State Subsidies to Film and Their Effects at the Box Office: Theorizing and Measuring Why Some Genres Do Better than Others

Gianpiero Meloni, Dimitri Paolini, and Manuela Pulina

1 Do State Subsidies to Film Help at the Box Office?

"Any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, in so far as it affects trade between Member States, be incompatible with the internal market" (Art.107, European Treaty, 2012). An exception to this law is public aid for movies, which is permitted for cultural goals, that is, to promote culture and heritage conservation where such aid does not affect trading conditions and competition in the Union to the extent that is contrary to the common interest. As remarked by Katsarova (2014), in 2010, the European film industry was rather dynamic, accounted for over 75,000 companies, and made 60 billion euros in revenue. Amongst the EU countries, France, Germany, the UK, Italy, and Spain accounted for approximately 80% of releases, industry turnover, and persons employed (more than 370,000 people).

Considering these main European countries, in terms of movie production, direct public subsidies from government agencies are an important source of film funding. In 2012, the governments of Germany, France, Italy, and the UK provided funding in the amounts of 201.3 million euros, 720.1 million euros, 75.8 million euros, and

G. Meloni (✉)
DiSEA, Università di Sassari, Sassari, Italy
e-mail: gp.meloni@gmail.com

D. Paolini
DiSEA and CRENoS, Università di Sassari, Sassari, Italy

CORE, Université catholique de Louvain, Louvain-la-Neuve, Belgium
e-mail: dpaolini@uniss.it

M. Pulina
POLCOMING and CRENoS, Università di Sassari, Sassari, Italy
e-mail: mpulina@uniss.it

P.C. Murschetz et al. (eds.), *Handbook of State Aid for Film*, Media Business and Innovation, https://doi.org/10.1007/978-3-319-71716-6_7

134.2 million euros, respectively (see Lange, 2012). Moreover, film productions can receive indirect subsidies in the form of tax shelters incentives for investors, valued in 2011 at 222 million euros for the UK, 90 million euros for Italy, and 100 million euros for France (see Lange, 2012).

From the perspective of the public agent, on the one hand, several explanations may support public intervention in the movie industry. First, movies can be viewed as "merit goods", that is, public goods for which often there is no demand from the public but are provided by the government on paternalistic grounds given the benefits in promoting their fruition (Fiorito & Kollintzas, 2004; Musgrave, 1959; Pratt, 2005). In this respect, a subsidy may increase the revenue received but may also decrease the costs for producers, who may be encouraged to become more efficient and to produce at a more socially oriented level. Second, public intervention is desirable in the presence of positive externalities, which are the positive effects that an activity exerts on an unrelated third party. For example, movies often play an important role in aiding the educational development of schoolchildren by strengthening their critical skills and allowing them to witness dramatic historical episodes. Informational and documentary movies can also be important for lifelong learning in adulthood. Ultimately, increased education can enhance individuals' public participation and lead to a higher level of welfare. Finally, public subsidies for the movie industry are likely to enhance social and cultural benefits that range from regeneration, social inclusion, and an affirmation of national identity (see Pratt, 2005). In this sense, evaluating public interventions in cultural products is not a simple task.

On the other hand, several explanations may discourage public intervention in the movie industry (e.g. Bagella & Becchetti, 1999; Christopherson & Rightor, 2010; Collins & Snowball, 2015; McKenzie & Walls, 2013; Tannenwald, 2010; Teti, Collins, & Sedgwick, 2014). Inefficient outcomes in terms of negative rates of return and poor quality of the production can be seen as a valid reason not to support this industry. Moreover, governments face trade-offs in allocating public resources. Public financing to a specific economic sector may prevent public money allocation to more efficient uses. A further argument relates to the economic concept of crowding out effect. In this respect, government funding can cause a decrease in private investments given a rise in interest rates that are likely to occur because of an increase in demand for loanable funds. Ultimately, an overall rise in public spending can lead to a contraction of the economy and/or a higher taxation.

So far, there are not many studies that explore the impact of public subsidies on the film industry adopting more sophisticated quantitative approaches (e.g. Bagella & Becchetti, 1999; Chisholm, Fernandez-Blanco, Ravid, & Walls, 2015; Collins & Snowball, 2015, 2016; Jansen, 2005; McKenzie & Walls, 2013). The aim of this chapter is to highlight a range of theoretical constructs that can help to analyse the factors that influence the movie industry. A focus is dedicated to parametric tools such as panel data that allow to investigate the impact of a set of explanatory variables, amongst others subsidies, on film box office. Given the data availability, a stochastic frontier can also be implemented to analyse movie industry's productivity and efficiency and to address in what measure a set of exogenous variables

may affect the overall performance expressed in terms of economic (in)efficiency (see seminal works by Aigner, Lovell, & Schmidt, 1977, and by Meeusen & van den Broeck, 1977).

Amongst other methods, *data envelopment analysis* (DEA)[1] can be used to evaluate the relative efficiency across time and amongst a sample of decision-making units (DMUs). This well-established non-parametric approach has the advantage to reduce multiple inputs and multiple outputs to a virtual one input and one output without the need for setting a priori underlying functional form (seminal works include Banker et al., 1984; Charnes et al., 1978). A post-DEA can also be implemented to explore the factors that influence the economic efficiency.

