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Effects of Oscar Awards on Movie Production

Betty Agnani and Henry Aray

Abstract

This article tests the effects of Oscar awards on the production of feature films. Time series data for Spain over the 1953–2014 period are used and a production function is estimated assuming that the Oscar effects accrue through the total factor productivity. A lag structure is introduced which allows for a general specification so that the Oscar awards could have constant or diminishing effects over time. The results show that the Oscar wins have significant positive effects on movie production and that some of them have caused structural breaks, while others have vanishing effects over time. The results are fairly robust to the introduction of control variables and different methods of estimation.

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Keywords Movie production; Oscar awards; Cobb-Douglas Production Function

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1 Introduction

The increasing academic research on the motion picture industry as collected in the surveys by Hadida (2008) and McKenzie (2012) reveals that researchers are typically interested in the exhibition of films, i.e. the financial performance of films or demand for cinema attendance. In fact, most of the articles summarized by McKenzie (2012) have to do with factors explaining the demand side or financial success of a film such as the role of stars, critics, reviews, awards, nominations, ratings and genres. Thus, many of them estimate demand functions. Hadida (2008) pointed out that many empirical illustrations of film performance are limited to total domestic box office revenues. Regarding production, contribution is, in general, limited to organizational and financial factors related to the production and distribution process.

Unlike the traditional literature, we focus on the supply side. Specifically, we are interested in testing what effects Oscar awards may have on the production of Spanish feature films.

In spite of the importance normally attributed to the Oscar awards in cinematography, there are no articles in the relevant literature that quantitatively measure their impact on movie production. However, the effects of Oscar nominations and awards have been tested on the financial success of a movie by Nelson *et al.* (2001), Deuchert *et al.* (2005), Hennig-

Thurau *et al.* (2007) and Lee (2009), who generally found positive effects.

It is well known that each year most Oscars go to US film producers, leaving the remainder of the world with a relatively low number of nominations and awards. Indeed, our interest in testing the effect of Oscar awards outside the US is justified precisely because the countries (other than the US) that are awarded Oscars vary across the years. An Oscar award could be more important for the industry of those countries than for the US industry itself. Moreover, winning an Oscar could be interpreted as a positive expectation in general by motion picture producers in such countries. In our specific case, domestic and foreign demand for Spanish films might be expected to rise, which would imply higher expected profits for the domestic industry. Therefore, producers should be prepared to satisfy that increasing demand. Furthermore, winning an Oscar may also be important in that it could attract not only foreign investment to the domestic industry, but also foreign technology. Simonton (2004) pointed out that Oscar awards provided meaningful information about cinematic creativity and achievement. In fact, a country that wins an Oscar could be thought to be endowed with skill factors in the movie industry. Related to this or not, the international trend in movie production shows an increase in films made by more than one country as pointed out by Hoskins *et al.* (1997), who highlight the increase in co-productions between Europe and Canada; and by McCalman (2004), who claims that higher foreign direct investment in the movie production industry leads to increased collaboration between countries.

This article is related to Agnani and Aray (2010), who used panel data regression to test the effects of subsidies and international awards on Spanish movie production. They found that awards positively affect the productivity of the movie production industry, while subsidies have no effect. However, this article differs from Agnani and Aray (2010) in four important aspects. First, it focuses specifically on the Academy Awards (Oscars) due to the paramount importance typically attributed to them around the world. Winning an Oscar contributes to the worldwide impact of a film more than any other award by producing not only an increase in box office revenues as pointed out in the above literature, but might also attract funds and technology to the industry through new sponsors, producers or partners. Therefore, this is precisely the contribution of this paper, to look for an Oscar effect on the supply side instead of the demand side. Second, although a production function is also estimated, in this article we use time series data of total feature film production rather than panel data. Third, the time series approach allows us to consider that the impact of an Oscar award on movie production could be constant and persistent or vanishing over time. We therefore specify a sufficiently general model with a lag structure that permits us to determine the decay rates of each Oscar effect. And fourth, we control for the main changes in legislation as suggested by the history of the Spanish cinema industry and for the impacts of television and video.

The empirical results can be summarized as follows. Strong and robust evidence supporting the existence of positive Oscar effects on Spanish movie production is found. The general specification proposed in this article suggests that some Oscars might have caused structural breaks in the industry, while others might have had vanishing effects.

The rest of the paper is organized as follows. In the following section an overview of the data is presented. In the third section, we specify the econometric model to be estimated. Section 4 presents the main results. The robustness check of the model is shown in Section 5. Finally, conclusions are presented in Section 6.

2 Overview of Data

Our data were drawn from the *Estadísticas de Cine y Audiovisuales* (Cinema and Audiovisual Statistics) report published by the Spanish Ministry of Education, Culture and Sport. We concentrate on the 1953-2014 period using annual data on the total production of feature films. Therefore, we include Spanish films and films produced jointly with foreign partners (co-productions).

According to the Spanish Ministry of Education, Culture and Sport, a film is considered a "Spanish film" if it is made by a Spanish or European firm located in Spain, which fulfills the following requirements: 75 percent of the authors (director, screenwriter, director of photography and music composer), players and the rest of the artists, as well as the creative and technical staff must be Spanish citizens, European Union citizens or citizens of any other European state holding an agreement with the European Union Economic Area, or have a Spanish residency permit or a residency permit of any of these states. In any case, the director of the film must fulfill such requirements. Moreover, the language of the films should be Spanish or any other official language of Spain. The filming, except screenwriting, postproduction and laboratory work must be carried out in the European Union.

According to the Spanish Ministry of Education, Culture and Sport, a film is said to be a co-production with one partner whenever the share of the Spanish participation is 20 to 80 percent of the production cost of the film. Moreover, in the case of multiple partners, participation must be 10 to 70 percent. In addition, the participation of artists and technical staff must be proportional to the economic participation. In general, economic participation must not exceed 50 percent.

Table 1 shows the basic statistics for the series of number of feature films and firms involved in film production. As can be seen, Spain produces, on average, 108 films per year with a deviation of 46 films. On average, 74 completely Spanish films are produced with a deviation of 33, while there are 34 co-productions on average with a standard deviation of 21. Regarding firms involved in the production of films, the mean is 92 with a deviation of

67.

Figure 1 plots the evolution of Spanish movie production and shows the year (shaded) of Oscar awards. It can be observed that the production of films has fluctuated considerably over time. We plot the total production and disaggregate it into completely Spanish films and co-productions. In general, most of the films produced in Spain were completely Spanish films; a trend that has grown in recent years. In fact, total production and completely Spanish production followed a similar pattern over the sample period, while co-productions followed a different pattern. After joining the European Union, Spain became a more open country, although co-productions have not increased on a par with completely Spanish productions.

