



The global impact of public and private funding on cultural and economic movie success: evidence from German film funding

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Received: 28 October 2022 / Accepted: 15 July 2023
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Abstract

Entertainment products such as movies are risky investments but contribute to societal welfare through their cultural and economic value. Therefore, movie production receives financial support from both private investors and public institutions, in the form of subsidies. Noting the ongoing debate about the actual impact of such funding, in research and practice, this study reviews a large sample of 1984 movies (co-) produced in Germany and released to cinemas over a 10-year period. The findings demonstrate the positive impact of public funding on movie success: indirectly by attracting private funding, and directly by increasing local and global box office revenues. However, public funding does not directly improve movie quality, which contradicts one of the aims of public funding. The analyses reveal different correlations and interaction effects with regard to financing and quality signals generated by the cast, directors, and producers of movies. Public funding emerges not only as relevant for the economic success of movies but also as a factor that supports their cultural contribution.

Keywords Movie success · Film financing · Signaling · Public subsidization · Private investment

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1 Introduction

The global movie industry generated USD 42.3 billion in gross box office revenues in 2019. Even during the COVID-19 pandemic, the industry grossed USD 11.8 billion in 2020 and USD 21.3 billion in 2021 (MPA, 2022). Yet despite these impressive revenues, movies remain risky investments, due to significant first copy costs, sunk expenditures, and the difficulty of predicting success (De Vany & Walls, 2004). Public funding is one way to lower investors' risk, in that it reduces the initial investment needed to launch a project (Thom, 2018). Allocations of public funding often are justified by cultural and economic considerations: Entertainment products can promote national culture, diversity, and other positive externalities (Meloni et al., 2015; Messerlin & Parc, 2017), and of course, it also helps national companies and entertainment products compete globally (Bomnüter & Schulze, 2019; Kleer, 2010).

However, the actual impact of public subsidies on movie quality and revenues has been widely disputed (McKenzie, 2022); even some members of public funding bodies doubt their impact (Follows, 2015). Both Jansen (2005) and McKenzie and Walls (2013) offer evidence that public funding does not increase movies' profitability or box office revenues. McKenzie et al. (2020) find a low positive impact of public funding on box office revenues, whereas Meloni et al. (2015) suggest a negative impact. Beyond these divergent findings, we note that most studies of public funding ignore private funding and its likely interaction effects, including those with other quality signals (see Table 1).

To broaden this perspective, we consider other parts of the value chain to identify the overall effect of public funding and its strategic benefits for private funding, expert and consumer ratings, and the interactions among them. We also seek to advance insights into the strategic potential of public funding by tackling four primary research questions (RQ): (1) How do quality signals affect public and private movie funding? (2) How does public funding affect private funding, and vice versa? (3) How do public and private funding affect cultural success in terms of movie quality, and how do they moderate the impact of quality signals? (4) How do public and private funding affect economic success, in terms of local and global box office revenues, and how do they moderate the impact of quality signals?

To address these questions, we collected data on 1,984 movies, eligible for public funding and released in German cinemas between 2005 and 2015. In sequential models, we first analyze how quality signals influence financing decisions. Next, we consider how this influence might contribute to cultural and economic success. The results have implications for government organizations, which can review their impacts and adjust their selection committees' strategic decisions accordingly (Hennig-Thurau & Houston, 2019). Likewise, production companies can benefit from the clear, easy-to-measure indicators of what drives public funding, with implications for the cultural and economic success of their products.

Table 1 Quantitative Studies on Public Funding

Study	Sample		Outcomes					Key Findings			
	Movies	Period	Movies/Year	Public/Private Funding	Expert Rating	Expert Volume	Consumer Rating		Local Box Office	Global Box Office	Interactions
Jansen (2005)	120	1993–1998	24	×	×	×	×	×	×	×	Public funding does not increase profitability
McKenzie and Walls (2013)	830	1997–2007	83	×	×	×	×	✓	×	×	Public funding has no impact on box office revenues
McKenzie et al. (2020)	487	1997–2017	24	×	✓	×	✓	✓	✓	×	Despite its low impact on box office revenues, public funding contributes by increasing the production of (prospective) high-quality movies
Meloni et al. (2015)	754	2002–2011	84	×	×	×	×	✓	×	×	Public funding negatively affects box office revenues, except for dramas and thrillers
This study	1,984	2005–2015	198	✓	✓	✓	✓	✓	✓	✓	Public funding increases private funding, review volume, and global box office success, but it has no direct effect on expert and consumer ratings

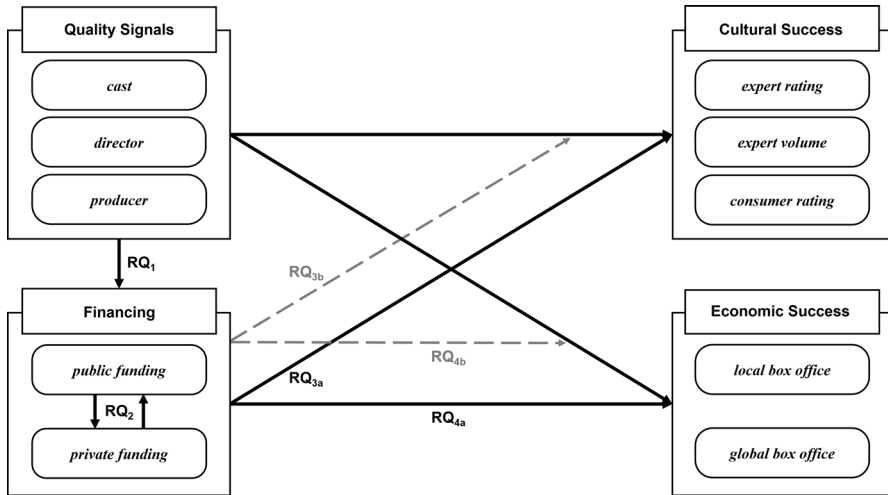


Fig. 1 Conceptual Framework

2 Conceptual and research background

Several findings inform and support our RQ (Fig. 1 shows the corresponding conceptual framework that encompasses RQ1–4). Because the German funding system framed how we formed our research questions, we outline this institutional setting next.

2.1 The German public funding system

The German funding system is designed to support a diverse range of projects, from large-scale international co-productions to smaller, independent movies. The funding bodies offer various support mechanisms, including grants, loans, and tax incentives (e.g., rebates). The criteria for access to these incentives depend on the funding body, federal and state interests, and the targeted form of support (e.g., script development, pre-production, documentary funding).¹ The system is administered by the Federal Government Commissioner for Culture and Media (BKM), the German Federal Film Board (FFA), and various regional institutions (Jansen, 2005). The German Federal Film Fund (DFFF) and German Motion Picture Fund (GMPF) are primary federal funding sources for larger productions; they provide grants and loans for a range of productions, including features, animated movies, documentaries, and TV series. Funding is available to both German and international

¹ Funding guidelines, restrictions, and details about grants are available from different institutions and government websites (e.g., dfff-ffa.de/filing-an-application.html; ffa.de/funding.html; <https://bit.ly/3KTKL4>).

productions that meet the relevant criteria, such as a preset minimum production budget and local spending.