In this chapter, an empirical application is also provided on the impact of public subsidies on box office revenues, while controlling for their possible impact on the quality of financed movies as well as for "*genre heterogeneity*", that is, disentangling the effects of different types of movies such as drama, thrillers, or comedies. To test these hypotheses, Italy is considered as a case study—as one of the big players in the EU (see Katsarova 2014)—and the time span under analysis is from 2002 up to 2011. The Italian legislation concerning economic and financial support by the public for various forms of cultural activities, such as music and theatre, was issued with "Law 163, April 30, 1985", which represented the "new discipline of interventions in favour of the performing arts" (Forte & Mantovani, 2013) and 25% delineated the total funds to be granted to the movie industry. A further regulation on motion pictures was issued in 2004 that established that public funding could be allocated either directly to the production of a new movie or indirectly by subsiding movies or authors based on their quality as defined by a set of criteria. In addition, another type of contribution can be allocated to movie producers and authors based on box office performance (see the Appendix for a more detailed discussion). In this chapter, we consider Italian movies released in the domestic market between 2002 and 2011. The focus of the empirical analysis is only on the domestic market, because amongst the sample only a small quota received an international distribution. This is coherent with the sample of market share for Italian movies employed by Waterman and Jayakar (2000).

From a methodological perspective, a fixed-effects and random-effects panel data analysis is employed to explore the impact of public subsidies on box office revenues. Besides, a panel Poisson is run to investigate to what extent public subsidies and genre influence the number of prizes won, which can be regarded as a proxy for implicit quality in the Italian movie industry.

The chapter is organized as follows. Section 2 presents the related literature, while Sect. 3 highlights the methodological framework. In Sect. 4, the case study is presented along with a description of the data and the findings that emerge from the empirical investigation. Concluding remarks are presented in the last section.

[1]DEA is a non-parametric approach that constructs a production frontier to evaluate the relative economic performance of a sample of decision-making units characterized by homogeneous technology.

2 Reviewing Research on Movie Performance

Movie industry has attracted research attention from economics and marketing scholars, due to its economic relevance and complex characteristics, in particular, high production costs and uncertainty of demand (De Vany, 2004; Ebbers & Wijnberg, 2012; Fernandez-Blanco, Ginsburgh, Prieto-Rodríguez, & Weyers, 2014), timing strategies, and seasonality issues (Belleflamme & Paolini, 2015; Chiou, 2008; Einav, 2007, 2010). Moreover, copyright industries, such as cinema, face fixed export costs due to cultural and geographic distances with importing countries, along with trade barriers. Meloni, Paolini, and Tena (2014) study how these costs impact the number of products exported and the relative value per trade with a microeconomic approach by estimating a hedonic model of US movies revenues in foreign markets. Holbrook and Addis (2008) claim that market performance and artistic excellence, measured by industry recognition (i.e. Oscars and other awards), are uncorrelated aspects of movie success. Several papers have estimated the impact of critical reviews (Basuroy & Ravid, 2014; Eliashberg & Shugan, 1997) and awards (Lee, 2009) on movie revenues, but none of them consider these types of variables to evaluate the quality of cultural products.

Bagella and Becchetti's (1999) work is one of the first and one of the few studies that investigates some critical issues within the Italian movie industry over the period between 1985 and 1996 using a sample of 977 Italian films. Using a GMM-HAC (*generalized method of moments heteroskedasticity and autocorrelation consistent*[2]) approach, the authors find that public subsidies do not influence total admissions, daily revenues, or per screen daily admissions. In addition, the positive and statistically significant effect of the genre "comedy" on total admissions shows that the decision to produce films in this type of genre has an independent, positive effect on box office revenues regardless of ex ante cast and director popularity. Along the same line, McKenzie and Walls (2013), for the case of Australia, find that government subsidies have no impact on a film's financial success at the box office.

They find, moreover, that even though Australian films are generally advertised more heavily and released more widely than non-Australian films, *ceteris paribus*, they earn less at the box office. Jansen (2005) examines the case of the movie industry in Germany and finds that public subsidies tend to support producers who have consistently had above-average success in their movie performance.

Hence, this finding stands in contrast with the author's prior belief that public funding tends to distort producers' incentives to make movies that match viewers' expectations. To sum up, despite a large body of literature in the field—see McKenzie and Walls (2013) and Chisholm et al. (2015) for a detailed survey—only a few papers consider how public intervention affects box office performance and, to the best of our knowledge, this chapter is the first to analyse its impact on quality.

[2]*Generalized method of moments* (GMM) is an estimation procedure that allows economic models to be specified while avoiding unnecessary assumptions, such as specifying a particular distribution for the errors.

3 How to Measure Movie Performance?

From a methodological perspective, several constructs can be implemented according to data availability that can be used to test different theoretical hypotheses.

3.1 Stochastic Frontier

The stochastic frontier model is used in a large number of studies of production, cost, revenue, profit, and other models of goal attainment. The model, as it appears in the current literature, was originally developed by Aigner et al. (1977) and Meeusen and van den Broeck (1977).

The film industry, as any other economic industry/sector, is characterized by a production process where a set of factors of production, capital, and labour (i.e. inputs) lead to a given output. In this respect, it is possible to implement a stochastic frontier that assumes that in the production process a parametric function exists between inputs and outputs. Deviations from the ideal frontier represent decision-making units's (in this case movies) economic inefficiency. The generic equation for a panel (i,t), in logarithm terms (L), can be expressed as follows:

$$LY_{it} = \alpha_0 + \sum_{j=1}^{k} \alpha_j LZ_{jit} + \varepsilon_{it} \tag{1}$$

where L denotes logarithm, Y is the output (e.g. box office revenues), and Z are the K inputs (e.g. budget of production). The residual is $\varepsilon_{it} = \nu_{it} - \upsilon_{it}$; specifically, the SF is characterized by a composite error term (ε_{it}) that can be further decomposed into two parts: the standard idiosyncratic disturbance which captures measurement errors and noise (υ_{it}) and a disturbance term which represents the effects of inefficiency relative to the stochastic frontier (ν_{it}). As reported in Belotti, Daidone, Ilardi, and Atella (2012), a set of exogenous variables that are not inputs may also affect the distribution of inefficiency, and hence the films' performance, because they can cause either a shift or rescale of the frontier function or even both the effects. Such an uncontrolled impact may affect the inference of the SF models leading to bias (in)efficiency estimates (e.g. distributor, film genre, release date, runtime, number of nominations, public subsidies).

