)	-253.7 (808.4)
GDP at PPP per capita	-1.272 (2.272)	6.913 (5.163)	9.513 (6.905)	9.571 (6.964)	8.548 (7.365)
Population	-0.00505 (0.00655)	0.007028 (0.008394)	0.001215 (0.009372)	0.001277 (0.009511)	0.002564 (0.009635)
Real interest rate	n.a.	-229.4 (165.4)	-241.9 (160.6)	-242.6 (164.2)	-232.0 (169.5)
Copyright_Law	16.52*** (4.518)	10.89* (6.216)	10.28** (4.721)	10.24** (4.891)	0.9751 (6.920)
Piracy	n.a.	n.a.	n.a.	50.95 (709.9)	-388.7 (650.0)
Copyright_Law*Piracy	n.a.	n.a.	n.a.	n.a.	535.1 (372.5)
R&D expenditure per capita	n.a.	n.a.	-82.18 (95.97)	-82.41 (97.52)	-45.28 (112.7)
Government funding	0.000514*** (0.0000897)	0.000482*** (0.0000943)	0.000479*** (0.0000954)	0.000478*** (0.0000970)	0.000488*** (0.000102)
Time	-1.523 (1.929)	-10.43** (5.102)	-10.40* (5.120)	-10.44* (5.156)	-10.44* (5.156)
Country fixed effects	included	included	included	included	included
No. of observations	54	42	42	42	42
Adjusted-R <sup>2</sup>	0.9724	0.9737	0.9657	0.9741	0.9744
F-statistic	172.1	131.5	116.5	102.5	92.08
Mean movie production	67.98	80.82	80.82	80.82	80.82
Mean Piracy	n.a.	n.a.	n.a.	n.a.	0.01792
Increase in movie production associated with extension of copyright duration					
	24.3%*** (±6.65%)	13.4%* (±7.69%)	12.7%** (±5.84%)	12.7%** (±6.05%)	13.1%** (±4.65%)

\*\*\* significant at 99%; \*\* significant at 95%; \* significant at 90%.

Notes:

1. Countries included: Austria, Germany, and Poland (column (a) only), 1991-2002; Denmark and France, 1994-2002. Germany was omitted from the country fixed effects.
2. Standard errors computed using White's (1980) heteroscedasticity adjustment.
3. Standard error of the increase in movie production in column (e), last row, was calculated by same formula as in Table 3.



**Table 6**  
**Major U.S. studios**

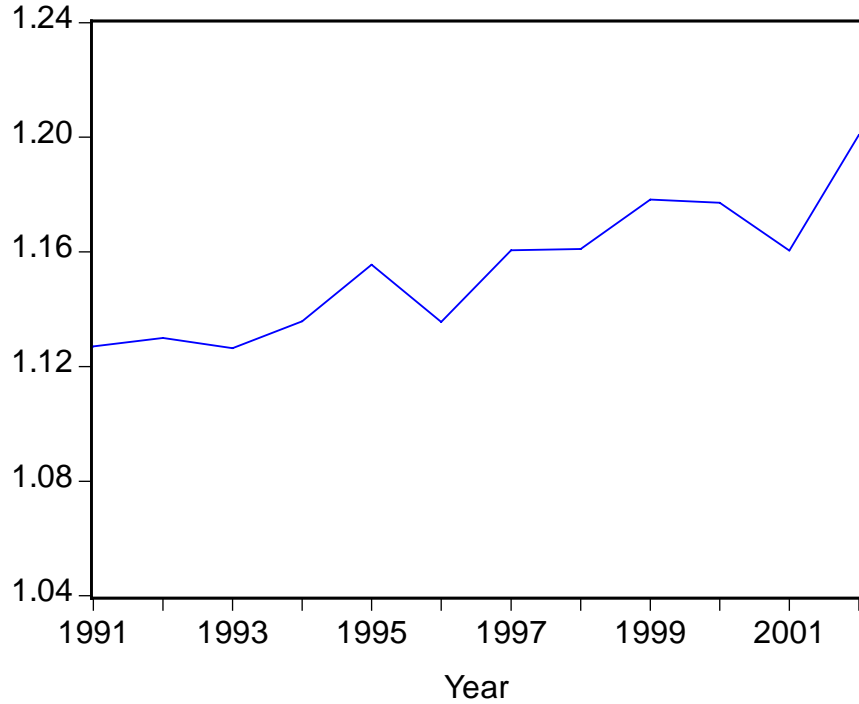
Independent variables	Dependent variable: Annual production		Dependent variable: Annual distribution	
	(k)	(l)	(m)	(n)
Constant	-639.7 (60.14)	-639.7 (602.0)	-480.2 (595.4)	-480.2 (603.9)
GDP at PPP per capita	-2.680 (3.309)	-2.680 (3.307)	-6.118 (4.371)	-6.118 (4.442)
Population	0.002709 (0.002370)	0.002709 (0.002377)	0.002311 (0.002265)	0.002311 (0.002299)
Real interest rate	73.76 (71.07)	73.76 (70.90)	98.10 (79.95)	98.10 (82.31)
Copyright _Law	1.448 (2.591)	1.305 (2.522)	2.838 (2.494)	3.692 (2.518)
Copyright _Law*Library_1994	-0.000541 (0.000705)	n.a.	0.000941 (0.000701)	n.a.
Copyright _Law*Library_1997	n.a.	-0.000341 (0.000444)	n.a.	0.000328 (0.000404)
Piracy	-32.90 (216.0)	-32.90 (217.4)	-373.1* (205.4)	-373.1* (213.3)
R&D expenditure per capita	29.18 (26.58)	29.18 (26.32)	47.67 (35.14)	47.67 (36.22)
Time	-4.514 (6.841)	-4.514 (6.808)	0.8959 (8.199)	0.8959 (8.311)
Studio fixed effects	included	included	included	included
No. of observations	72	72	72	72
Adjusted-R <sup>2</sup>	0.6796	0.6792	0.9271	0.9258
F-statistic	12.58	12.56	70.49	69.12