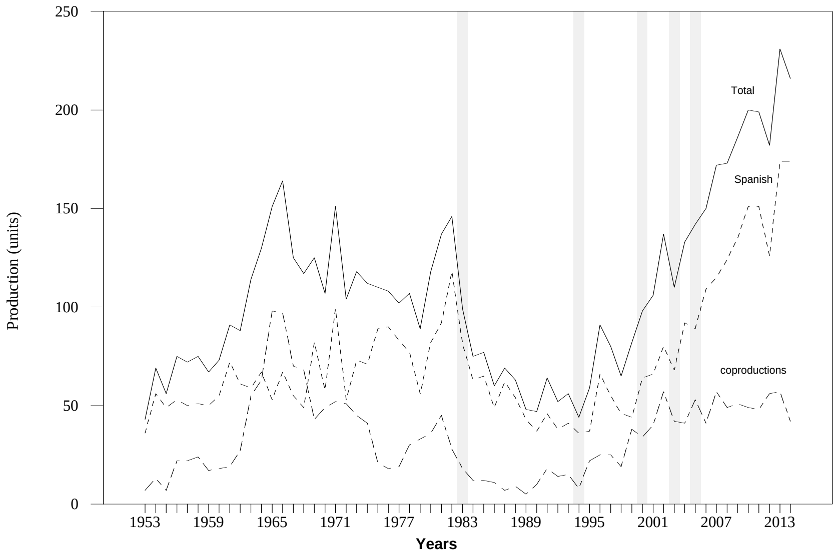

Figure 1. Evolution of the Spanish Production of Feature Films.

According to Figure 1, the series of production of feature films are suspected to have unit roots. Therefore, we perform unit root tests considering the following specifications

$$Y_t = C + \rho Y_{t-1} + \mu_t$$

$$Log\left(Y_t\right) = C^* + \rho^* Log\left(Y_{t-1}\right) + \mu_t^*$$

Where Y_t is the production of feature films in each period t, C and C^* are constants, and μ_t and μ_t^* are random disturbances. Table 1 shows the

Dickey-Fuller (DF) test, which assumes that disturbances are *iid*, and the Phillip-Perron (PP) test, which typically turns out to be more powerful since it allows for serial correlation. All τ-statistics are higher than the critical value at the 5% level of significance. Therefore, we cannot reject the null hypothesis of existence of unit roots. In fact, the series are stationary at taking the first difference.[1] Table 1 also shows unit root tests for series of number of firms which is also stationary at taking the first difference.

3 The Econometric Model

Let us consider a Cobb-Douglas production function as follows

$$Y_t = A_t N_t^{\alpha} \tag{1}$$

where Y_t is the total number of feature films produced in each period t, N_t is the combined input of physical capital and labor in t, α is the output elasticity of the input N_t, which is expected to be positive. We consider that the physical capital and labor inputs grow at the same rate of N_t. Even though this is actually a very strong assumption, it is a sound one.[2] A_t measures the total factor productivity in t, which is the portion of output

[1] We also carried out regressions introducing a linear trend and obtained similar results.

[2] In fact, if the production function is specified as $Y_t = A_t K_t^{\gamma} L_t^{\delta}$, where K_t are units of physical capital and L_t are units of labor, and we rewrite $Y_t = A_t N_t^{\alpha}$, it can be noticed that $N_t^{\alpha} = K_t^{\gamma} L_t^{\delta}$. Therefore, if physical capital and labor inputs grow at the same rate and are equal to the growth rate of N_t, $\Delta Log\left(N_t\right) = \Delta Log\left(K_t\right) = \Delta Log\left(L_t\right)$, we obtain that $\alpha = \gamma + \delta$.

not explained by the amount of inputs used in production.[3] A_t captures any variable other than the input N_t that affects the production of films. Therefore, we consider that the effects of Oscar awards accrue through the total factor productivity. Moreover, A_t could capture other aspects such as the institutional and legal characteristics of the sector and could even be affected by the value of the previous period A_{t-1}, which allows us to specify a convenient form for A_t as follows

$$A_t = A_{t-1} e^{\left(\delta + D'_{1t} B_1 + D'_{2t} B_2 + D'_{3t} B_3 + \varepsilon_t\right)} \quad (2)$$

where δ is a constant term, D_{1t} is a $(n \times 1)$ vector of dummy variables that takes the value of one in the following year in which the industry wins an Oscar and zero otherwise, and B_1 is a vector of the parameters that capture the Oscar effects only in those single years. The Spanish industry is said to have won an Oscar when the film that won the award is officially recognized worldwide as a Spanish film and fulfills the definition of the Spanish Ministry of Education, Culture and Sport. Therefore, we do not include Oscar awards given to films produced in other countries with Spanish participation. Thus, the Oscars awarded to *The Secret in Their Eyes* and *Pan's Labyrinth* are not included despite Spanish participation, since the Academy considered them Argentinean and Mexican films, respectively.[4] Moreover, since we only

[3] Agnani and Aray (2010) assume that A_t is an augmenting input factor.

[4] Indeed, the films' directors, Juan José Campanella (*The Secret in Their Eyes*) and Guillermo del Toro (*Pan's Labyrinth*), did not fulfill the requirements for the films to be

include Oscar awards given to a Spanish film as defined above, we do not consider the Oscar awards of Spanish talents. Hence, we have not included the Oscars awarded to Javier Bardem in 2008 or Penélope Cruz in 2009 since they starred in foreign films. We also disregard Spanish films nominated for an Oscar. On the one hand, an Oscar award is assumed to impact more than an Oscar nomination. On the other hand, considering Oscar nominations would mean having to introduce at least 15 more dummies, which would make the parameter estimates unstable due to the lack of degree of freedom. Therefore, in the sample period considered, the Spanish motion picture industry as included here won four Oscars in the category of "Best Foreign Language Film" and one in the category of "Best Writing, Original Screenplay", thus $n = 5$. The award-winning films are as follows:[5]

- *To Begin Again*, José Luis Garci (1983), Best Foreign Language Film. The dummy variable takes the value of one in 1984 and zero otherwise.

- *Belle Epoque*, Fernando Trueba (1994), Best Foreign Language Film. The dummy variable takes the value of one in 1995 and zero otherwise.

- *All About My Mother*, Pedro Almodóvar (2000), Best Foreign Language Film. The dummy variable takes the value of one in 2001 and zero otherwise.

recognized as Spanish films since they were Argentinian and Mexican, respectively and they were neither Spanish nor European residents.

[5] Notice that the year we take into account is the year in which the award is announced and not the year of the corresponding Oscar event, which is the previous year.

- *Talk to Her*, Pedro Almodóvar (2003), Best Writing, Original Screenplay. The dummy variable takes the value of one in 2004 and zero otherwise.

- *The Sea Inside*, Alejandro Amenábar (2005), Best Foreign Language Film. The dummy variable takes the value of one in 2006 and zero otherwise.

D_{2t} is a $(m \times 1)$ vector of dummy variables to control for the effects of government reforms aimed at the cinema industry and B_2 is a vector that captures such effects. In order to avoid multicollinearity, we only introduce major changes in the legislation provided for in acts and other legal forms which are suggested by the history to have had the greatest impact in the industry. Typically, legislation changes aim at promoting, protecting and supporting domestic film production. Therefore, we consider $m = 7$ taking into account the following major reforms:

- Ministerial Order of August 19th 1964 (MO 1964). The dummy variable takes the value of one from 1965 to 1971.[6]

- Royal Decree 3304/1983 of December 28th (Miró Act). The dummy variable takes the value of one from 1984 to 1989.[7]

[6] The subsidy policy of this ministerial order was abolished in 1971.
[7] This was repealed by Royal Decree 1282/1989 of August 28th.