Two overarching types of support are available: project film funding (selective, project-based) and reference funding (automatic, performance-based). The project-based funding decision is made by committees, such as the FFA, or the management of the funding bodies, which do not disclose the reasons for their final decision. Thus, it remains unknown which funding sources have been accessed, prior to published funding decisions. In certain cases, smaller productions may apply for public funding without having received significant private funds; others have secured some private funds, apply for public funds, and then seek additional private investments. The absence of precise timing information about the distribution of funding sources thus leads us to propose a bi-directional model, with which we can examine the impacts of financing and different quality signals during the production phase, across both possible variations (i.e., public before private or vice versa). However, in the subsequent release phase, at which cultural and financial success get determined, the bi-directional setup of model 1 becomes irrelevant, because both funding types have been exhausted at that time.

2.2 Impact of quality signals on movie financing (RQ1)

Movies are high-risk investments with relatively short life cycles, but they are also unique, hedonic products (Hennig-Thurau & Houston, 2019). To realize a movie project, producers need to find support from investors or the studio with which they are affiliated. They pitch ideas and provide information about personnel commitments (actors, directors) and other roughly fixed factors (e.g., genre, target age group), along with an estimated budget (De Vany & Walls, 2004). If investors join early, during the production planning phase, production can start. Considering the inherent risk of these investments, reliable quality signals are necessary.

Producers also can turn to two major sources of financing: public or private (Kanzler 2020). As cultural products, movies create positive externalities and contribute to social welfare. Therefore, many countries support them with public funding, in efforts to strengthen the domestic film industry, attract foreign investment through co-productions, and make cultural contributions (Hennig-Thurau & Houston, 2019; McKenzie et al., 2020). In contrast, private investors typically seek to maximize profits, in line with microeconomic principles. For both financing sources, asymmetric information exists between producers and investors. Some aspects of the content, such as the genre or a rough storyline, might be known, but movie quality is not known until its release. Content-related features, recognizable in the script, largely determine success, in that consumers prefer movies that draw them into the story (Paulich & Kumar, 2021), but such features are difficult to judge objectively and consistently. Non-content-related factors, such as committed cast members, directors, and producers (Bharadwaj et al., 2017), provide more accessible quality signals (Basuroy et al., 2006), known to investors prior to production.

Several studies confirm the positive influences of stars on a movie's success (Hofmann et al., 2017). Star power increases revenue expectations (Elberse, 2007) and

reduces the risk of sunk costs (De Vany & Walls, 2004; Hennig-Thurau et al., 2013). Therefore, the involvement of popular actors or directors likely attracts investors. However, Brewer et al. (2009) argue that the high fees commanded by star actors might skim additional revenues and deter private funding. We thus ask:

RQ1: How do quality signals affect (a) public and (b) private funding?

2.3 The relationship between public and private funding (RQ2)

When producers apply for public funding, they usually must disclose the financing structure of their project. In general, a higher total budget has a positive effect on revenues (Hennig-Thurau & Houston, 2019). Because economic impacts are among the goals of public funding, we assume that any previously pledged private funding sends a positive signal to public funding decision-makers. But beyond economic intentions, public institutions also look for cultural impacts. These dual goals make public investors at least slightly less risk-averse than private investors (Hennig-Thurau & Houston, 2019), as is reflected in funding guidelines. Before any public funding can be repaid, producers must repay their private investors. In addition, more public funding signals that professionals recognize the movie's value, support its production, and are likely to continue their support for the entire distribution process (King et al., 2017). Due to their broader presence at international movie festivals, publicly funded movies also tend to attract more international investment (Bomnüter & Schulze, 2019). However, if a public funding commitment covers a greater share of the required budget, the perceived risk to (further) private investors decreases; their investment share can be smaller.

As mentioned, the final timing of funding sources remains unknown. Therefore, and considering the various options for obtaining public funding, we acknowledge the possibility of alternative timing, where public funding is already committed and sends a positive signal to private investors. Considering that such precise timing information is not available, we explicitly work to address this issue with a bi-directional analysis approach, in the production phase.² In detail, while we expect public funding to send a positive signal to investors, we also anticipate that private investors, seeking to maximize their investment returns, adjust their investments accordingly. Thus, our second RQ addresses the effects of both funding sources:

RQ2: How does (a) private funding affect public funding, and (b) vice versa?

2.4 Impact of movie financing on cultural success (RQ3)

Due to streaming services, what was once the quasi-exclusive metric of movie success (i.e., box office revenue) is no longer a fully reliable gauge (Hadida et al., 2021). To prevent churn while also attracting new consumers, subscription-based business

² Thus, we can capture the dynamic relationship between funding and movie success. However, any interpretation of the results must acknowledge the limitations imposed by the unknown timing, in that this uncertainty may affect the causal interpretation and generalizability of our results.

models maintain dynamic, long-term content libraries. In their long-tail distribution models, higher movie quality likely attracts more consumers (Hadida et al., 2021; Hiller, 2017).

As noted, public funding aims for both economic and cultural contributions, and these two goals are not mutually exclusive (Bomnüter & Schulze, 2019). In this sense, cultural value is distinct from and exists separately of economic value but can positively affect it. Audience numbers strongly determine the impact of films on socio-cultural discourse, whereas public funding distinctly aims to improve objective qualitative contributions. Therefore, before public and private funding can determine financial success, they may already have determined the cultural contribution and thereby influenced the impact of current quality signals. Although measuring any influences on society and culture can hardly be reduced to a single construct, professional critics and consumer perceptions may provide the best approximations (Angelini & Castellani, 2019; Hutter & Frey, 2010).³

Professional critics play a dual role: They provide an impartial gauge of quality, and they influence the public's perception. The level of attention that movies receive from critics can indicate their cultural significance and reflect international press resonance. Due to their training and expertise, the opinions of critics often diverge from those of the average consumer. Popularity with the general audience also might imply cultural success (Basuroy et al., 2020).

Because public funding institutions follow a cultural mandate, we expect a positive effect of public funding on cultural success. McKenzie et al. (2020) show that with more public funding, local Australian institutions support more high-quality movies that otherwise would not have received financial help. As experienced professionals, expert critics evaluate quality objectively; the popularity of the cast or director should have less influence on their judgments but likely attract more critics (Basuroy et al., 2020). Angelini and Castellani (2019) argue that cast popularity is influential only for economic, not cultural, success. If a popular, successful cast or director is associated with a movie that receives further support from, for example, public institutions, we expect positive interaction effects of the quality signals.