3.2 DEA and Post-DEA

Within the production function, a non-parametric specification can also be implemented such as the *data envelopment analysis* (DEA) . This approach was developed by Charnes et al. (1978) and Banker et al. (1984).[3] DEA is a linear

[3] See also Coelli (1996).

programming technique; it defines the best-practice frontier that serves as a benchmark and computes the relative distance between each unit and the frontier. This distance can be interpreted as the relative economic performance of the units in the sample.

The outputs, expressed as y_{in} (i.e. the quantity of output n produced by the DMU i), can include box office revenues, number of nominations, and number of awards. The factors of production, expressed by x_{in} (i.e. the quantity of input k employed by the DMU i), can include the monetary value of capital and labour—for example, the budget of production—public subsidies. DEA reduces such a multivariate construct to a virtual unique input–output framework through a linear programming. In standard full frontier models, a subgroup of DMU will achieve a relatively level of efficiency equal to 1, whereas the residual DMU will be considered as inefficient with the score <1. The generic maximization problem can be expressed as follows:

$$\text{Max}\theta_i(y_i, x_i, u_i, v_i) = \frac{\sum_{n=1}^{N} u_{in} y_{in}}{\sum_{k=1}^{K} v_{ik} x_{ik}} \tag{2}$$

subject to:

$$\sum_{n=1}^{N} u_{in} y_{in} = 1 \tag{3}$$

$$\begin{gathered} u_{in} \geq 0 \\ v_{ik} \geq 0 \end{gathered}$$

$$\begin{gathered} n = 1, 2, \ldots..,N \text{ outputs;} \\ k = 1, 2, \ldots\ldots.,K \text{ inputs;} \\ i = 1, 2, \ldots\ldots,M \text{ firms} \end{gathered} \tag{4}$$

where θ is the efficiency for the DMU I, u_{in} is the weight of output n for the DMU i, and v_{in} is the weight of input k for the DMU i.

As an extension, a post-DEA can also be implemented to investigate the factors that can influence economic efficiency. As emphasized by Assaf and Josiassen (2015), the main limitation of DEA is that it does not take into account random errors, is highly sensitive to outliers and sample size, and does not allow for statistical inference on the efficiency results. To overcome such limitations, a post-DEA can be implemented, as a further extension to this non-parametric method, based on the methodology proposed by Simar and Wilson (2007). Thanks to a bootstrapping procedure, it is possible to identify the factors that affect the economic (in)efficiency. These combined parametric and non-parametric approaches provide more insight for economic agents who may formulate policy aimed at improving the overall efficiency. The generic specification is given by the following expression:

$$\theta it = Z_{it}\beta\ \varepsilon_{it} \geq 1 \qquad i = 1, \ldots, n \quad t = 1 \ldots .. T \tag{5}$$

where θ_{it} is the i-th DMU's efficiency score at time t (DMUs are technically inefficient when $\theta_{it} < 1$); Z_{it} contains factors that are assumed to influence the DMUs' efficiency; β is the vector of parameters to be estimated; and ε_{it} is the residual that is assumed to be white noise.

3.3 Panel Data: Fixed and Random Effects

Alternative methods can be also implemented according to the data availability. For example, for the film industry in Italy, from the official statistics no information can be gathered on the monetary value of inputs (e.g. the budget of production). In this case, a panel data approach (see, for example, Gujarati & Porter, 2009), with individual and time dimension, can be employed.

Panel data (also known as longitudinal or cross-sectional time-series data) is a dataset in which the behaviour of entities is observed across time. Specifically, the fixed-effects model controls for individual heterogeneity as well as assumes that those time-invariant characteristics are unique to the individual and are not to be correlated with other individual characteristics. In this manner, each individual is regarded as different and the individual's error term and the constant, which captures individual characteristics, are not correlated with the others. If the latter assumption does not hold, the random-effects model needs to be employed.[4]

As an example, a baseline specification consists of a movie's revenue i as a function of public subsidies and genre, that is, comedy, drama, thriller, and documentary treated as the reference category. The continuous variables are expressed in logarithm terms and are adjusted for inflation. The generic model is specified as follows:

$$Lrevenue_{i,t} = \beta_0 + \beta_1 Lsubsidies_{it} + \beta_2 comedy_{it} + \beta_3 drama_{it} + \beta_4 thriller_{it} + \varepsilon_{it} \tag{6}$$

where L denotes logarithm, β_r for $r = [1,4]$ are the parameters of the model to be estimated, and $\varepsilon_{i,\ t}$ is the white error term. The relevant variables are expressed in logarithm terms to measure parameters in terms of elasticity.

[4]To discriminate between these fixed effects and random effects, a Hausman test can be used where the null hypothesis is that the empirically preferred model is random effects and the alternative hypothesis the fixed effects.