- Royal Decree1282/1989 of August 28th (RD 1282/1989). The dummy variable takes the value of one from 1990 to 1996.[8]

- Act 17/1994 of June 8th. The dummy variable takes the value of one from 1994 to 2001.

- Act 15/2001 of July 9th. The dummy variable takes the value of one from 2002 to 2007.[9]

- Royal Decree 1652/2004 of July 9th (RD 1652/2004). The dummy variable takes the value of one from 2005 to 2014.[10]

- Act 55/2007 of December 28th. The dummy variable takes the value of one from 2008 to 2014.[11]

Note that if the law was enacted (repealed) in the first semester of the year, the dummy variable takes the value of one (zero) from that year, otherwise it takes the value of one (zero) from the following year.

D_{3t} is a $(p \times 1)$ vector of dummy variables with $p = 3$ to proxy the impact of television and video. From the demand side, these two activities work as substitutes for cinema attendance, as pointed out by Fernández-Blanco and Baños-Pino (1997). From the supply side, several effects could arise.

[8] This was repealed by Royal Decree 1039/1997 of June 27th.

[9] Act 15/2001 repealed Act 17/1994.

[10] This was modified by Royal Decree 1588/2012 of November 23rd and repealed by Royal Decree 988/2015 of October 30th.

[11] Act 55/2007 repealed Act 15/2001 and remains in force.

Television, on the one hand, can compete for resources with movie production which would impact negatively. On the other hand, a positive effect of television on movie production can be given by the fact that the former can foster movie production since TV programming demands products to fill screen time and, as pointed out above, television can also move resources to movie production as established under Spanish legislation. Regarding the effect of video, it could have been seen as the opening up of a new target market. However, we should not overlook the fact that the video industry also has given rise to other competitors to movie producers, namely video game producers who have captured and increasing share of the market in recent years. Therefore, the effects of television and video is not so clear. To construct the dummy variables, we followed Fernández-Blanco and Baños-Pino (1997), who pointed out that television became more popular in Spain in the 1980s due to the end of the state television monopoly in 1984 and the creation of new regional television channels, and later in 1989 when private television channels were launched. Therefore, the dummy variable capturing the effect of television takes the value of zero until 1984 and one from 1985 onwards. Regarding video, Fernández-Blanco and Baños-Pino (1997) pointed out that although VCRs first appeared in 1980 in Spain, they expanded on a large scale from 1983. Therefore, the influence of video is introduced by means of a dummy variable which takes the value of zero until 1983 and the value of one onwards. Additionally, and considering a similar argument as above, we introduce digital television since it has enlarged the TV supply, especially in terms of movies and, of course, movies produced in Spain. Let us call Digital TV a dummy variable that takes the value of one from 2004 onwards.

Finally, ε_t is a random disturbance.

Taking the natural logarithm to equation (1) we obtain

$$Log\left(Y_t\right) = Log\left(A_t\right) + \alpha Log\left(N_t\right)$$

As shown in the previous section, the series Y_t and $Log\ (Y_t)$ have a unit root. Therefore, in order to avoid spurious regression, we consider

$$\Delta Log\left(Y_t\right) = \Delta Log\left(A_t\right) + \alpha \Delta Log\left(N_t\right) \tag{3}$$

Substituting (2) in (3) and rewriting we obtain

$$\Delta Log\left(Y_t\right) = \delta + D'_{1t}B_1 + D'_{2t}B_2 + D'_{3t}B_3 + \alpha \Delta Log\left(N_t\right) + \varepsilon_t \tag{4}$$

A drawback to the specification in equation (4) is that the Oscars would have constant effects only in the years after the announcement, but no effects for the rest of the sample period. However, Oscar awards could be expected to have lagged effects since production might react slowly to such awards. Therefore, to overcome this drawback, we incorporate a simple lag structure *à la* Koyck (1954) into the equation (4), which allows for a more general model

$$\Delta Log\left(Y_t\right) = \delta + \sum_{k=0}^{K} D'_{1t-k}B_{1,k} + D'_{2t}B_2 + D'_{3t}B_3 + \alpha \Delta Log\left(N_t\right) + \varepsilon_t \quad (5)$$

where $B_{1,k} = \Pi B_{1,k-1} = \Pi^2 B_{1,k-2} = ... = \Pi^k B_{1,0}$ with Π being a $(n \times n)$ diagonal matrix showing the decay rates of the distributed lag structure and whose value falls in the interval $[0, 1]$.

In order to estimate the equation (5) for values of the diagonal components of matrix Π in the interval $[0, 1]$, we construct the vector of auxiliary variables, $V'_{1t} = \sum_{k=0}^{K} D'_{1t-k}\Pi^k$,[12] and rewrite the equation (5) as follows

$$\Delta Log\left(Y_t\right) = \delta + V'_{1t}B_{1,0} + D'_{2t}B_2 + D'_{3t}B_3 + \alpha \Delta Log\left(N_t\right) + \varepsilon_t \quad (6)$$

Notice that we consider a single lag structure, K, for the five dummy variables included in D_{1t} and know that the Oscar is awarded on different dates. Thus, it is natural to think that each dummy variable in D_{1t} should have its own lag structure. However, it is straightforward to see that with the specification of the dummy variables, whenever we consider a lag structure that is equal to or larger than the total lag structure of the Oscar for 1983, we obtain the same vector of the auxiliary variables, V_{1t}. In fact, our model can even be interpreted as having an infinite lag structure since we know

[12] See Appendix.

that the dummy variables take the value of zero before the beginning of our sample period.

The specification of the equation (6) is general enough since it allows each Oscar award to have a different persistent effect over time due to the parameters included in vector $B_{1,0}$ and the decay rates included in Π. Although the parameters included in $B_{1,0}$ are equal, the Oscar effects could evolve differently over time due to the different decay rates in Π. Conversely, if the decay rates are equal, the effects could evolve differently over time due to the different parameters included in $B_{1,0}$.

It can be also noticed that equation (6) nests the opposite cases of Oscar effects only in the years after the announcement, and fully persistent constant Oscar effects over time. Thus, whenever $K = 0$, we have the model of the equation (4) with $V_{1t} = D_{1t}$ and $B_{1,0} = B_1$.[13] On the other hand, if all the components of the diagonal of the matrix Π are equal to one, the vector of auxiliary variables, V_{1t}, becomes a vector of dummy variables that take the value of one from the period following the year in which the industry wins an Oscar to the end of the sample period, and zero otherwise. In this case, the effects of the Oscars are constant over time and persist forever. Thus, whenever any of the components of the diagonal of the matrix Π is in the interval $(0, 1)$, the effect of the Oscar award associated to that component will be decreasing over time, which is a plausible case, since it recognizes the

[13] Mathematically, in the specific case of $K = 0$ and $\Pi = \mathbf{0}_{nxn}$, we have an indetermination since we obtain 0^0. However, we know that whenever $K = 0$, $V_{1t} = D_{1t}$.

lagged effects of an Oscar award, but it also considers that such effects could vanish over time.

We have to estimate the parameters in vectors $B_{1,0}$, B_2, B_3, δ, and α for the different combinations of the decay rates included in Π.