In contrast with objective expert opinions, consumer opinions tend to be more dynamic and dependent on financial resources, as well as a popular cast (Basuroy et al., 2020; Hofmann et al., 2017). Although expert ratings help consumers, by signaling unobservable product quality (Moon et al., 2010), and consumers often use these expert ratings to confirm their previously held beliefs, the opinions of experts

³ Film festivals and awards are also commonly used indicators of cultural success; we considered including them in our model. We opted for nominations instead of awards received though, because they provide a more extensive selection of exceptional movies to evaluate while mitigating the potential influence of unobservable factors in the final decision-making process. The included awards/festivals are the Academy Awards ("Oscars"), Golden Globes, European Film Awards ("Felix"), German Film Awards ("Lola"), and Berlin International Film Festival ("Bears"). In our sample, 160 titles were nominated for 219 of these awards, for an average of .110 nominations per movie (37 U.S. nominations for 24 movies, .019 nominations per movie; 182 German nominations for 152 movies, .092 nominations per movie). Considering the strong correlations with expert rating and expert volume, increasing variance inflation factors (VIFs), model simplicity, and international resonance, we opted to exclude awards.

and consumers do not necessarily align (Basuroy et al., 2003, 2020). Critics typically evaluate movies well in advance of their actual release date, so expert ratings may be the sole source of advance information available to consumers; here, a negative professional review likely deters them. We thus predict that expert rating and volume positively affect consumer ratings, because consumers typically only rate movies they choose to see, which suggests a preexisting positive attitude (Basuroy et al., 2020). Similar to the presumed positive interaction between public funding and quality signals for economic success, we anticipate that more financial resources available through public funding and support from experienced critics reinforce the positive effects on consumer ratings, which motivates our next RQ:

RQ3: How does public funding (a) affect cultural success and (b) moderate the impact of quality signals on cultural success?

2.5 Impact of movie financing on economic success (RQ4)

Especially for private investors, movies' economic success remains a key driver. To date, expansive research has evaluated movie success by measuring box office revenues (Carrillat et al., 2018; Hennig-Thurau & Houston, 2019; Hofmann et al., 2017; McKenzie, 2022). Other than McKenzie et al. (2020), studies of the impact of public funding have focused on national, that is, local, box office revenues (e.g., Jansen, 2005; McKenzie & Walls, 2013; Meloni et al., 2015). We seek to extend these findings by adding public funding as a determinant of local and global economic success that interacts with other, established quality signals. In general, a higher production budget indicates higher box office revenues (Hennig-Thurau & Houston, 2019), but the specific effect of public funding remains disputed. As mentioned, McKenzie et al. (2020) find a low positive effect of public funding on box office revenues, whereas Meloni et al. (2015) find a negative effect.

We propose that, in addition to the indirect effect we predicted with regard to attracting private funding and increasing cultural success, by providing movies that resonate with both experts and consumers, public funding directly affects economic success. More financial resources and support from experienced public funding agencies, who know the domestic market and might provide valuable industry contacts, should allow movie makers to produce a better final product. However, previous studies with limited samples have been unable to establish such influences (see Table 1). In addition, quantitative studies that ignore public funding cannot specify its potentially positive impacts on other success factors. For example, movies with more public funding lean toward smaller budgets, whereas titles with sufficient funding (e.g., those produced by a major movie studio) are less inclined to consider public sources of support in the first place. However, if a movie with a popular cast were to receive public funding, it might strengthen the positive influence of that popular cast, because additional money becomes available to invest in other aspects and improve the overall product. Likewise, specially curated, subsidized movies with a better expert rating may benefit more from funding support, whereas a high-budget, privately funded project may not derive much marginal benefit from enhanced expert ratings (Hennig-Thurau & Houston, 2019). Because

funding agencies act largely within local networks, we expect that public funding has a stronger impact on local success, but because funding also aims at global success, these impacts should not differ too greatly. Therefore,

RQ4: How does public funding (a) affect local and global economic success and (b) moderate the impact of quality signals on economic success?

3 Study design

3.1 Data

To address our research questions in a representative domestic market that relies heavily on public funding, we collected data on 1984 movies that were either produced locally or co-produced in Germany, which is a requirement for applying for German public funding (BKM, 2022; FFA, 2022). Funding institutions provide information about the amounts granted for all movies shown in German cinemas between 2005 and 2015. Germany is one of the largest European movie markets and among the top 10 markets internationally (MPA, 2022). Data on German cinema revenues also have been used in relevant previous research and are valid for global interpretation (e.g., Clement et al., 2014). Table 2 illustrates the variable operationalizations, descriptive details, and respective data sources.

Public funding figures are included in annual reports of the respective government institutions, which include two federal and nine regional institutions. Usually, a committee or the management of the respective institution makes the final funding decision. The reasons for acceptance or rejection are unknown; they are not even shared with applicants. Private funding refers to all financial contributions that are not public; we rely on movie budgets to determine this measure.

To quantify cultural success, that is, socio-cultural impact, we obtain review ratings by experts and consumers. Expert rating is the weighted average quality score given to each movie by professional critics. Expert volume captures the number of published reviews by professional critics. Consumer rating reflects the Internet Movie Database (IMDb) ranking, which tends toward higher ratings but is still a popular indicator of typical consumer preferences (e.g., Basuroy et al., 2020).

With regard to cast and director signaling power, we develop local popularity indices for the cast and the director of each movie in the year of its production. These scores are based on an annual community ranking by Filmstarts, a leading German online movie magazine. The time-dependent and country-specific measures account for shifting popularity across countries and over the course of a star's career. To quantify producer signaling power, we use the track record of the production company, which signals economic competitiveness. This track record consists of accumulated cinema admissions in Germany for all the company's movies during the period under consideration, until the year before the focal movie was released. We refer to legally independent production companies; dependent companies, where other production companies hold at least 25% of their capital, instead are consolidated. That is, we consolidate any subsidiaries that might have been created to produce a specific movie.

Table 2 Variable Operationalization & Descriptive Statistics

Category	Variable	Operationalization	Mean (SD)	Min	Max	Data source
Financing	Public funding	Ln-transformed financial contribution by public institutions (based on annual reports; in euro)	13.326 (2.300)	0.000	18,464	mediabiz.de public reports
	Private funding	Ln-transformed financial contributions apart from public subsidies based on production budgets (in euro)	9.871 (5.194)	0.000	16,441	imdb.com the-numbers.com
Cultural success	Expert rating	Ln-transformed weighted average quality score by professional movie critics (transformed to 1 to 10 scale)	1.906 (.285)	0.642	2.398	filmstarts.de metacritic.com
	Expert volume	Ln-transformed number of published professional reviews	2.522 (1.262)	0.095	6.409	imdb.com
Economic Success	Consumer ratings	Ln-transformed average consumer ratings (IMDb user rating from 1 to 10)	1.975 (.104)	0.000	2.332	imdb.com
	Local box office	Ln-transformed total box office revenues in Germany (in euro)	11.075 (2.538)	1.860	17,789	boxofficejojo.com
Quality Signals	Global box office	Ln-transformed total box office revenues worldwide (in euro)	13.032 (2.659)	3.030	19,710	boxofficejojo.com
	Cast	Ln-transformed popularity indices for the cast members during the year of production, based on an annual community ranking	0.688 (1.434)	0.000	5.328	filmstarts.de
Target Audience (Controls)	Director	Ln-transformed popularity indices for the director during the year of production, based on an annual community ranking	0.035 (0.258)	0.000	2.833	filmstarts.de
	Producer	Ln-transformed sum of sold cinema tickets in Germany of all the producing studio's movies up to one year before the movie release	6.188 (6.772)	0.000	19,059	mediabiz.de boxofficejojo.com public reports
Age rating	Age rating	German age restriction transformed into an ordinal variable: ages 0 (=0), 6 (=1), 12 (=2), 16 (=3), and 18 and above (=4)	1.281 (1.108)	0	4	imdb.com
	Release date	Cinema release day during observation period, sequentially numbered and ln-transformed	7.332 (0.912)	1.792	1	imdb.com
Major	Major	Binary variable for cinema distribution by major studio	0.163 (0.369)	0	1	imdb.com
	Sequel	Binary variable if movie classifies as sequel	0.021 (0.144)	0	1	imdb.com
Genre	Genre	Binary variables for genres: action/adventure, comedy, crime, documentary, drama, fantasy/sci-fi, horror, kids	n.a	0	1	imdb.com

Mean (SD) values for genres: action/adventure .024 (0.154); comedy .133 (0.340); crime .035 (0.183); documentary .327 (0.469); drama .403 (0.491); fantasy/sci-fi .009 (0.092); horror .005 (0.071); kids .058 (0.234); n.a. = not applicable

As additional quality signals, we determine the prospective release circumstances in terms of age rating, release date, if movies are produced in collaboration with a major studio, if they classify as sequels, and their genre. The size of the potential target market depends on the age rating, so we classify all movies using an ordinal variable, according to grades of restrictiveness. We distinguish eight dominant genres but also pool hybrid movies that overlap in several genre categories (Zhao et al., 2013).