3.4 Poisson Models for Count Data

A further specification can be expressed in terms of the number of awards, or nomination, obtained by each film. Since these types of variables are count variables, a Poisson distribution[5] needs to be considered as follows:

$$\text{Prob}(Y_i = y_i) = \frac{e^{-\mu}\mu^{y_i}}{y_i!} y_{i=0,\ldots..N} E(Y) = V(Y) = \mu \tag{7}$$

The parameter μ represents the number of the occurrence of the event, and by assumption, the average and the variance are equal.[6] In the literature, several extensions of the Poisson model are considered according to the characteristics of the empirical data as well as the dispersion hypothesis that is the possible inequality of the mean and the variance. In fact, this latter hypothesis can be further tested against a negative binomial model through a likelihood ratio test: the null hypothesis is that the variance is statistically equal to the mean and the alternative hypothesis is that the variance is statistically different. This approach is called count model, because the observations of the dependent variable can take only the non-negative integer values {0, 1, 2, 3, . . .}, and where these integers arise from counting rather than ranking (Cameron & Trivedi, 2013; Greene, 2003).

4 Film Subsidies and Genre Success: The Case of Italy

4.1 The Italian Law on Movie Industry: An Overview

The Italian Ministry of Culture in 1985 created a special state fund so-called FUS (*Fondo Unico per lo Spettacolo, that is, Italian National Funding for Entertainment*). The FUS is revised every year by the budgetary law, to aid the Italian performing arts, with a special section for the movies. According to the Law issued in 1985, 25% of its funds were destined to movie production. From 1990, the FUS constantly diminished in real terms and as a percentage of GDP. Initially, the amount given to the movies production was 150 billion lire (approximately 75 million euros). As Forte and Mantovani (2013) underline, a remarkable amount considering that the aggregate revenue of the Italian movies in 1985 was approximately 80 million of euros (153 billion lire). In 1990, the fixed percentages for various sectors were abolished. From then on, Italian movies obtained a yearly percentage of approximately 18%. The funds were mostly used to finance new films on the basis of a project presented to the ministerial committee of experts. A section was reserved to new debutants and producers. A minor share was reserved to short

[5]Poisson regression is a form of regression analysis used to model Count Data.

[6]The Poisson model is non-linear; however, it can be easily estimated by the maximum likelihood technique.

films, film festivals, and prizes for the best movies. The share of new movies that obtained FUS funds on the total new movies produced per year is rather large: often above 50% of the total.

The financial aid to the production of new movies, originally, was mostly given by loans at a very low interest rate. But the received funding had to be reimbursed only if there were returns net of production and only partially. Furthermore, often the company producing the movie was dissolved after the production and no sanction was given for the violation of the obligations of reimbursement. Thus, only a small share of the loans was recovered. Subsequently, a variety of grants were added to the loans. The criteria for the assignment of the aid have had continuous changes in the attempt of improving its effectiveness. Broadly speaking, initially the relevant parameters besides the cultural quality of the movies were the coherence and articulation of the subject, the reputation of the director and artists, and their technological and organization features. In 1997, the Committees for the assignment of the funds were reformed. A major change occurred in 2004, with the Law January 22/01/2004 n. 28 entitled "Reform of rules for the matter of the cinematographic activities". Giuliano Urbani, the minister of Ministry of Cultural Heritage and Activities and Tourism, during the *Berlusconi* Government, promoted this reform. The main change in this law was the introduction of a contribution on the movies' revenues to boost the production of quality movies.

4.2 The Empirical Data

As an empirical illustration, panel data for 754 Italian movies exhibited during the 2002–2011 time span are employed (see Meloni, Paolini, & Pulina, 2015). In Appendix 2, a detailed description of the variables is provided.

The dependent variable, as reported in Eq. (5), is box office revenue (expressed in euros and adjusted for inflation, base year 2011), which is obtained for each movie and genre from several sources.[7] Public subsidies, which are used as an explanatory variable, are obtained from MiBACT (*Ministero dei Beni e delle Attività Culturali e del Turismo, that is*, *Ministry for Cultural Heritage and Tourism*). Awards won at film festivals, which are used as the dependent variable, are collected from www.cinemaitaliano.info. Table 1 presents the descriptive statistics for the whole sample.

The sample shows a strong predominance of dramas and comedies over thrillers and documentaries, with the former accounting for 45% of the sample and the latter 43%. Notably, 311 of a total of 754 movies were granted public subsidies from MiBACT.[8] Over the time span under analysis, the average public financing per movie was 636 thousand euros, with a maximum of 4.2 million euros. When

[7] In particular, http://www.imdb.com, http://www.comingsoon.it, http://www.boxofficemojo.com/

[8] *Ministero dei Beni e delle Attività Culturali e del Turismo*, that is, Ministry for Cultural Heritage and Tourism.

Table 1 Descriptive statistics of movies

Variable	Mean	Std. deviation	Min	Max
Whole sample				
Subsidies (adjusted)	636,898	1,011,733	0	4,200,919
Genres				
Drama	0.448		0	1
Comedy	0.435		0	1
Documentary	0.059		0	1
Thriller	0.058		0	1
Observations	754			
Subsidized movies				
Genres				
Drama	0.534		0	1
Comedy	0.334		0	1
Documentary	0.061		0	1
Thriller	0.071		0	1
Festivals	25.70	27.96	0	139
Awards	5.57	9.16	0	51
Observations	311			
Data on festivals				
Festivals	22.69	25.56	0	139
Awards	4.94	8.16	0	51
Observations	529			

considering the subsample of financed movies, dramas account for 53% of the total public financing, while comedies account for 33%. This difference in the allocation of public resources can be explained by multiple factors: first, comedies are less likely to contain cultural aspects of public interest; second, as shown by Bagella and Becchetti (1999) and Meloni et al. (2015), Italian movie viewers exhibit a strong preference for comedies; thus, box office revenues for such movies are above the mean, and production companies are less likely to seek for public financing. For a subsample of 461 movies, information on participation at film festivals and awards won is available; 279 of these movies received a public subsidy, which accounts for 90% of the subsidized movies sample. To see interesting features regarding the statistical distribution of these variables, you can check Tables 2 and 3 by Meloni et al. (2015).