4 Estimation Issues

Assuming that the industry produces with a combined input of physical capital and labor is actually a very strong assumption and therefore deserves an explanation. When attempting to perform the econometric estimation, we encounter a problem: data for physical capital and labor inputs are not available. In order to overcome this problem, we have to rely on proxies and make very restrictive assumptions. Therefore, we propose two different measures to proxy N_t. Since it is true that the greater the number of firms in the industry, the higher the physical capital and labor employed in producing films, the number of firms can be thought of as an input that combines the physical capital and labor input in the industry. Let N_t^0 be the number of Spanish firms with positive production in the industry in each period t. This assumption is supported by the fact that about 80 percent of the production in the Spanish movie industry is done by firms that only produce one film. In the history of the Spanish film industry, however, there have been several examples of firms that were created only to produce one specific film or directors who created a firm only to produce their own films. Hence, it is difficult for the variable number of firms to show heterogeneity across firms. Therefore, correlations with the error term might be expected. In order to overcome this problem, we propose the following adjusted variable:

$$N_t^1 = \sum_{i=1}^{3} n_{it} e^{x_i w_i} \qquad \text{for } i = 1, 2, 3 \tag{7}$$

where

$$w_i = \frac{\sum\limits_{t=1995}^{2014} n_{it}}{\sum\limits_{t=1995}^{2014} N_t^0} \qquad \text{for } i = 1, 2, 3$$

And n_{it} is the number of firms that produce x_i films each year. Thus, n_{1t} is the total number of firms that produced only one film ($x_1 = 1$) in year t, n_{2t} is the total number of firms that produced between 2 and 4 films in year t (we consider, $x_2 = 3$) and n_{3t} is the total number of firms that produced more than 5 films ($x_3 = 5$) in year t.[14]

Notice that w_i, for $i = 1, 2, 3$, are weights that were calculated using data for the 1995-2014 period when data for the groups of firms are available. Thus, we use those weights for the entire period of estimation. In line with that, the actual values of n_{1t}, n_{2t} and n_{3t} for the 1953-1994 period are not available. In order to overcome this problem, we proxy the values for each year t of the period as follows:

[14] Notice that for n_{2t} we use the central point of the interval of production in this group, that is, $x_2 = 3$. For n_{3t} we use the lowest value of the interval of this group, $x_3 = 5$, since we understand that most of the Spanish firms included in this group are not large enough to produce more than five films on average.

$$n_{it} = w_i N_t^0 \qquad \text{for } i = 1, 2, 3 \text{ and } 1953 \leq t < 1995$$

The equation (7) states that the combined input of physical capital and labor is the summatory of three kinds of inputs, thus allowing us to account for heterogeneity in the industry. In fact, each input, n_{it}, is augmented by an exponential factor that is precisely what allows for firms' heterogeneity when considering their relative weights in the industry.

Moreover, we should not neglect the participation of foreign partners that contribute physical capital and human resources to the industry. Therefore, we have to adjust N_t^1 in order to include the foreign input as follows

$$NC_t^1 = N_t^1 \left(1 + WC_t\right) \tag{8}$$

where

$$WC_t = \frac{\text{Number of co-productions in period } t}{\text{Total production in period } t}$$

According to (8), foreign partners contribute an additional input equivalent to the share of the number of co-productions on the total film production.

We therefore show estimations for the two proxies of the combined input given by N_t^1 and NC_t^1.[15]

[15] We also run regressions using N_t^0 and other alternative measures such as $N_t^2 = N_t^0 e^{\left(\sum_{i=1}^3 x_i w_i\right)}$, $NC_t^2 = N_t^2 \left(1 + WC_t\right)$, $N_t^3 = N_t^0 \left(\sum_{i=1}^3 x_i w_i\right)$ and $NC_t^3 =$

The parameters of equation (6) are estimated using maximum likelihood estimation controlling for heteroskedasticity and autocorrelation by means of a covariance matrix *à la* Newey and West (1987) and considering increments of 0.1 in the components of the diagonal of the matrix Π in the interval $[0, 1]$. Since equation (6) has many parameters to be estimated with respect to the available number of observations, we propose an estimation procedure that involves including groups of variables in each step. Thus, we include a constant, the combined input and the Oscar variables in the first step of the estimation procedure. In the second step, we add the variables capturing legislation. In the third step, we delete the non-significant variables controlling for legislation in the second step and add the variables that capture the effects of television and video. Finally, in the fourth step, we deleted the non-significant control variables of the estimation in the third step and reestimated the model including only the significant ones. In using this procedure, the maximum number of parameters that we estimated were 16. However, the total number of parameters that would have to be estimated if we included all explanatory variables at once would be 19. An additional advantage of this procedure is that it allows showing the robustness of the Oscar effects as the control variables are included. Thus, for each proxy for the combined input N_t and in each step we carry out 161,051 (11^n) regressions and choose the one which provides the highest value of the

$(1 + WC_t)\, N_t^3$. Most of the empirical results hold. Available upon request.

maximum likelihood function.[16]

Table 2 shows the estimation of equation (6) for $N_t = N_t^1$. According to the criterion pointed out above and looking at the final step of the estimation procedure (fifth column), we obtain that the components of the diagonal of Π are $(0.2, 1, 1, 1, 1)$, i.e. the decay rates for each Oscar are $\pi_{1983} = 0.2$ and $\pi_{1994} = \pi_{2000} = \pi_{2003} = \pi_{2005} = 1$. All the estimated coefficients of the Oscars have positive signs and are significant at any conventional level, except the Oscar for *To Begin Again*. It can be noticed that the Oscar effects are fairly robust to the inclusion of the control variables. The decay rates for the significant ones suggest that the Oscars have constant effects over time and persist forever. Thus, those Oscars can be interpreted as having caused structural breaks in Spanish movie production. The highest Oscar effect is that of *Talk to Her* (0.1378), followed by the Oscar for *Belle Epoque* (0.0659), *All About My Mother* (0.0388) and *The Sea Inside* (0.0261).

Table 3 shows the estimation of equation (6) for $N_t = NC_t^1$. The components of the diagonal of Π are $(0.4, 0, 0.6, 0.4, 1)$. The estimated coefficients of the Oscars for *Talk to Her* and *The Sea Inside* have positive signs and are significant at any conventional level with decay rates $\pi_{2003} = 0.4$ and $\pi_{2005} = 1$, respectively. Therefore, the positive effect of the Oscar for *Talk to Her* vanishes at a moderate rate, while that of *The Sea Inside* suggests

[16] GLS regressions were also carried out with very similar results (available upon request). The criterion was the highest R^2. Nevertheless, the maximum likelihood estimator is the efficient one since V_{it} is a vector of generated regressors.

a structural breaks in Spanish movie production. The Oscars for *To Begin Again* and *All About My Mother* are not significant at any conventional level. And we have found an unexpected result for the Oscar for *Belle Epoque* since that the estimated coefficient is negative and significant at any conventional level. However, notice that the decay rate is $\pi_{1994} = 0$, which suggests that the negative effect arises only in the first year. Again, results are fairly robust to the inclusion of the control variables. Changes with respect to the results in Table 2 can be seen in all decay rates, except for *The Sea Inside*. The highest Oscar effect in the first period is again that of *Talk to Her* (0.1826), followed by the Oscar for *The Sea Inside* (0.1281).