3.2 Model

The variables in Table 2 provide the basis for a series of regressions derived from our research questions and respective movie production stages (Fig. 1). We start by considering the relevant impact factors for public funding and private funding. Next, we note the outcome variables for cultural success (expert rating, expert volume, consumer rating) and economic success (local/global box office). We derive five base model equations that we gradually extend with mean-centered interaction terms. Finally, we analyze floodlight plots and simple slopes (Aiken & West, 1991; Spiller et al., 2013). Formally,

$$\begin{aligned} \text{public funding} = & \beta_{0a} + \beta_{1a}\text{private funding} + \beta_{2a}\text{cast} + \beta_{3a}\text{director} + \beta_{4a}\text{producer} \\ & + \beta_{5a}\text{INTERACTIONS} + \beta_{6a}\text{CONTROLS} + \varepsilon_{1a} \end{aligned} \quad (1a)$$

$$\begin{aligned} \text{private funding} = & \beta_{0a} + \beta_{1b}\text{public funding} + \beta_{2b}\text{cast} + \beta_{3b}\text{director} + \beta_{4b}\text{producer} \\ & + \beta_{5b}\text{INTERACTIONS} + \beta_{6b}\text{CONTROLS} + \varepsilon_{1b} \end{aligned} \quad (1b)$$

$$\begin{aligned} \text{expert rating} = & \delta_0 + \delta_1\text{public funding} + \delta_2\text{private funding} + \delta_3\text{cast} + \delta_4\text{director} \\ & + \delta_5\text{producer} + \delta_6\text{INTERACTIONS} + \delta_7\text{CONTROLS} + \varepsilon_2 \end{aligned} \quad (2)$$

$$\begin{aligned} \text{expert volume} = & \gamma_0 + \gamma_1\text{public funding} + \delta_2\text{private funding} + \delta_3\text{expert rating} + \delta_4\text{cast} \\ & + \delta_5\text{director} + \delta_6\text{producer} + \delta_7\text{INTERACTIONS} + \delta_8\text{CONTROLS} + \varepsilon_3 \end{aligned} \quad (3)$$

$$\begin{aligned} \text{consumer rating} = & \lambda_0 + \lambda_1\text{public funding} + \lambda_2\text{private funding} + \lambda_3\text{expert rating} \\ & + \lambda_4\text{expert volume} + \lambda_5\text{cast} + \lambda_6\text{director} + \lambda_7\text{producer} \\ & + \lambda_8\text{INTERACTIONS} + \lambda_9\text{CONTROLS} + \varepsilon_4 \end{aligned} \quad (4)$$

$$\begin{aligned} \text{local box office} = & \sigma_{0a/b} + \sigma_{1a/b}\text{public funding} + \sigma_{2a/b}\text{private funding} + \sigma_{3a/b}\text{expert rating} \\ & + \sigma_{4a/b}\text{expert volume} + \sigma_{5a/b}\text{consumer rating} + \sigma_{6a/b}\text{cast} + \sigma_{7a/b}\text{director} \\ & + \sigma_{8a/b}\text{producer} + \sigma_{9a/b}\text{INTERACTIONS} + \sigma_{10a/b}\text{CONTROLS} + \varepsilon_{5a/b} \end{aligned} \quad (5a)$$

$$\begin{aligned}
\text{global box office} = & \sigma_{0a/b} + \sigma_{1a/b}\text{public funding} + \sigma_{2a/b}\text{private funding} + \sigma_{3a/b}\text{expert rating} \\
& + \sigma_{4a/b}\text{expert volume} + \sigma_{5a/b}\text{consumer rating} + \sigma_{6a/b}\text{cast} + \sigma_{7a/b}\text{director} \\
& + \sigma_{8a/b}\text{producer} + \sigma_{9a/b}\text{INTERACTIONS} + \sigma_{10a/b}\text{CONTROLS} + \varepsilon_{5a/b}
\end{aligned}
\tag{5b}$$

Equations 1a and 1b measure the impact of quality signals on financing sources; they do not include the cultural success variables (which appear in Eqs. 2–4), which only emerge during and shortly after the movie’s cinema release. Equations 5a and 5b measure the impact of funding, cultural success, and quality signals on economic success. The CONTROLS matrix measures the control variables age rating, release date, major, and sequel, as well as the genre categories. Then, INTERACTIONS indicates the interaction effects of funding and quality signals.

Arguably, financing decisions follow unobservable management decisions. However, both variables, as well as all other variables, are exogenous and uncorrelated with the respective equations’ error terms (Papies et al., 2017). The extensive set of controls should minimize endogeneity problems (Ebbes et al., 2016, and instrumenting core variables can decrease model predictive usability (Papies et al., 2017). Therefore, we are confident in our model’s robustness. We check for possible multicollinearity with VIF; the values range between 1.05 and 1.91, well below the threshold of 5.0 and the even more restrictive threshold of 3.33 (Hair et al., 2010).

Some heteroscedasticity tests for several sub-models were positive, so we tested each model again, using robust standard errors (Ebbes et al., 2016). The results were congruent with our base estimations.

4 Results

4.1 Overview

Our study focuses on analyzing the impact of the type of financing on cultural and economic movie success. We begin with the results for influences on the two major film financing components, public funding and private funding. They are based on the respective signal factors, cast, director, and producer, which we include as independent variables, as well as the controls for the target audience, which commonly is set at the financing stage. Next, we present our results for movie success. As noted, we extend the regression equations successively and display the shortened results in Table 3.⁴ We base our analysis of the interaction effects on floodlight plots, including the Johnson-Neyman points displayed in Figs. 2, 3 and 4 for cultural success and Fig. 5 for economic success (Aiken & West, 1991; Spiller et al., 2013). We begin by presenting the direct results and discuss their intricacies in the succeeding section.

⁴ Model statistics, bivariate correlations, *t*-test results, and extensive result tables are available on request.

4.2 Impact of quality signals on movie financing (RQ1) and impact of public on private funding (RQ2)

4.2.1 Public funding

As expected, our first model (Table 3, column 1a) confirms that, in addition to private funding, cast popularity and the producers' track record attract public funding. However, a more popular director does not suffice to increase public funding commitments. The t-tests further confirm that the impact of cast is stronger than that of private funding. In addition, the interaction effects show that private funding weakens the positive impact of producer: If a movie is privately financed anyway, the producer's past successes are less important to attract public funding.