\*\*\* significant at 99%; \*\* significant at 95%; \* significant at 90%.

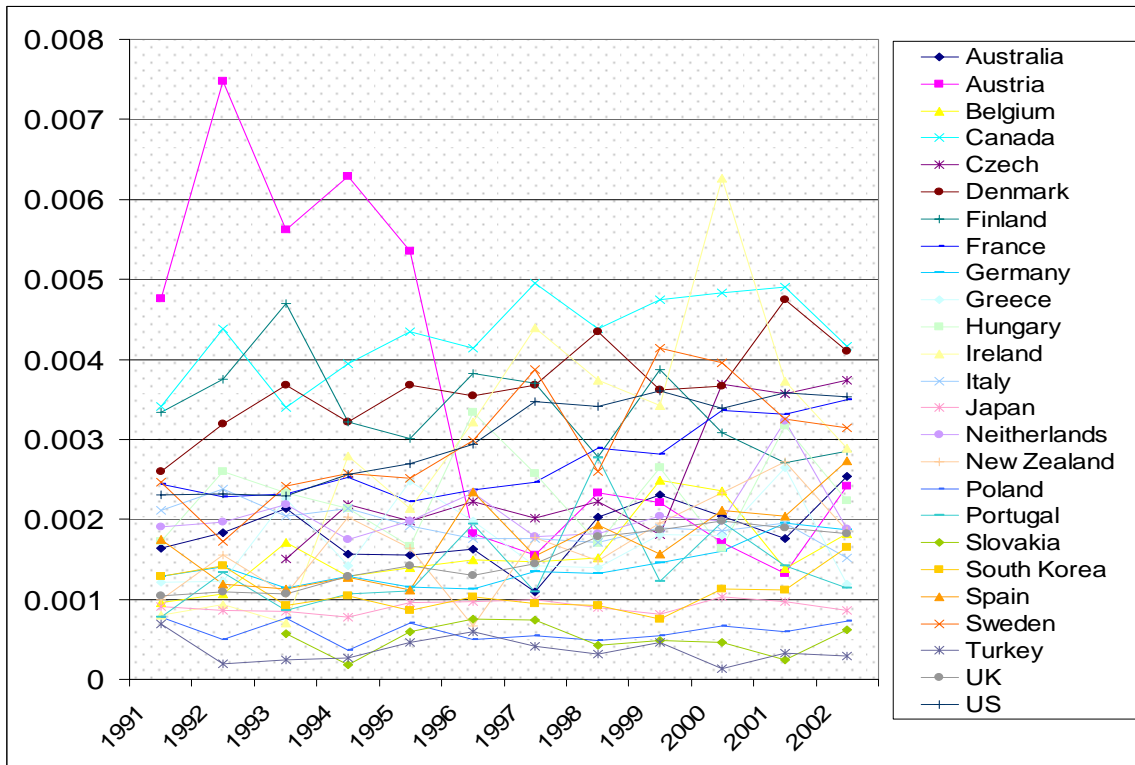
Notes:

1. Disney was omitted from the studio fixed effects.
2. Standard errors computed using White's (1980) heteroscedasticity adjustment.