According to the results of Tables 2 and 3, we can say, in general, that Oscar awards have positive impacts on the production of films.

Figure 2 plots the Oscar effects over time for those which are significant with positive signs. In the upper illustration we show the case when $N_t = N_t^1$. Since the decay rates are $\pi_{1994} = \pi_{2000} = \pi_{2003} = \pi_{2005} = 1$, the effects are constant over time. In the lower figure, we show the case when $N_t = NC_t^1$. It is important to note the constant effect of *The Sea Inside* and the rapidly vanishing effect of *Talk to Her* since $\pi_{2003} = 0.4$. In fact, the median lag of *Talk to Her* is -0.7565, meaning that 50 percent of the total Oscar effect is conveyed in about one year.[17] After that, the rest of the effect vanishes quickly over time and in about 5 years it is very close to zero.

[17] The median lag of the Koyck model is $-log\left(2\right)/log\left(\pi_{\tau}\right)$ where τ denotes the years of Oscar wins.

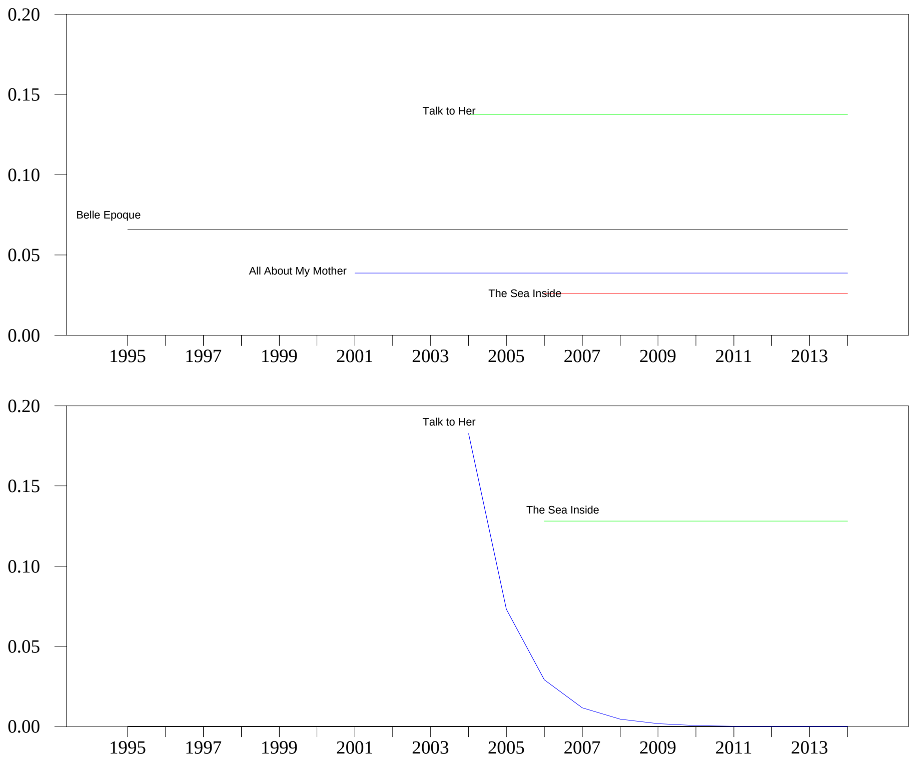

Figure 2. Oscar effects over time.

Our lag structure allowed us to estimate the total Oscar effects over time, which can be calculated as

$$\sum_{k=0}^{\infty} B_{1,k} = (I_{n\times n} - \Pi)^{-1} B_{1,0}$$

where $I_{n\times n}$ is an $(n \times n)$ identity matrix. This can also be understood as a long-term multiplier.

According to Table 2, when N_t^1 is used as proxy of N_t, we can conclude that the Oscars for *Belle Epoque*, *All About My Mother*, *Talk to Her* and *The Sea Inside* have infinitive positive total effects on movie production, since their effects are constant and persistent over time. Nevertheless, the Oscar for *To Begin Again* had no effect.

According to Table 3, when NC_t^1 is used as proxy of N_t, we can again conclude that the Oscar for *The Sea Inside* has an infinitive positive total effect on movie production, since its effect is constant and persistent over time. Nevertheless, the negative effect of the Oscar for *Belle Epoque* and the positive effect of the Oscar for *Talk to Her* have had limited impacts on movie production. In fact, we can calculate their total effects, which are -0.0758 and 0.3044, respectively. Finally, the Oscar for *To Begin Again* and *All About My Mother* had no effect. Recall that such total effects depend on both the estimated coefficients and the decay rates.

As we pointed out above, winning an Oscar could be interpreted as a positive expectation in general by motion picture producers in countries other than the US. Demand for Spanish films might be expected to rise, which would imply higher expected profits for domestic producers. Therefore, the results suggest that an Oscar award proves to be an incentive to increase production in such countries. Much more importantly, an Oscar award affects the total factor productivity of the sector since it allows for an increase in output, which is not explained by an increase in inputs as pointed out by Agnani and Aray (2010). Therefore, policies aimed at improving the competitiveness of domestic films in very relevant international film competitions such as the Oscars could increase the number of awards won, which would positively impact the general production of domestic films and in turn have positive consequences for the industry. Moreover, Oscar awards have made it easier for Spanish talents such as Antonio Banderas, Penélope Cruz, Javier Bardem or Alejandro Amenábar, among others, to break into Hollywood; an event which is assumed to have benefitted the Spanish cinema industry as a whole.

Tables 2 and 3 show that the proxies (N_t^1 and NC_t^1) for the combined input (N_t) have positive effects on production as expected. The coefficients are significant at the 1% level. Table 2 also suggests that the production function of the Spanish motion picture industry exhibits constant returns to scale when using N_t^1. This is due to the fact that we test the hypothesis $H_1 : \alpha = 1$ (p-values in parentheses) and are unable to reject it at any conventional level. This is in line with Agnani and Aray (2010). Nevertheless, this result is weaker when using NC_t^1 as can be seen in Table 3, since the null hypothesis of constant returns to scale would be rejected at the 10% confidence level.

Regarding the effects of cinema industry reforms, in Table 2 we found that only 3 out of the 7 variables controlling for the effects of legislation turn out to be significant and with negative signs. They are Act 15/2001, Royal

Decree 1652/2004 and Act 55/2007. Similar results were found in Table 3 where it can be noticed that only 4 out of the 7 variables controlling for the effects of legislation are significant. Negative effects are found for Act 15/2001, Royal Decree 1652/2004 and Act 55/2007. However, a positive significant effect is found for Act 17/1994. These results are very striking. In spite of the movie industry being protected and largely financed through public funds, the results of the model specification suggest that the legislative actions taken by the government have had prevalently negative effects on movie production.

