# Modeling the Main Determinants of Movie Sales: An Econometric Study of Chinese Marketplace

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**Abstract:** This paper investigates the financial performance of movies in China, a fast-growing commercial exhibition marketplace. Movie sales and Chinese market returns, movie characteristics and cultural contexts are operationalized in ordinary least squares (OLS) regression and quantile regression models to explain the highly varied acceptance across different products released since 2009. The samples comprise most of the widely released motion pictures in China. We posit that production budgets, sequels, audience ratings, cultural contexts and movie genres can significantly account for the variation in box office (BO) revenue and sales-revenue-to-cost (SRTC) within the Chinese market. Movies produced in countries with similar cultural contexts capture more audiences measured by box office proceeds, but it is noteworthy that SRTC falls at a decreasing rate as cultural differences increase. An increase in production budget generates more sales in China, but reduces the SRTC ratios with other factors controlled. Although aggregate cinema attendance may fluctuate with releasing date, this is not always true for an individual movie's financial success. Quantile regressions provide us with a richer characterization of the relationship, enabling us to analyze the entire distribution of box office proceeds and SRTC ratios, as well as their determinants at key quantiles.

**Keywords:** Box office revenue, market sales return, cultural discount.

## 1. INTRODUCTION

Buoyed by a sharp increase in cinema consumption, box office revenues[1] in China[2] continued to surge in the first two quarters of 2013 (Brzeski and Tsui 2013). Homegrown movies made a material contribution to the sales growth. Their sales increased 1.11 billion U.S. dollars (6.85 billion China Yuan), a 144% year-on-year jump. The domestic sales of imported movies, however, decreased 675 million U.S. dollars (4.14 billion China Yuan), falling by 21.3% year-on-year (Brzeski and Tsui 2013). Although, in 2012, a new policy agreement between China and the United States allowed for 14 more 3D or IMAX movies to be imported, China has been attaching more importance to the support of homegrown movies. Since December 1st 2012, the Chinese government would subsidize the production and distribution of homegrown, "high-tech" movies featured by 3D and IMAX. For exhibition sectors, the State Council of China has subsidized the installation of digital screens and offers refunds for newly constructed theaters (EntGroup 2013a). Along with the fierce competition and golden opportunities within the international market, it is of utmost importance to have a comprehensive and in-depth understanding about the development of the movie industry in China. In this study, we examine the main determinants of movie sales in China, with a special emphasis on the culture perspective.

Although the Global Financial Crisis led to a decline in the movie business in most parts of the world since 2008 (Poupard 2008), however, 2009 was a boom year for box office sales in China (Su 2010). In 2012, China experienced a rapid growth in gross domestic product (GDP) with a total of 51.93 trillion China Yuan, increasing by 7.8% year-on-year, based on the data obtained from the Nation Bureau of Statistics of China (2012). The per capita annual disposable income (DPI) of urban households of 24,565 China Yuan was a real increase of 9.6% compared with the previous year. The sustained growth of GDP and DPI boosted personal consumption and allowed the movie business to flourish during these years. Several recent studies have paid special attention to Chinese films (Liebler, Jiang and Chen 2015; Zhou 2001; Yeh 2009). However, until now, few extant academic works involve the discussion of the movie industry in China from an economics perspective. In this regard, we contribute to the literature on movie sales by uncovering the factors affecting a movie's financial success in China.

Culturally, there is reason to believe that the type of movies shown in the Chinese market would differ from that of other markets due to the socio-economic differences. Given the increasing maturity of market circumstance and industrial regulation, understanding the financial performance of the theatrical releases in a

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[1]Box office revenues, box office sales and box office proceeds are used interchangeably in this paper.
[2]In this study, the Chinese box office sales refer to the revenues in mainland China market, which do not include the proceeds from Hong Kong, Macau and Taiwan markets.

burgeoning commercial exhibition market will make a significant sense for both industrial forecasting and managerial suggestions.