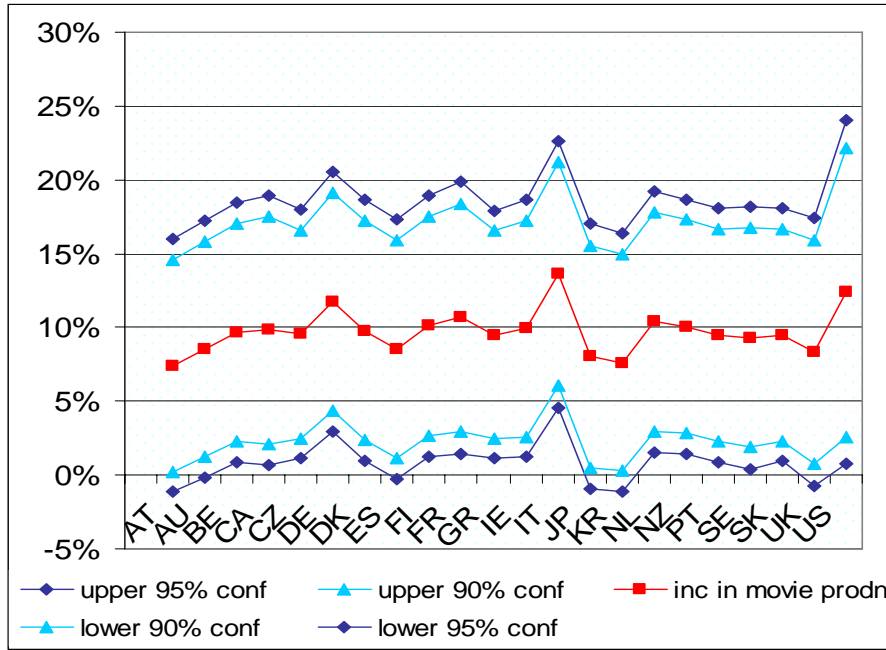
**Figure 1: Average number of co-producing countries per movie**



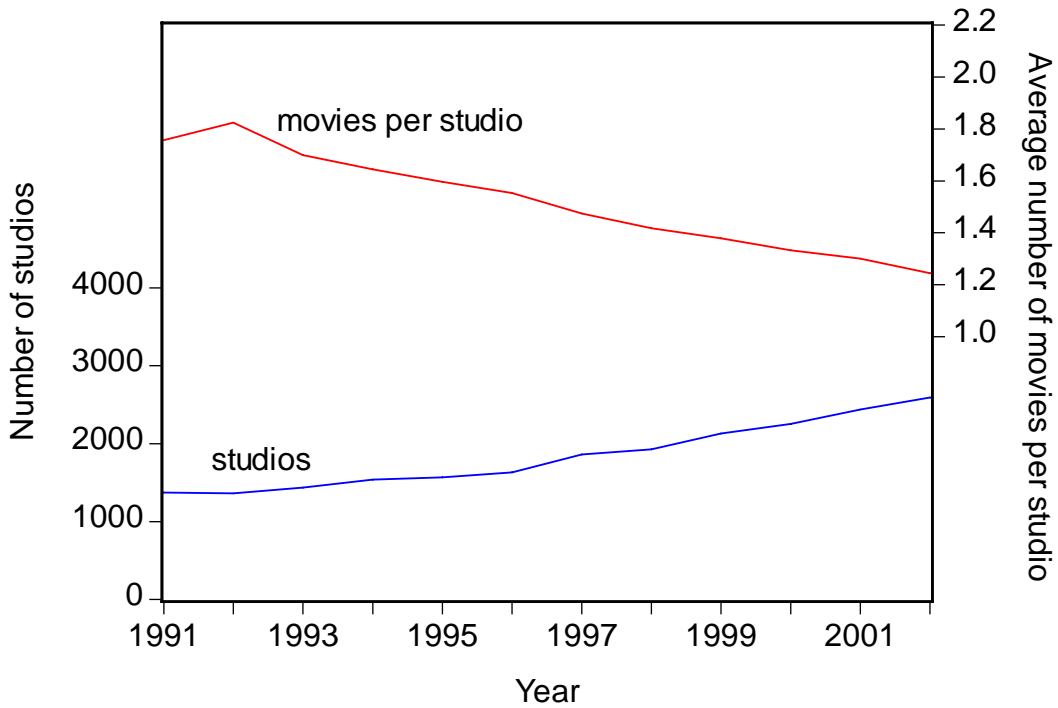
**Figure 2: Movie production per capita**