On average, each movie in the subsample competed in 26 festivals, winning 5.67 awards. These values slightly increase for publicly financed movies to 28.64 festivals and 6.21 awards. However, for both groups, there is a predominance of zero awards associated with a rather low median value (that is, the median is equal to 2 for the whole subset, and the median is equal to 3 for subsidized movies). Moreover, the analysis of the percentiles shows that the distribution of the awards is heavily skewed towards the right, which implies that only a small number of movies obtained the majority of the awards. The third column of Tables 2 and 3 shows the

Table 2 Italian movie revenues: baseline specification

	Fixed effects	Random effects
ln subsidies	0.0352** (−2.95)	−0.0676 (−4.96)
Drama	1.145** (3.22)	1.146** (0.24)
Comedy	2.490*** (6.99)	2.484*** (7.05)
Thriller	1.361** (2.88)	1.319** (2.81)
Documentary	(Omitted)	(Omitted)
R^2		
Within	0.149	0.143
Between	0.308	0.303
Overall	0.119	0.125
N	754	754

t statistics in parentheses
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

Table 3 Poisson model for awards

	Coefficients	Incidence ratio
Festivals	0.0283*** (55.48)	1.02
ln subsidies	0.0152*** (−4.84)	0.98
Comedy	0.656*** (6.30)	1.93
Drama	0.868*** (8.57)	2.38
Thriller	0.731*** (5.23)	2.08
Documentary		(Omitted)
N		461
Pseudo R^2		0.524

***$p < 0.001$

ratio between awards won and festival participation. While a simple correlation analysis of the two variables indicates strong reciprocity (0.8), the mean and median values are approximately 16% to 19%, respectively; hence, frequent participation at festivals does not automatically lead to more awards.

4.3 The Empirical Analysis

As stated in the methodological section, two separate specifications are run: a panel random-effects model and a panel fixed-effects model. The statistical test suggests that the fixed-effects model is an empirically appropriate specification.[9] Overall, the results are rather congruent in terms of magnitude of the coefficients and in terms of sign in both the random- and fixed-effects specifications (Table 2).

Public subsidies have a negative impact on box office revenue. Furthermore, comedies appear to play a leading role in attracting demand, followed by thrillers

[9]To establish which model empirically fits the data better, a Hausman test is run. In this case, the calculated value Chi-squared = 21.48 (0.000) implies that the fixed-effects model under the alternative hypothesis is empirically a better specification.

and dramas, when compared with the reference category. These findings are all consistent with the results obtained by Bagella and Becchetti (1999), thus reinforcing the relevant role played by the comedy genre in driving the box office performance of Italian movies as well as the negative effects exerted by public intervention.

As a further example, awards won at film festivals, which are used as the dependent variable, are collected from www.cinemaitaliano.info. From the descriptive statistics, it emerges that 279 of the 311 financed movies participated in at least one festival. Hence, by taking into account only film festival participation and prizes won, a subset of 461 movies is considered. These count specifications, as reported in the methodological section, can be used to assess the factors that may impact the quality of the quality of the movies. For example, the dependent variable can be expressed as the number of awards obtained by each film. Since this variable is a count variable, a panel Poisson model must be estimated. As a robustness check, this hypothesis is further tested against a panel negative binomial model through a likelihood ratio test where the null hypothesis is that the variance is statistically equal to the mean and the alternative hypothesis is that the variance is statistically different. The baseline model is specified as follows:

$$awards_{it} = \beta_0 + \beta_1 festivals_{it} + \beta_2 Lsubsidies_{it} + \beta_3 comedy_{it} + \beta_4 drama_{it} + \beta_5 thriller_{it} + \varepsilon_{it} \quad (8)$$

where L denotes logarithm; *awards* is a function of the film i participation at festivals, public subsidies, if any, and different genres; β_ρ for $r = [1,5]$ are the parameters to be estimated; and $\varepsilon_{i,\,t}$ is an error term. The final results are reported in Table 3.

As a matter of interest, the Poisson results are congruent with the results obtained when employing a negative binomial specification (full results are available upon request). The incidence ratio[10] (IRR) magnitude for the festival participation variable confirms that participation at festivals does not automatically lead to more awards. Moreover, as in the previous baseline model, public subsidies show a negative and statistically significant sign on the coefficient, and the IRR shows that awards are expected to decrease by a factor of 0.98 when holding all other variables in the model constant. Moreover, the genre with the best performance is drama; this result is coherent with the belief that quality may be better perceived in movies with an insightful and dramatic characterization.

As an extension of the Poisson model, assessing the iteration between genres and public subsidies can pursue the impact of public intervention for different types of movies on film quality. The following expression can be estimated:

[10]The incident ratio is the rate at which events occur.

Table 4 Poisson model for awards: budget interaction with genres

	Coefficients	Incidence ratio
Festivals	0.0284*** (53.31)	1.03
Non-subs comedy	0.898* (1.72)	2.45
Subs comedy	0.0645* (1.69)	1.06
Non-subs drama	1.316** (2.54)	3.72
Subs drama	0.0684* (1.89)	1.07
Non-subs thriller	0.598 (1.06)	1.81
Subs thriller	0.0758** (1.99)	1.08
Non-subs documentary	0.547 (1.02)	1.73
Subs documentary	0.000470 (0.01)	1.00
N		461
Pseudo R^2		0.530

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

$$awards_{it} = \beta_0 + \beta_1 festivals_{it} + \gamma_k subsidies\_genres_{it} + \delta_k non\_subsidies\_genres_{it} + \varepsilon_{it} \quad (9)$$

where *festivals* are the number of organized presentation of films often held in a city or region (e.g. Cannes film festival, Venice film festival); notably, from the descriptive statistics it emerges that the frequent participation at festivals does not imply an award. *Subsidized_genres* are the iteration variables between the four genres and public subsidies, expressed in logarithm and real terms. Moreover, *non_subsidized_genres* are the interaction dummy variables that take the value 1 if a movie with no public funding belongs to a certain genre, and zero otherwise; β, γ, and δ are the parameters to be estimated, and ε is the error term.