Notice that both Table 2 and Table 3 show similar results regarding video and television effects, which are significant at any conventional level. We found video to have a negative effect on movie production. Although this is a surprising result at first glance, since videos created a new target market for movie producers, we already pointed out above that videos, as a substitute of cinema attendance, can produce a negative effect on the demand side of the cinema market with similar consequences on the supply side. Moreover, videos have also given rise to movie producer competitors, such as video game producers. This might suggest that part of the resources formerly devoted to developing technology and producing feature films have been targeted at producing video games. On the other hand, we found the popularization of television (TV) in Spain to have a positive effect. As we pointed out above, television is clearly a substitute for cinema attendance. However, it can also act as a producer in the movie industry, since it needs products to fill screen time or simply to comply with the legislation on targeting resources to produce feature films. The results for digital television (Digital TV) show a negative effect in Table 2 and no effect in Table 3.

Tables 2 and 3 also show the estimate of the variance parameter (σ^2) which is significant at any conventional level and in all the steps of the estimation procedure.

Finally, note that our specification accounts for about 66% of the variability of the dependent variable when using N_t^1 and 63% when using NC_t^1, thus suggesting good fits for the model.

5 Robustness Check

5.1 Controlling for any others events that occurred in the following years of Oscar wins

Since the variables that capture the Oscar effects stem from a vector of dummy variables that takes the value of one in the following year in which the industry wins an Oscar and zero otherwise, it is likely that other events could have occurred in these years which also affect movie production. For instance, in the years 2003 and 2005, two of the greatest hits in the history of the Spanish film industry were screened: *Mortadelo and Filemon: The Great Adventure* and *Torrente 3*. Therefore, these events could have also stimulated Spanish movie production in 2004 and 2006, respectively. Additionally, negative events in those years could have also affected movie production. In order to control for events like these or any others events that could have also stimulated or discouraged movie production, we reestimate the specification of the fifth column of Table 2 and Table 3 and introduce a dummy variable that takes the value of one the years following Oscar wins and zero otherwise.[18,19] The results are shown in Table 4. When N_t^1 is used as the combined input, the decay rates of *To Begin Again* and *Belle Epoque* fall slightly to $\pi_{1983} = 0.1$ and $\pi_{1994} = 0.9$, respectively, while the others remain the same. The significance of the Oscar effects changes only in the case of the Oscar for *Belle Epoque*, which is significant at the 5% level instead of the 1% level of Table 2. The dummy for the following years of Oscar wins is negative but not significant at any conventional level. When NC_t^1 is used as the combined input, the decay rates of *To Begin Again*, *Belle Epoque* and *All About My Mother* rise to $\pi_{1983} = 1$, $\pi_{1994} = 0.1$ and $\pi_{2000} = 1$. However, the decay rate of *Talk to Her* and *The Sea Inside* drastically decrease to $\pi_{2003} = \pi_{2005} = 0$. Moreover, all Oscar effects turn out to be positive and statistically significant at the 1% level. The dummy for the following years of Oscar wins is negative and significant at any conventional level, thus suggesting that there were more events that discouraged than stimulated movie production in these years. Although the Oscar effects are still fairly

[18] Thus, this variable takes the value of one in 1984, 1995, 2001, 2004 and 2006.

[19] Since the case of all decay rates equal zero is not a solution in our estimation procedure, there is not a perfect multicollinearity problem.

significant and positive in general, different decay rates are found, suggesting that the some Oscar effects vanish faster over time and others never vanish, as can be especially seen in the lower illustration of Figure 3. Therefore, in general, the results are stronger than the previous section.

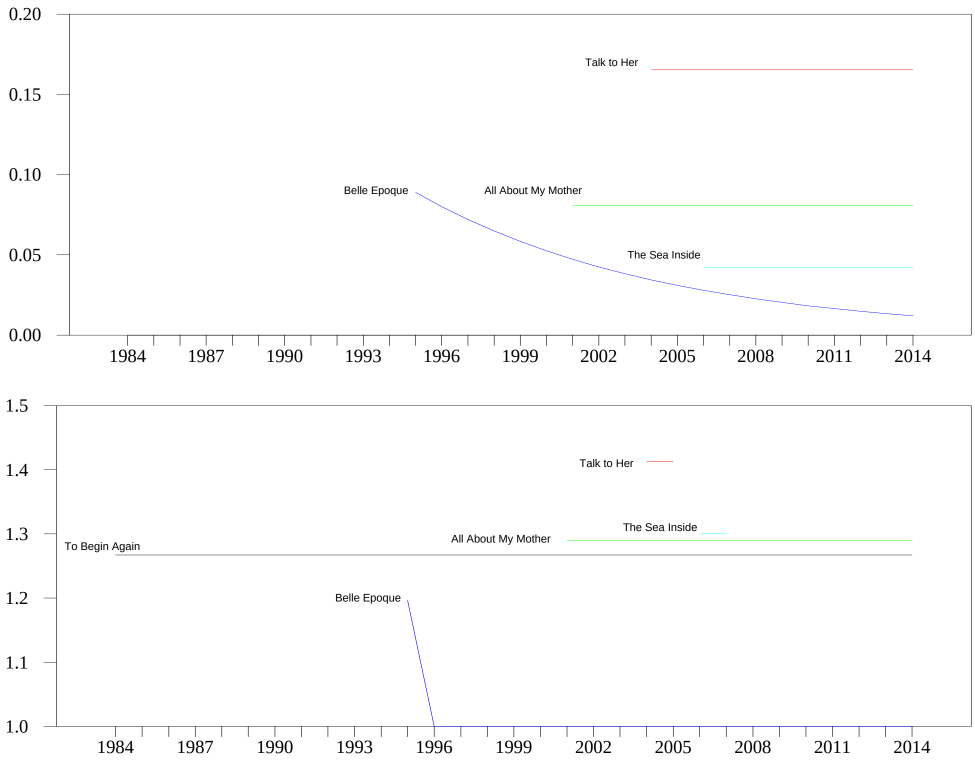

Figure 3. Oscar effects over time.

5.2 Controlling for Endogeneity

The proxies used for the combined input could introduce endogeneity problems. We therefore reestimate only the previous specification by two-stage least squares (2SLS). The results are shown in Table (5).[20] Some changes can be seen. However, the evidence in favor of positive Oscar effects hold, although they are weaker. When N_t^1 is used as the combined input, 3 out of the 5 Oscar wins turn out to be significant: *All About My Mother* and *Talk to Her* at the 1% level and *The Sea Inside* at the 10% level. When NC_t^1 is used as the combined input, all Oscar wins turn out to be significant. Notice also in Table (5) that most of the estimations for the controller are significant in both cases.

The Hausman endogeneity test shows unusual results since it turns to be negative, which could be interpreted as meaning that no endogeneity problems were found. Moreover, the results for the Sargan test show that the instruments were valid.

6 Conclusions

This article tests the effect of awards on movie production. We use the Oscars since they are considered to be the most important awards worldwide. We

[20] The instruments in the second column were $\Delta Log\left(N_{t-1}^1\right)$, $Log\left(N_{t-1}^1\right)$, and the rest of explanatory variables in such a column. Anagously, the instruments in the third column were $\Delta Log\left(NC_{t-1}^1\right)$, $Log\left(NC_{t-1}^1\right)$, and the rest of explanatory variables in the same column.

estimate a production function using time series data on the production of Spanish feature films and considering a lag structure that allows the Oscars to have constant or diminishing effects over time.