4.2.2 Private funding

The second model (column 1b) confirms that more public funding also attracts private funding. This impact of public on private funding is significantly stronger than the reverse impact. The estimation also reveals that both cast and producer attract private funding, in addition to director popularity, which does not affect public funding. Although cast has the strongest impact on public funding, director has the strongest impact on private funding. In addition, the positive impact of producer is significantly stronger on public funding.

The interaction effects of public funding with the signal factors remain insignificant, both jointly and individually. Not surprisingly, movies by major studios are more privately financed. Likewise, action/adventure and crime productions seem to appeal more to private investors.

4.3 Impact of movie financing on cultural success variables (RQ3)

4.3.1 Expert rating

After movies go through the production process, they are ready for the big screen. Here, professional critics are the first to judge their quality. In line with the supposedly objective nature of their judgement, our estimation (Table 3, column 2) shows that neither private nor public funding affects expert rating. Only cast popularity slightly deters professional critics' ratings, but the floodlight plot of the financing variables' moderating impacts reveals that more public funding can reverse the negative effect (Fig. 2); the same applies to the interaction effect of director. In turn, private funding has no impact on the effect of cast on expert rating, but it weakens the effect of director on expert rating valence.

Table 3 Model Results

Model	Financing			Cultural success			Economic success							
	1a		1b		2		3		4		5a		5b	
	Public funding (0.208)	P> t	Private funding (0.260)	P> t	Expert rating (0.091)	P> t	Expert volume (0.450)	P> t	Consumer rating (0.226)	P> t	Local box office (0.600)	P> t	Global box office (0.609)	P> t
Coef	P> t	Coef	P> t	Coef	P> t	Coef	P> t	Coef	P> t	Coef	P> t	Coef	P> t	
Public funding	-	-	0.028**	0.007	0.001	0.442	0.010*	0.098	0.001	0.102	0.066**	0.000	0.042**	0.003
Private funding	0.144**	0.007	-	-	-0.006	0.130	0.210**	0.000	0.000	0.828	0.159**	0.000	0.331**	0.000
Expert rating	-	-	-	-	-	-	0.948**	0.000	0.120**	0.000	0.268	0.125	0.045	0.838
Expert volume	-	-	-	-	-	-	-	-	0.016**	0.000	0.689**	0.000	1.193**	0.000
Consumer rating	-	-	-	-	-	-	-	-	-	-	10.503**	0.002	1.600**	0.006
Cast	0.393**	0.000	0.178**	0.000	-0.009*	0.079	-0.043**	0.017	0.007**	0.000	0.284**	0.000	0.144**	0.000
Director	-0.497	0.225	0.528**	0.003	0.006	0.821	0.377**	0.000	-0.016**	0.046	0.059	0.686	-0.197	0.216
Producer	0.157**	0.000	0.017**	0.038	0.001	0.577	0.009**	0.027	0.000	0.401	0.018**	0.016	0.018**	0.039
Public*private	-	-	-	-	0.001	0.118	-0.008**	0.001	0.000	0.100	0.005	0.228	-0.007	0.226
Public*expert	-	-	-	-	-	-	0.036**	0.039	-0.003	0.100	0.020	0.522	-0.007	0.860
Public*volume	-	-	-	-	-	-	-	-	0.002**	0.000	0.011	0.106	0.002	0.872
Public*consumer	-	-	-	-	-	-	-	-	-	-	.070	0.394	-0.076	0.421
Public*cast	-	-	-0.003	0.707	0.003*	0.066	-0.013**	0.007	0.001**	0.046	0.012	0.137	0.000	0.981
Public*director	-	-	-0.025	0.382	0.007*	0.098	-0.009	0.501	0.004**	0.002	0.044*	0.063	0.030	0.258
Public*producer	-	-	-0.002	0.126	0.000	0.736	0.000	0.854	0.000	0.149	0.000	0.744	-0.004**	0.036
Private*expert	-	-	-	-	-	-	-0.056	0.148	0.030**	0.000	-0.190**	0.011	-0.630**	0.000
Private*volume	-	-	-	-	-	-	-	-	0.003**	0.001	0.002	0.888	0.060**	0.006
Private*consumer	-	-	-	-	-	-	-	-	-	-	-0.611**	0.003	-1.029**	0.000
Private*cast	-0.022	0.624	-	-	-0.003	0.320	-0.009	0.386	-0.002**	0.011	-0.033*	0.058	-0.021	0.374
Private*director	-0.398*	0.073	-	-	-0.057**	0.000	-0.036	0.428	-0.009**	0.043	0.337**	0.000	0.095	0.261

Table 3 (continued)

Model	Financing			Cultural success			Economic success								
	1a		1b		2		3		4		5a		5b		
	Coef	P> t	Coef	P> t	Coef	P> t	Coef	P> t	Coef	P> t	Coef	P> t	Coef	P> t	
DV (R2) =	Public funding (0.208)	0.358	0.000	0.018	0.743	0.022**	0.016	0.017	0.593	-0.002	0.461	-0.299**	0.000	-0.224**	0.001
	Private funding (0.260)	0.998	0.000	0.989**	0.000	-0.034	0.131	0.093	0.220	0.012*	0.088	1.248**	0.000	1.104**	0.000
	Expert rating (0.091)	0.261	0.119	0.247	0.467	-0.070	0.147	-0.238	0.145	-0.020	0.216	1.367**	0.000	1.404**	0.000
	Expert volume (0.450)	0.119	0.119	1.131**	0.000	-0.196**	0.000	0.447**	0.005	-0.036**	0.017	0.386	0.161	0.291	0.316
	Consumer rating (0.226)	0.081	0.620*	-0.010	0.947	-0.111**	0.000	-0.394**	0.000	-0.023**	0.002	1.418**	0.000	1.346**	0.000
	Local box office (0.600)	0.003	1.806**	0.749**	0.006	-0.036	0.353	0.346**	0.008	-0.014	0.247	0.414*	0.070	0.574**	0.032
	Global box office (0.609)	0.000	-3.156**	0.000	0.000	0.002	0.943	-0.788**	0.000	0.019**	0.010	0.097	0.472	0.307	0.109
		0.365	1.015	0.016	0.580	-0.243**	0.001	0.653**	0.006	-0.036	0.113	0.575	0.163	0.776*	0.092
		0.016	-3.511**	0.354	0.580	-0.409**	0.000	10.141**	0.001	-0.187**	0.000	0.284	0.651	1.014	0.153
		0.037	1.093**	0.780**	0.001	-0.058*	0.093	-0.752**	0.000	-0.024**	0.037	1.703**	0.000	1.742**	0.000
	Constant	7.848**	0.000	12.876**	0.000	1.864**	0.000	-2.091**	0.000	1.713**	0.000	4.870**	0.000	1.893	0.147