Table 4 shows that the impact of subsidies on quality for each of the genres is rather negligible when compared with non-subsidies. The incidence rate ratios indicate that subsidized thrillers and dramas are the types of movies that lead to a relatively higher performance in terms of quality and, therefore, should also be supported more by the public.

5 Concluding Remarks: Subsidies for Drama and Thrillers Are More Effective

This chapter has offered a conceptual framework to outline different parametric and non-parametric approaches that can be used to analyse, amongst other factors, the impact of public intervention on the movies. Based on data availability, stochastic frontier as well as data envelopment analysis (DEA), followed by post-DEA approaches, can be implemented. Based on data availability, panel fixed-effects and random-effects models can be estimated by employing box office revenues as a dependent variable. Moreover, a Poisson specification can also be implemented for count variables such as number of awards and/ or nomination. In this manner, it is

possible to explore the impact of public intervention on film quality taking also into account different movie genres.

Two main examples have been provided on Italian movies, used as a case study. Specifically, two main indicators have been employed as the dependent variables that are quantity expressed by revenues and quality defined in terms of awards won at film festivals. The findings have shown that public funding exerts a negative impact on performance and quality. This result is in line with that of McKenzie and Walls (2013) for the Australian market and Bagella and Becchetti (1999) and Meloni et al. (2015) for the Italian movie industry.

As a further step into the investigation, the empirical example has assessed that non-financed movies denote a relatively larger impact than subsidized movies on the performance. With respect to public intervention, only thrillers and dramas have presented a relatively higher performance.

Overall, comedies have proved to outperform the other types of movies in terms of both productivity and quality despite support from the public as arguably it is the most preferred genre by Italian consumers. Hence, the empirical evidence suggests the need to allocate public resources towards drama and thrillers that can be thought to be more educational productions for the public. As shown in Bagella and Becchetti (1999), Italian movie-goers have a strong preference for comedy movies and the impact of the genre on box office revenues reflects this bias.

As highlighted by Collins and Snowball (2016), the movie industry is still under-researched and particularly the investigation on the effects of direct and indirect public subsidies on this activity. Arguably, the film industry may have concern that empirical evidence may not support public intervention, hence reducing the probability to offer actual data for independent evaluation. Nevertheless, the allocation of public financing needs to be supported on several grounds and especially on various economic indicators such as job creation, employment type (e.g. gender, cultural minorities), and possible spillover effects amongst other sectors and multiplier effects.

Appendix 1[11]: Trend of State Subsidies in the Italian System

The revenue market share of the Italian movies on the aggregate revenue was 39.00% in 1983, 33.12% in 1984, and 30.06% in 1985 when the FUS was issued for the first time. From 1986 to 2010, it oscillated in the range of 20.65–27.84%, with two exceptions slightly above in 1987 and in 1997 and two slightly below in 1993 and 2000. Basically, the market share of the Italian movies, in the entire period after FUS, remained at a slightly lower level than that of the first year of the FUS, with a limited recovery on the last decade of the considered period. Meanwhile, FUS funds for movies declined from 0.026% of GDP to 0.005% of GDP in 2010.

[11]From Forte and Mantovani (2013).

Other types of public finance aids to movies were issued from the end of 1990 onwards. The trend of the share of the Italian movies in terms of the number of new movies presented in the Italian cinemas, after FUS, was similar to that of the revenue market share until the end of 1990, although higher in the last decade. The number of new Italian movies as a share of the total number of new movies released in Italian cinemas, that was between 33.5 and 31.8% in the 3 years before 1985, went down to an average level of 25.8% in the first 5 years of the FUS. Then, it declined with a certain volatility to <25.0% until 1996 and reached the maximum level of 40.96% in 2008, after the new law was issued, which provided tax incentives. The share of the market in terms of revenue of the Italian movies was smaller than that of the foreign movies, but still they had a recovery because of the new ways of financing other than the FUS.

Appendix 2: Dataset

Data providers:

- www.cinemaitaliano.info (movie characteristics and revenues)
- www.comingsoon.it (movie characteristics and revenues);
- http://www.cinema.beniculturali.it/ (public subsidization data)

The dataset consists of 754 movies produced in Italy and exhibited during the period 2002–2011.

For each movie, the following variables were collected:

box-office: amount of money earned by each movie, expressed in euros and adjusted for inflation;

subsidization: amount of public subsidization granted from MiBACT (Ministero dei Beni delle Attività Culturali e del Turismo), expressed in euros and adjusted for inflation;

festivals: variable that accounts participation at film festivals when a movie is eligible for awards. Out of competition appearances are not recorded;

prizes: prizes won at film festivals;

comedy: factor variable which takes value 1 if a movie belongs to comedy, romantic comedy, family movies genres or if it is an animation movie (and 0 otherwise);

drama: factor variable which takes value 1 if a movie is of dramatic genre and 0 otherwise;

documentary: factor variable which takes value 1 if a movie is a documentary and 0 otherwise.

thriller: factor variable which takes value 1 if a movie belongs to thriller or horror genres and 0 otherwise.