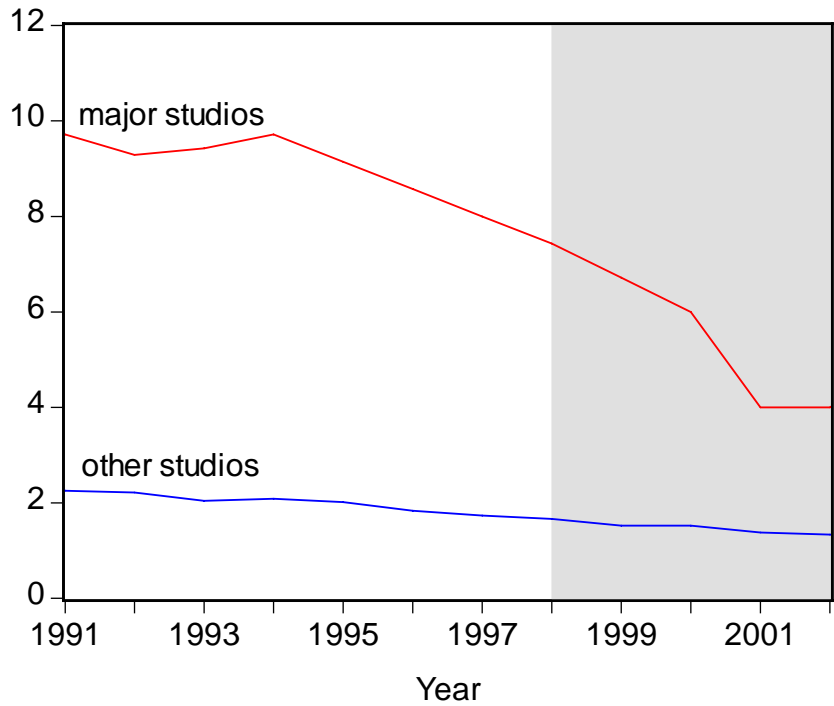
**Figure 3: Impact of copyright duration on movie production, excluding one country**



**Figure 4: Number of studios and average movie production**

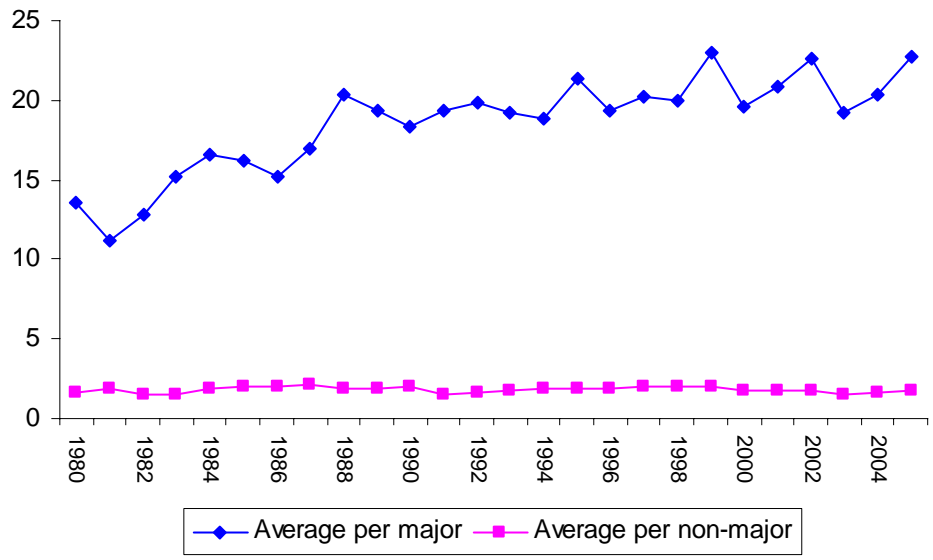


**Figure 5: U.S. studios: Average movie production**



Note: Without adjustment for co-production (between 1980-2005, only 26 of 21316 titles were associated with two companies)

**Figure 6: U.S. studios: Average movie distribution**



## **Appendix: Data**

1. Movie production (IMDbPro): Data for the Czech Republic and Slovakia were available only from 1993.
2. Real interest rates (IMF): Data for Hungary, Poland, and Turkey were missing for the entire period.
3. R&D expenditure (OECD): Data for Australia, Belgium, Denmark, Greece, Sweden and New Zealand were missing for every other year. For missing data, we used the expenditure for the previous year. Data for Switzerland were missing for the entire period.
4. Music CD piracy rates (IFPI): Data was available only from 1994-2000. For 1991-1993, we used the 1994 rates, while for 2001-2002, we used the 2000 rates.