We show strong evidence supporting the existence of positive Oscar effects on the productivity of Spanish movie production. The general specification proposed in this article suggests that some Oscars might have caused structural break in Spanish movie production. Strikingly, reforms in the Spanish film industry have generally had no effects or negative effects. The results are fairly robust to different measures of the input of the production function, methods of estimations and the introduction of control variables.

Appendix

We have that

$$\sum_{k=0}^{K} D'_{1t-k} B_{1,k} = \sum_{k=0}^{K} D'_{1t-k} \left(\Pi^k B_{1,0}\right) \qquad \text{A.1}$$

Let us define the vector of Oscar, D_{1t-k}, the vector of parameter, $B_{1,0}$, and the matrix Π as

$$D_{1t-k}=\begin{bmatrix} d_{1t-k} \\ d_{2t-k} \\ d_{3t-k} \\ d_{4t-k} \\ d_{5t-k} \end{bmatrix} \quad B_{1,0}=\begin{bmatrix} b_{10} \\ b_{20} \\ b_{30} \\ b_{40} \\ b_{50} \end{bmatrix} \quad \Pi = \begin{bmatrix} \pi_1 & 0 & 0 & 0 & 0 \\ 0 & \pi_2 & 0 & 0 & 0 \\ 0 & 0 & \pi_3 & 0 & 0 \\ 0 & 0 & 0 & \pi_4 & 0 \\ 0 & 0 & 0 & 0 & \pi_5 \end{bmatrix}$$

where d_{1t-k} is a dummy variable for the Oscar won in 1983, d_{2t-k} for that of 1994, and so on. The same applies for $B_{1,0}$ and Π.

Substituting in A.1 we obtain

$$
\begin{aligned}
\sum_{k=0}^{K} D'_{1t-k}\left(\Pi^k B_{1,0}\right) &= \sum_{k=0}^{K} \begin{bmatrix} d_{1t-k} & d_{2t-k} & d_{3t-k} & d_{4t-k} & d_{5t-k} \end{bmatrix} \times \\
& \left(\begin{bmatrix} \pi_1 & 0 & 0 & 0 & 0 \\ 0 & \pi_2 & 0 & 0 & 0 \\ 0 & 0 & \pi_3 & 0 & 0 \\ 0 & 0 & 0 & \pi_4 & 0 \\ 0 & 0 & 0 & 0 & \pi_5 \end{bmatrix}^k \begin{bmatrix} b_{10} \\ b_{20} \\ b_{30} \\ b_{40} \\ b_{50} \end{bmatrix} \right) \\
&= \sum_{k=0}^{K} \left(d_{1t-k}\pi_1^k b_{10} + d_{2t-k}\pi_2^k b_{20} + d_{3t-k}\pi_3^k b_{30} + d_{4t-k}\pi_4^k b_{40} + d_{5t-k}\pi_5^k b_{50} \right) \\
&= \left(\sum_{k=0}^{K} \begin{bmatrix} d_{1t-k} & d_{2t-k} & d_{3t-k} & d_{4t-k} & d_{5t-k} \end{bmatrix} \begin{bmatrix} \pi_1 & 0 & 0 & 0 & 0 \\ 0 & \pi_2 & 0 & 0 & 0 \\ 0 & 0 & \pi_3 & 0 & 0 \\ 0 & 0 & 0 & \pi_4 & 0 \\ 0 & 0 & 0 & 0 & \pi_5 \end{bmatrix}^k \right) \times \\
& \begin{bmatrix} b_{10} \\ b_{20} \\ b_{30} \\ b_{40} \\ b_{50} \end{bmatrix} \\
&= \left(\sum_{k=0}^{K} D'_{1t-k}\Pi^k \right) B_{1,0} = V'_{1t} B_{1,0}
\end{aligned}
$$

where $\sum_{k=0}^{K} D'_{1t-k}\Pi^k = V'_{1t}$.

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Table 1: Preliminary Data Analysis: 1953-2014 period

Basic statistics	Total	Spanish	Co-productions	Firms
Sample Mean	108.2258	73.9839	34.2419	91.8548
Standard Deviation	45.7245	33.3213	21.1208	66.5291
Unit Root TestS				
$Y_t = C + \rho Y_{t-1} + \mu_t$				
DF	-1.1727	-1.1331	-2.2669	1.2375
PP	-1.1924	-1.1522	-2.3050	1.2583
$Log\left(Y_t\right) = C^* + \rho^* Log\left(Y_{t-1}\right) + \mu_t^*$				
DF	-1.9392	-2.145	-2.6194	-0.7921
PP	-1.9718	-2.1810	-2.6634	-0.8054

$P(\hat{\tau} < -3.22) = 0.025,\ T = 50.\ P(\hat{\tau} < -3.17) = 0.025,\ T = 100.$

Table 2: Estimation of the Equation (6)

Using N_t^1 as the input in the production function				
Variable	Estimation 1	Estimation 2	Estimation 3	Estimation 4
	$\Pi_1 = diag\,(1, 0.8, 0, 0, 1)$	$\Pi_1 = diag\,(0, 0.9, 1, 1, 1)$	$\Pi_1 = diag\,(0.9, 1, 1, 1, 1)$	$\Pi_1 = diag\,(0.2, 1, 1, 1, 1)$
Constant	0.0091	0.0056	0.0139	0.0136
	(0.0151)	(0.0159)	(0.0152)	(0.0138)
$\Delta Log\left(N_t\right)$	0.8097***	0.8143***	0.7824***	0.7889***
	(0.1325)	(0.1524)	(0.1667)	(0.1589)
Oscar_83	-0.0547*	-0.0477***	0.0697*	0.0135
	(0.0325)	(0.0003)	(0.0390)	(0.0441)
Oscar_94	0.0936	0.0861**	0.0708***	0.0659***
	(0.0970)	(0.0395)	(0.0174)	(0.0169)
Oscar_00	0.0877***	0.0549***	0.0435***	0.0388***
	(0.0292)	(0.0120)	(0.0118)	(0.0113)
Oscar_03	0.0763***	0.1343***	0.1410***	0.1378***
	(0.0291)	(0.0038)	(0.0047)	(0.0036)
Oscar_05	0.0374	0.0303***	0.0272***	0.0261***
	(0.0547)	(0.0054)	(0.0065)	(0.0053)
MO 1964		0.0121		
		(0.0640)		
Miró Act		-0.0486**	-0.0392	
		(0.0236)	(0.0516)	
RD 1282/1989		-0.0253		
		(0.0207)		
Act 17/1994		-0.0397		
		(0.0267)		
Act 15/2001		-0.1858***	-0.1381***	-0.1419***
		(0.0187)	(0.0187)	(0.0178)
RD 1652/2004		-0.0801***	-0.0842***	-0.0847***
		(0.0041)	(0.0050)	(0.0037)
Act 55/2007		-0.1630***	-0.1253***	-0.1309***
		(0.0094)	(0.0098)	(0.0092)
Video			-0.1331***	-0.1224***
			(0.0099)	(0.0094)
TV			0.0604***	0.0710***
			(0.0102)	(0.0095)
Digital TV			-0.0186***	-0.0158***
			(0.0057)	(0.0050)
$\hat{\sigma}^2$	0.0131***	0.0129***	0.0127***	0.0127***
	(0.0051)	(0.0046)	(0.0043)	(0.0040)
R^2	0.6519	0.6583	0.6639	0.6633
H_1	2.0626 (0.1510)	1.4857 (0.2229)	1.7051 (0.1916)	1.7642 (0.1841)