Appendix 3: Syntax

```
iis year
```

The seldom used *iis* command declares the time dimension of the dataset without the need of declaring also the panel variable as in *xtset*.

```
foreach var of varlist comedy-documentary {
qui gen subs_'var'='var'*log_subs
qui replace subs_'var'=0 if subs_'var'==.
}
foreach var of varlist comedy-documentary {
qui gen nosubs_'var'='var'
qui replace nosubs_'var'=0 if subs_'var'!=0
}
```

The first loop generates iteration variables between genre and subsidization. The command *foreach* calls variables from the list comedy, drama, thriller, documentary. The second loop is then used to generate a dummy variable that takes value 1 if a movie belongs to a given genre but did not received public funding and 0 otherwise.

```
xtreg log_box log_subs drama comedy thriller, fe
est store fe_reg
xtreg log_box log_subs drama comedy thriller, re
est store re_reg
```

xtreg command fits regression models to panel data. The *fe* option fits fixed-effects models (by using the within regression estimator), while the *re* option fits random-effects models by using the GLS estimator (producing a matrix-weighted average of the between and within results).

```
hausman fe_reg re_reg
```

To discriminate between random and fixed effects, the Hausman test is performed.

```
xtreg log_box subs_comedy nosubs_comedy
subs_drama nosubs_drama subs_thriller nosubs_thriller
subs_documentary nosubs_documentary, fe
est store re_iter_reg
```

```
xtreg log_box subs_comedy nosubs_comedy
subs_drama nosubs_drama subs_thriller nosubs_thriller
subs_documentary nosubs_documentary, re
est store fe_iter_reg

hausman fe_iter_reg re_iter_reg

poisson prizes festivals log_subs comedy drama thriller
documentary if festivals>0, irr
est store prizes_pois
```

Poisson regression fits count models, that is, the number of occurrences of an event. Here, the condition if $festivals > 0$ limits the estimation to those movies that competed at film festivals. The *irr* option reports estimated coefficients transformed into incidence-rate ratios, that is, β_r rather than β_i. Standard errors and confidence intervals are similarly transformed.

```
nbreg prizes festivals log_subs comedy drama thriller
documentary if festivals>0, irr
est store prizes_nbreg
```

With the same restriction as above, the model is estimated with a negative binomial. In this model, the count variable is believed to be generated by a Poisson-like process, except that the variation is greater than that of a true Poisson.

```
poisson prizes festivals  nosubs_comedy subs_comedy
nosubs_drama subs_drama nosubs_thriller subs_thriller
nosubs_documentary subs_documentary if festivals>0, irr
est store prizes_poiss_iter

nbreg prizes festivals subs_comedy subs_drama  subs_thriller
subs_documentary nosubs_comedy nosubs_drama
nosubs_thriller nosubs_documentary if festivals>0, irr
est store prizes_nbreg_iter
```

References

Aigner, D. J., Lovell, C. A. K., & Schmidt, P. (1977). Formulation and estimation of stochastic frontier production function models. *Journal of Econometrics, 6*(1), 21–37.

Assaf, A., & Josiassen, G. A. (2015). Frontier analysis: A state-of-the-art review and meta-analysis. *Journal of Travel Research*, 1–16.

Bagella, M., & Becchetti, L. (1999). The determinants of motion picture box-office performance: Evidence from motion pictures produced in Italy. *Journal of Cultural Economics, 23*, 237–256.

Banker, P. C., Charnes, A., & Cooper, W. W. (1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis. *Management Science, 30*, 1078–1092.
Basuroy, S., & Ravid, S. A. (2014). *How relevant are experts in the internet age? Evidence from the motion pictures industry* (Working Paper). University of Oklahoma.
Belleflamme, P., & Paolini, D. (2015). *Strategic promotion and release decisions for cultural goods* (CORE DISCUSSION PAPER 2015/37).
Belotti, F., Daidone, S., Ilardi, G., & Atella, V. (2012). Stochastic frontier analysis using Stata. *The Stata Journal, 13*(4), 1–39.
Cameron, A. C., & Trivedi, P. K. (2013). *Regression analysis of count data* (2nd ed.). Cambridge: Cambridge University Press.
Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research, 2*, 429–444.
Chiou, L. (2008). The timing of movie releases: Evidence from the home video industry. *International Journal of Industrial Organization, 26*(5), 1059–1073.
Chisholm, D. C., Fernandez-Blanco, V., Ravid, S. A., & Walls, W. D. (2015). Economics of motion pictures: The state of the art. *Journal of Cultural Economics, 39*, 1–13.
Christopherson, S., & Rightor, N. (2010). The creative economy as 'big business': Evaluating state strategies to lure filmmakers. *Journal of Planning Education and Research, 23*(3), 336–352.
Coelli, T. J. (1996). *A guide to DEAP version 2.1: A data envelopment analysis computer program* (Working Papers 8/96). CEPA, The University of New England.
Collins, A., & Snowball, J. (2015). Transformation, job creation and subsidies to creative industries: The case of South Africa's film and television sector. *International Journal of Cultural Policy, 21*(1), 41–59.
Collins, A., & Snowball, J. (2016). *The effectiveness and impacts of subsidies to film industries. South African Cultural Observatory*. First National Conference Counting Culture. The Cultural and Creative Industries in National and International Context. The Boardwalk International Convention Centre, Nelson Mandela Bay.
De Vany, A. (2004). *Hollywood economics: How extreme uncertainty shapes the film industry*. London: Routledge.
Ebbers, J. J., & Wijnberg, N. M. (2012). The effects of having more than one good reputation on distributor investments in the film industry. *Journal of Cultural Economics, 36*, 227–248.
Einav, L. (2007). Seasonality in the U.S. motion picture industry. *Rand Journal of Economics, 38*, 127–114.
Einav, L. (2010). Not all rivals look alike: Estimating an equilibrium model of the release date timing game. *Economic Inquiry, 48*, 369–390.
Eliashberg, J., & Shugan, S. M. (1997). Film critics: Influencers or predictors? *Journal of Marketing, 61*(2), 68–78.
European Treaty. (2012). *EUR-Lex Access to European Union law*. http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A12008E107
Fernandez-Blanco, V., Ginsburgh, V., Prieto-Rodríguez, J., & Weyers, S. (2014). As good as it gets? Blockbusters and the inequality of box office results since 1950. In J. Kaufman & D. Simonton (Eds.), *The social science of the cinema* (pp. 269–285). Oxford: Oxford University Press.
Fiorito, R., & Kollintzas, T. (2004). Public goods, merit goods, and the relation between private and government consumption. *European Economic Review, 48*, 1367–1398.
Forte, F., & Mantovani, M. (2013). *Non conventional sources on financing movies: The case of Italy*. 54th Annual Conference Alma Mater Studiorum, University of Bologna, Department of Economics, 24–26 October.
Greene, W. H. (2003). *Econometric analysis* (5th ed.). Upper Saddle River, NJ: Prentice-Hall.
Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics* (5th ed.). Boston: McGraw-Hill.
Holbrook, M. B., & Addis, M. (2008). Art versus commerce in the movie industry: A two-path model of motion picture success. *Journal of Cultural Economics, 32*, 87–107.
Jansen, C. (2005). The performance of German motion pictures, profits and subsidies: Some empirical evidence. *Journal of Cultural Economics, 29*(3), 191–212.