** Significant at p < .05

*Weakly significant at p < .10

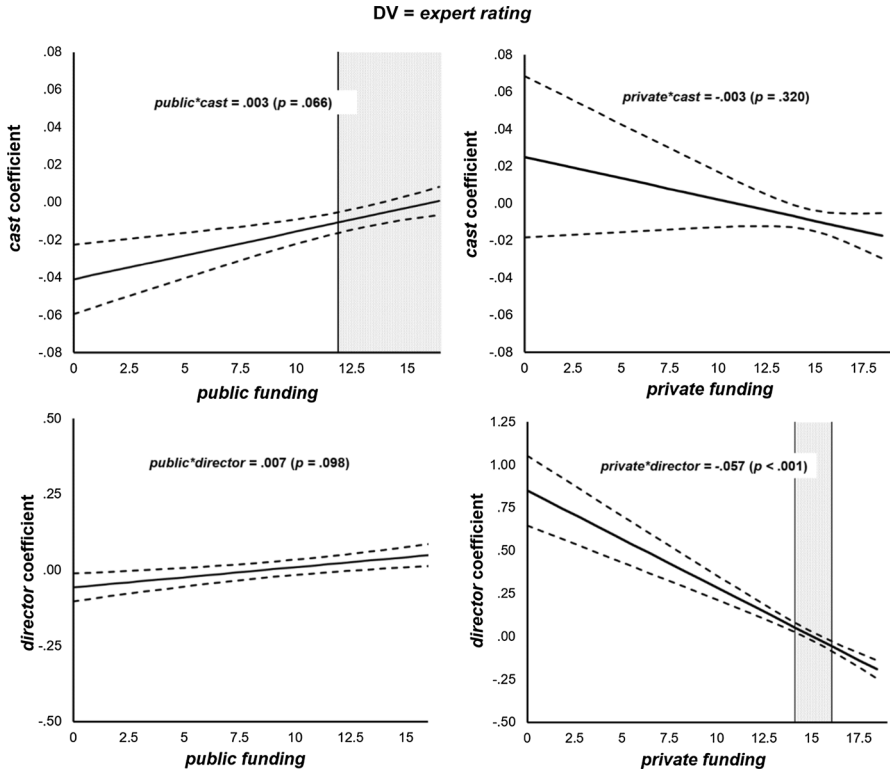


Fig. 2 Moderating Effects on Expert Rating

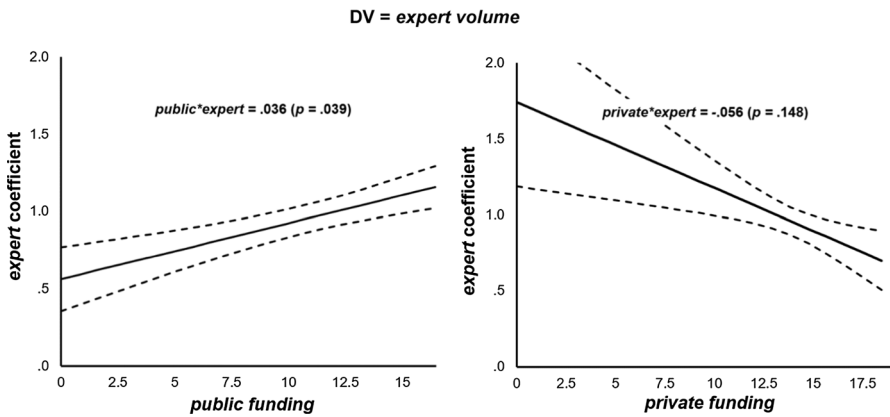


Fig. 3 Moderating Effects on Expert Volume

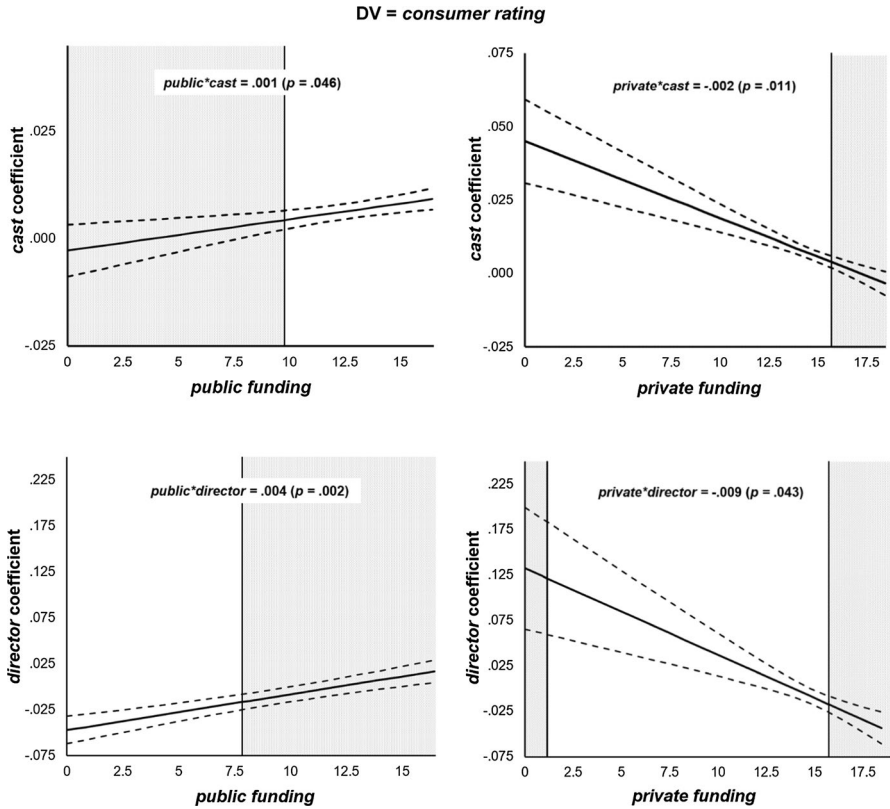


Fig. 4 Moderating Effects on Consumer Rating

4.3.2 Expert volume

Looking at the number of published reviews, our estimation results in Model 3 (column 3) indicate that both public and private funding (0.210, $p < 0.001$) have positive effects on expert volume; that is, bigger budget movies get more critical attention. The negative interaction of the two financing variables emphasizes this conclusion. Expert rating itself is the strongest predictor of expert volume. As with rating valence, cast popularity decreases expert volume. In contrast, a popular director attracts expert reviews. The floodlight analysis graphs display how public funding increases the positive effect of expert rating (Fig. 3).