Standard errors in parentheses. ***, **, * Significant at 1%, 5% and 10% levels, respectively

Table 3: Estimation of the Equation (6)

Using NC_t^1 as the input in the production function				
Variable	Estimation 1	Estimation 2	Estimation 3	Estimation 4
	$\Pi_1 = diag\,(0.9, 1, 1, 0, 1)$	$\Pi_1 = diag\,(0.9, 0, 1, 1, 0.4)$	$\Pi_1 = diag\,(0.4, 0, 0.6, 0.4, 1)$	$\Pi_1 = diag\,(0.4, 0, 0.6, 0.4, 1)$
Constant	0.0094	0.0029	0.0148	0.0148
	(0.0116)	(0.0157)	(0.0159)	(0.0146)
$\Delta Log\,(N_t)$	0.7401***	0.7716***	0.7389***	0.7393***
	(0.1085)	(0.1392)	(0.1485)	(0.1451)
Oscar_83	-0.0827***	-0.1860***	0.0282	0.0273
	(0.0233)	(0.0270)	(0.0274)	(0.0408)
Oscar_94	0.0294*	-0.1036***	-0.0748***	-0.0758***
	(0.0152)	(0.0001)	(0.0001)	(0.0124)
Oscar_00	-0.0701***	0.0251***	0.0283	0.0281
	(0.0174)	(0.0093)	(0.0267)	(0.0202)
Oscar_03	0.1376***	0.1703***	0.1828***	0.1826***
	(0.0001)	(0.0067)	(0.0059)	(0.0085)
Oscar_05	0.0483**	0.0901***	0.1281***	0.1281***
	(0.0219)	(0.0202)	(0.0058)	(0.0079)
MO 1964		0.0259		
		(0.0579)		
Miró Act		0.0965***	-0.0008	
		(0.0283)	(0.0343)	
RD 1282/1989		0.0392		
		(0.0296)		
Act 17/1994		0.0530**	0.0664**	0.0668**
		(0.0256)	(0.0307)	(0.0297)
Act 15/2001		-0.0834***	-0.0482**	-0.0480**
		(0.0215)	(0.0221)	(0.0198)
RD 1652/2004		-0.1611***	-0.0520***	-0.0521***
		(0.0073)	(0.0052)	(0.0076)
Act 55/2007		-0.0175**	-0.0210**	-0.0208*
		(0.0086)	(0.0096)	(0.0117)
Video			-0.1353***	-0.1351***
			(0.0081)	(0.0082)
TV			0.0773***	0.0768***
			(0.0081)	(0.0088)
Digital TV			-0.0003	
			(0.0067)	
$\hat{\sigma}^2$	0.0147***	0.0143***	0.0142***	0.0142***
	(0.0048)	(0.0049)	(0.0048)	0.0048
R^2	0.6095	0.6203	0.6117	0.6250
H_1	5.7366 (0.0166)	2.6934 (0.1008)	3.0919 (0.0787)	3.2278 (0.0724)

Standard errors in parentheses. ***, **, * Significant at 1%, 5% and 10% levels, respectively

Table 4: Estimation of the Equation (6) introducing a dummy for the following years of Oscar wins

Variable	**Estimation using N_t^1**	**Estimation using NC_t^1**
	$\Pi_1 = diag\,(0.1, 0.9, 1, 1, 1)$	$\Pi_1 = diag\,(1, 0.1, 1, 0, 0)$
Constant	0.0137	0.0156
	(0.0146)	(0.0158)
$\Delta Log\,(N_t)$	0.7876***	0.7167***
	(0.0746)	(0.0853)
Oscar_83	0.0363	1.2671***
	(0.0221)	(0.0140)
Oscar_94	0.0890**	1.1964***
	(0.0406)	(0.0502)
Oscar_00	0.0807***	1.2897***
	(0.0099)	(0.0244)
Oscar_03	0.1654***	1.4133***
	(0.0031)	(0.0053)
Oscar_05	0.0423***	1.3001***
	(0.0039)	(0.0004)
MO 1964		
Miró Act		
RD 1282/1989		
Act 17/1994		0.0423
		(0.0402)
Act 15/2001	-0.1600***	-1.3231***
	(0.0161)	(0.0344)
RD 1652/2004	-0.1047***	0.0397***
	(0.0023)	(0.0145)
Act 55/2007	-0.1512***	-1.2745***
	(0.0085)	(0.0256)
Video	-0.1226***	-0.1431***
	(0.0075)	(0.0291)
TV	0.0713***	-1.1809***
	(0.0079)	(0.0127)
Digital TV	-0.0123**	
	(0.0060)	
Dummy Oscars	-0.0234	-1.2394***
	(0.0189)	(0.0022)
$\hat{\sigma}^2$	0.0127***	0.0140***
	(0.0038)	(0.0049)
R^2	0.6635	0.6289
H_1	8.1031 (0.0044)	11.0266 (0.0009)

Standard errors in parentheses. ***, **, * Significant at 1%, 5% and 10% levels, respectively

Table 5: 2SLS Estimation of Equation (6)

Variable	**Estimation using** N_t^1	**Estimation using** NC_t^1
	$\Pi_1 = diag\,(0.1, 0.9, 1, 1, 1)$	$\Pi_1 = diag\,(1, 0.1, 1, 0, 0)$
Constant	0.0029	0.0075
	(0.0199)	(0.0193)
$\Delta Log\,(N_t)$	0.7676***	0.6194***
	(0.1506)	(0.1514)
Oscar_83	0.0375	1.6878**
	(0.0362)	(0.8324)
Oscar_94	0.0928	1.6570*
	(0.0579)	(0.9127)
Oscar_00	0.0779***	1.7084**
	(0.0261)	(0.8573)
Oscar_03	0.1709***	1.8224**
	(0.0571)	(0.8171)
Oscar_05	0.0418*	1.6949**
	(0.0214)	(0.7983)
MO 1964		
Miró Act		
RD 1282/1989		
Act 17/1994		0.0360
		(0.0498)
Act 15/2001	-0.1501*	-1.7304*
	(0.0798)	(0.8420)
RD 1652/2004	-0.1039***	0.0456
	(0.0338)	(0.0304)
Act 55/2007	-0.1419*	-1.6978**
	(0.0858)	(0.8630)
Video	-0.1191**	-0.1703
	(0.0588)	(0.0606)
TV	0.0781	-1.5650**
	(0.0508)	(0.7847)
Digital TV	-0.0238	
	(0.0863)	
Dummy Oscars	-0.0218	-1.6488**
	(0.0365)	(0.8173)
R^2	0.6815	0.6389
H_1	2.3817 (0.12276)	6.3164 (0.0120)
Hausman Test	-0.2724 (NA)	-1.1288 (NA)
Sargan Test	1.9525 (0.1623)	1.4305 (0.2317)

Standard errors in parentheses. ***, **, * Significant at 1%, 5% and 10% levels, respectively

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