Katsarova, I. (2014). *An overview of Europe's film industry*. European Parliamentary Research Service. http://www.europarl.europa.eu/RegData/etudes/BRIE/2014/545705/EPRS_BRI(2014)545705_REV1_EN.pdf

Lange, A. (2012). *Film market trends and film funding in four selected European Countries*. European Audiovisual Observatory, Brussels Council of Europe.

Lee, F. L. F. (2009). Cultural discount of cinematic achievement: The academy awards and U.S. movies' East Asian box office. *Journal of Cultural Economics, 33*, 239–263.

McKenzie, J., & Walls, W. D. (2013). Australian films at the Australian box-office: Performance, distribution, and subsidies. *Journal of Cultural Economics, 37*(2), 247–269.

Meeusen, W., & Van den Broeck, J. (1977). Efficiency estimation from Cobb-Douglas production functions with composed error. *International Economic Review, 18*(2), 435–444.

Meloni, G., Paolini, D., & Tena, J. D. (2014). *American Beauty: Trade flows and export costs of US movies* (CRENoS WP, n.2014/10).

Meloni, G., Paolini, D., & Pulina, M. (2015). The Great Beauty: Public subsidies in the Italian Movie Industry. *Italian Economic Journal, 1*(3), 445–455.

Musgrave, R. A. (1959). *The theory of public finance: A study in public economy*. New York: McGraw-Hill.

Pratt, A. C. (2005). Cultural industries and public policy. *International Journal of Cultural Policy, 11*(1), 31–44.

Simar, L., & Wilson, P. W. (2007). Estimation and inference in two-stage, semi-parametric models of production processes. *Journal of Economics, 13*(6), 31–64.

Tannenwald, R. (2010). *State film subsidies: Not much bang for too many bucks*. Washington, DC: Center on Budget and Policy Priorities. https://www.researchgate.net/profile/Robert_Tannenwald/publication/265004693_State_Film_Subsidies_Not_Much_Bang_for_Too_Many_Bucks/links/54469b2d0cf22b3c14de8750/State-Film-Subsidies-Not-Much-Bang-for-Too-Many-Bucks.pdf

Teti, E., Collins, A., & Sedgwick, J. (2014). An offer they couldn't refuse (but probably should have): The ineffectiveness of Italian state subsidies to moviemaking. *Public Money and Management, 34*(3), 181–188.

Waterman, D., & Jayakar, K. P. (2000). The competitive balance of the Italian and American film industries. *European Journal of Communication, 15*(4), 501–528.

Gianpiero Meloni holds a PhD from Università di Sassari in Italy. His main research interest is in cultural economics, within an empirical approach. He collaborates with the economics department (DiSEA, *Dipartimento di Scienze Economiche Aziendali*, University of Sassari, Italy), and he has recently started his own cultural business by opening a bookshop in Cagliari (Italy).

Dimitri Paolini, PhD, is a professor of economics at DiSEA (Università di Sassari) in Italy, and he is a research associate at CORE (Université Catholique de Lovain) in Belgium. Dimitri holds a PhD from Université Catholique de Louvain in Belgium, and he has received support for his research at national level by the Italian Ministry of Education, Universities and Research, by the *Regione Sardegna*, and by *Fondazione Banco di Sardegna*. His research interests are in media economics, education economics, and industrial organization.

Manuela Pulina, PhD, is an Assistant Professor in Economics at POLCOMING (Department of Political Science, Communication, Engineering and Information Technologies, University of Sassari, Italy). Manuela holds a PhD from the University of Southampton (UK). Her core research interests are in applied econometrics and regional economics. Amongst other topics, she has published in cultural economics, tourism economics, and crime economics. Part of this research has been devoted to analysing consumer behaviour. Recently, the focus of her research has been aimed at developing econometric models to evaluate the impact of public interventions across a number of private market sectors, such as agriculture, tourism and travel, health, and the film industry.