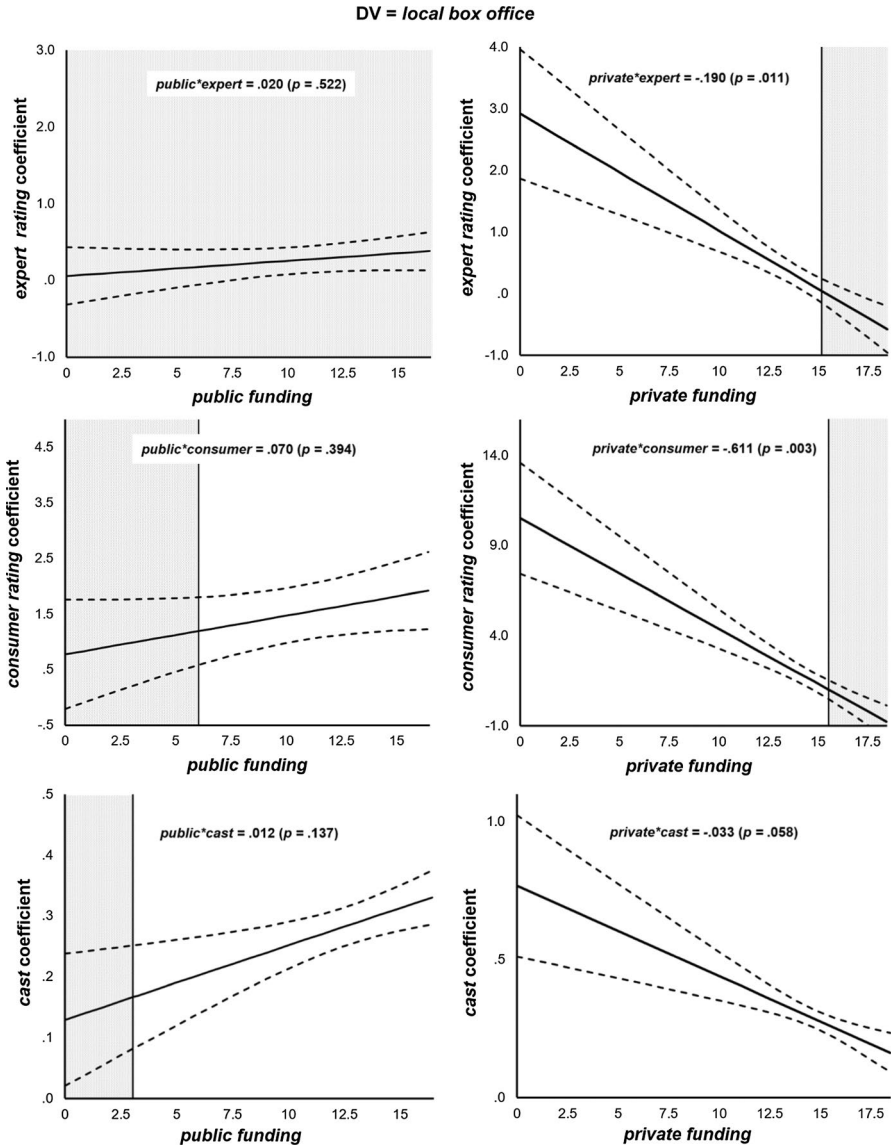


Fig. 5 Moderating Effects on Economic Success

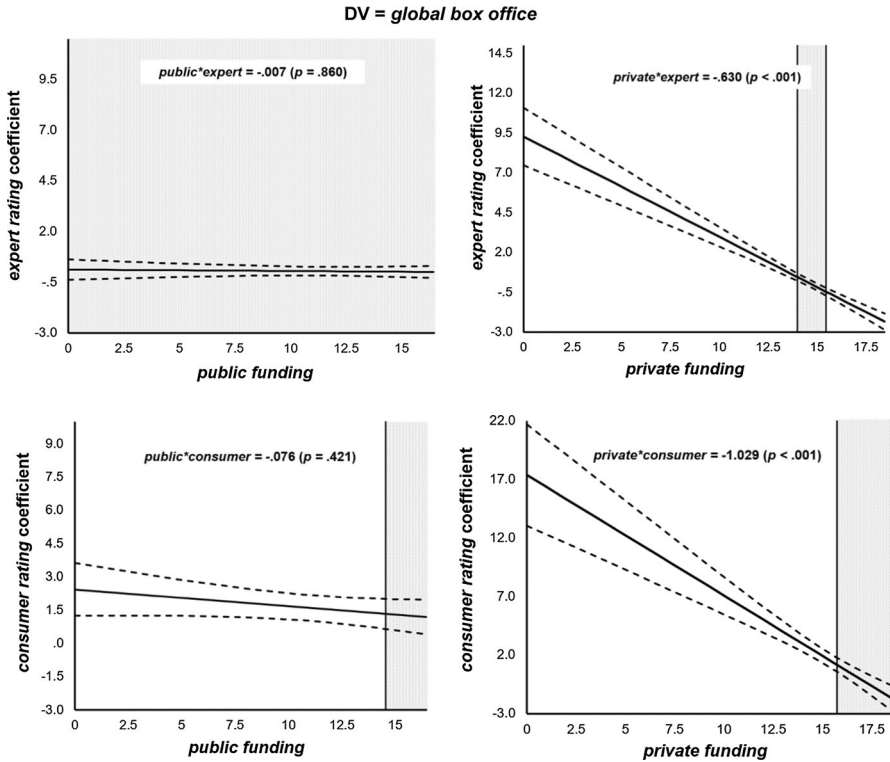


Fig. 5 (continued)

4.3.3 Consumer rating

Analogous to their impact on expert rating, neither private nor public funding affects consumer rating in Model 4. Expert rating overshadows all other factors, though expert volume and a more popular cast also resonate with consumer opinions. Both forms of financing also increase the positive impact of expert volume, whereas only private funding enhances the impact of expert rating. In contrast, a well-known director tends to lower consumer rating, a point we reflect on further in the discussion, in relation to our subsequent results. In fact, the moderating effects of public funding indicate that more public funding increases the positive impact of cast popularity and counteracts the negative effect of director on consumer rating (Fig. 4). In contrast, private funding weakens the success-increasing effect of the cast and strengthens the success-decreasing effect of the director.

4.4 Impact of movie financing on economic success (RQ4)

Despite ongoing market turbulence, cinemas continue to be crucial economic success multipliers. Our congruent Models 5a and 5b (Table 3) show that

higher public funding increases both local and global box office success, despite various control factors that could have outweighed its impact. Likewise, private funding increases local and global box office figures, but its global impact is significantly stronger. The local versus global effects of public funding do not differ significantly. In addition, the positive impact of public funding on local box office is significantly stronger than the local box office impacts derived from producer experience.

The floodlight graphs further illustrate how the funding type exerts strongly diverging effects on other success factors (Fig. 5). For example, the effect of expert rating is not affected by public funding. Although expert rating can significantly increase box office success at lower private funding levels, an increase in private funding can reverse this positive impact on both local and global box office. Similarly, an increase in private funding weakens the positive impact of consumer rating on both local and global box office success. In addition, we observe that private funding negatively moderates the positive impact of cast on local box office, whereas the latter is partly positively affected by public funding. In contrast, higher private funding can strengthen the positive effect of a popular director and producer experience on local box office success.

5 Conclusion

5.1 Discussion

5.1.1 Summary

Our proposed research model outlines how quality signals affect financing decisions for entertainment products, their interplay with available financial resources, and the effects on product success. As a key result, we show that public funding has positive impacts, by attracting both private funding and press coverage, eventually increasing national and global box office success. Public funding does not directly enhance expert and consumer ratings, suggesting that it does not guarantee quality (e.g., Follows, 2015). However, the effect of expert and consumer ratings on other non-content factors and on global box office success still suggests a positive socio-cultural impact. Our data even indicate a negative effect of private funding on quality, as judged by experts and consumers.

5.1.2 Financing drivers

In terms of quality signals, having a popular cast associated with a project is more important for attracting public funding than prior production success. This result validates the use of star power as a signaling factor when applying for public funding (Elberse, 2007; Hennig-Thurau et al., 2013). Moreover, the results confirm Brewer et al.'s (2009) suspicion that expensive, popular actors deter some private investors. In contrast, director popularity does not affect public funding decisions, which might be explained by the impact that directors have on private

funding: Renowned directors tend to attract sufficient private funding and may also attract the interest of major studios, making additional public support unnecessary in most cases. Given the relative importance of producer power for public funding, this signaling aspect may prevent equal access to subsidies in the market: Producers who have been more successful in the past tend to obtain more public funding, perhaps based on their experience with funding applications or their ties to public decision-makers (Suárez, 2011). In addition, funding bodies may try to mitigate their risk by preferring to subsidize projects run by proven production companies. The controls indicate that funding providers prefer movies that appeal to a broader audience, due to weaker age rating restrictions, but are also concerned with more serious topics.

In a general meta-analysis (outside the movie industry), Dimos and Pugh (2016) find that public R&D funding neither crowds out nor increases private funding. In a movie context, we instead find a correlation between these funding sources: Higher public funding attracts private investors. The cast has a significantly lower impact on private funding (vs. public funding), in line with Brewer et al.'s (2009) argument that cast fees can skim off additional revenues, leading to a trade-off for private investors. In contrast, a popular director provides more security and attracts more private funding. Producer power has the least impact on private investors; companies have equal access to private funding, so private investors consider other factors more crucial. Perhaps the production company is irrelevant to private investors, provided it meets some minimum production capacity requirements.

5.1.3 Cultural success

The overall impact of movies on the socio-cultural discourse is naturally determined by audience size and preferences, but we add an objectively judged qualitative contribution: Can public funding make a “better” contribution to cultural discourses? Entertainment products can be culturally successful if they appeal to professional critics and consumers alike (i.e., society). However, we find that more public funding does not increase expert ratings, in contrast with McKenzie et al.'s (2020) observation of higher quality output due to subsidization. But even if subsidization does not lead directly to better products, the interaction analysis suggests a supporting influence. As Fig. 2 displays, both cast and director popularity are elevated with more public funding, which can improve overall product quality if sufficient funding is available. Our results regarding the drivers of expert ratings and volume also confirm their validity: Only one of the non-content quality signals has an impact on review valence. Thus, the expert rating signals objectivity; expert judgments appear driven primarily by content and its interplay with the production chain (Hennig-Thurau & Houston, 2019). In contrast, the attention movies receive in the form of published professional reviews is markedly determined by financing and quality signals, in addition to their valence: Popular directors in particular attract critics; cast

popularity deters them. These findings align with extant evidence about cultural success drivers (Angelini & Castellani, 2019; Basuroy et al., 2020).

We find that neither funding source directly improves consumer ratings, which instead tend to reflect expert assessments. According to the interaction plot (Fig. 4), though more private funding decreases the advantage achieved by a popular cast or director, subsidization increases it. Expert ratings have the strongest positive effect on consumer ratings, in support of their general relevance and the expectation that consumers seek to have their opinions confirmed by experts, then make product choices accordingly (Basuroy et al., 2003, 2020). Furthermore, the effect is strengthened by more private funding, which follows the notion that large productions in particular promote well-reviewed movies (Rao et al., 2017). The negative interactions between private funding and cast and director confirm a dampening effect, such that the total marginal utility of cast and director decreases as the total budget increases.

5.1.4 Economic success

Public funding increases economic (local and global box office) success, regardless of other influential factors, such as private funding or cast popularity. The effect even exceeds that of producer power. Thus, our findings challenge extant research, based mostly on smaller and older samples (e.g., Jansen, 2005; McKenzie & Walls, 2013). Although expert rating valence affects neither local nor global box office success, the differences and interactions reveal intriguing, (indirect) impacts of public funding. The floodlight graphs indicate that, as public funding increases, the impact of expert (consumer) ratings on economic success remains relatively stable; in contrast, private funding significantly diminishes the impact of expert (consumer) ratings on economic success (Fig. 5). Therefore, greater public support can preserve the impact of factors that would otherwise lose influence due to private funding.

The floodlight diagram in Fig. 5 further shows that increasing private funding decreases the impact of cast popularity on local box office success. This point argues against a general effect, such that simply putting more popular cast members and money into a project would lead to economic success. In contrast, locally, the director benefits from more financial resources in general, but private funds appear more effective. This result might be rooted in the general tendency of private investors to favor projects with popular directors. Ultimately, producer power helps economic success, but its greatest impact is in attracting public funds.

5.2 Practical implications

Our findings show that public and private funding do not enhance movie quality, either by expert standards or from a consumer perspective, but make movies more successful economically in local and global cinemas—a point that government organizations must consider carefully if their goal is to improve cultural contributions. Our data also show that the decision to publicly fund a movie depends substantially on the cast and producer. For private funding, the director is highly relevant in determining funding amounts. Both financing types thus appear based on quality signals, which do not improve ratings but do improve box office success.

Still, it might be important and relevant for public funding bodies to take riskier paths and support movies with less experienced cast and producers, which might lead to the production of more innovative movies. Our finding that public funding directly enhances economic success, elevates other factors through indirect effects, and affects press coverage suggests that private investors should see public funding more as a success signal. It might be that subsidized projects are those that yield more success for both sides if additional private funding gives them opportunities to invest in necessary marketing. Especially for long-tail subscription models, which can target more niche tastes, such a synergetic relationship should benefit all parties.

We provide insights for other sectors of the economy that rely on public funding and confront market imperfections. Start-up companies and R&D projects in general frequently struggle for public funding, which can serve as a signal factor for private funding (Kleer, 2010). It is worth investing in successful personnel (cast) and executives (director), not only to attract public and private funding, but also because funding support creates synergies between funding personnel and corporate stakeholders.

5.3 Limitations and research outlook

Public funding for entertainment products might support various elements and sub-categories, such as screenwriting, project development, and distribution. We focus on (pre-)production-related funding and aggregate figures, but strategic insights might be hidden in the individual funding channels. As with all studies that analyze cultural goods, we deal with unique artistic products whose production and budget planning processes are largely confidential (Hennig-Thurau & Houston, 2019): Outsiders cannot know how/which funding sources have been secured, prior to the publication of public funding decisions. Thus, it was not feasible to include granular temporal differences (i.e., which funding was received first). Our large sample partially addresses this issue by mitigating outlier impacts. To be eligible for public funding in Germany, the core production activities must take place in Germany or as a German co-production. This sample selection condition naturally restricted our movie subset, though its substantial size supports generalization.

Similar to many industries, entertainment products are shifting from ownership-based toward access-based consumption. Subscription models rely on decision variables related to customer churn and retention. Therefore, additional studies should consider success measures other than sales, which likely will have lasting impacts on management decisions. Finally, cinemas continue to struggle with declining consumption. Our results can help cinemas maintain a certain competitive edge, but the results' longevity can be affected by dynamic audience changes. Stars still attract consumers, but their role is changing, especially among younger generations and with the rise of social media. Here, there is incidental evidence of a shift toward even more extreme conditions. On the one hand, there are fewer but more popular traditional movie stars, and on the other, a plethora of social media celebrities caters to their niche audiences.

Acknowledgments The authors thank Florian Kumb for his extensive intellectual support of this project, as well the editor and the anonymous reviewers for their constructive comments.

Funding Open Access funding enabled and organized by Projekt DEAL.

Declarations

Conflict of interest The authors declare to have taken into account all of the usual ethical standards.

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