Several studies have examined the factors associated with the financial performance of theatrical movies. Factors widely used to account for the variation in box office sales include: demographic characteristics (Redondo and Holbrook 2010), cultural distance (Fu and Lee 2008; Lee 2009; Walls and McKenzie 2012), seasonality effects (Cartier and Liarte, 2012), star power (Ravid 1999), budgets (Palia Ravid and Reisel 2008; Ravid 1999), professional reviews (Basuroy, Chatterjee and Ravid 2003), word of mouth referrals (Chintagunta, Gopinath and Venkataraman 2010; Liu 2006), sequel (Bruce, Foutz and Kolsarici 2012), genres (Desai and Basuroy 2005), and MPAA ratings (Ravid 1999; De Vany and Walls 2002). However, little scholarly discussion involved the indirect and nonlinear impact of cultural affinity on movie consumption behavior, and little research has been done to assess the movie performances across all the quantiles. This paper Contributes to this line of literature by showing a nonlinear effect of cultural similarity and using quantile regression technique to fully quantify the effect of determinants.

The rest of this paper is organized as follows. After this brief introduction in Section One, a review of the literature is the focus of the next section. In Section Three, hypotheses and research question are proposed. Section Four defines the variables, specifies the methods for quantitative analyses, describes the data, and provides the basic descriptive statistics. Section Five presents the findings and discusses the empirical results. The final section concludes.

## 2. BRIEF LITERATURE REVIEW

Movies have properties of art and economics. McKenzie (2012) offered a comprehensive review of the literature from an economic perspective. Movie revenues are unpredictable, even to insiders (Walls 2005a). Therefore, the status of the business is stochastic, and in many cases quite unpredictable, as reviewed by Brookey (2011). The budget allocated for movie production and distribution is sunk cost, which further hedges small companies from entering the movie industry. For example, in China, the top ten companies with the largest market shares in movie distribution accounted for 89.2% of the nationwide market in 2012 (EntGroup 2013a).

### 2.1. Main Determinants of Box Office Revenue

Since the 1990s, there has been a large body of research exploring the main determinants of box office revenue. Bagella and Becchetti (1999) analyzed the underlying determinants of box office success in Italy. Using statistical regression models, they showed that there was a significant relation between box office sales and the power of the director and cast (i.e. actors). Specifically, their study also showed a positive quadratic externality between the power of director and casting in predicting box office sales. Another interesting finding was that, ceteris paribus, production houses and movie genres had little significant marginal effects on the sale performance.

Ravid (1999) investigated the roles of movie stars, budgets, MPAA ratings, and sequels on influencing box office receipts and returns on investment for movies produced in the 1990s. He found a significant MPAA effect. He also found that stars had no influence on a film's financial success, whereas big budgets, high ratings, more reviews, and sequels are all contributive to the improvement of a film's financial performance. However, big budgets alone may not guarantee profitability.

By analyzing the weekly domestic box office revenues of 200 movies released from 1991 to 1993, Basuroy *et al*. (2003) identified the critical reviews as a significant factor that influenced the movie performance. They found that, early in the lifecycle of theatrical movies, all the reviews were significantly associated with the box office performance with a negative bias of reviews. They also found that movie budget and star power imposed a moderation effect on the critical reviews, in a way that the impact of budget and star power was proportional to the negative-positive-ratio of a movie's critical reviews.

Chang and Ki (2005) explained the success of movies by using budget, star, sequel, genre (drama), MPAA[3] rating (PG and R), seasonality and opening week screens. They identified the effect of critic review as a predictor rather than an influencer. It has been also found that the intrinsic preferences of the audiences could better explain their consumption behavior.

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[3]MPAA is the industry association known as the Motion Picture Association of America.

Desai and Basuroy (2005) employed an ANOVA model to explain the impact of star power, genres, and critic reviews on the market performance of each movie. They explained the sales performance not only in response of the individual influence of star, reviews and genres, but also the interactive effects among those variables. Their study showed that the influences of star and reviews were weaker for the movies whose genres were of great interest to the audiences. The interactive effect between star power and critic reviews was empirically proved to be positive.

The model of Fu and Lee (2006) focused on the economic determination of box office performance of imported movies in Singapore and also discussed movie content parameters. In a later study, Fu and Lee (2008) examined how Singaporean movie-goers responded to international movies while considering the cultural and sociolinguistic differences between Singapore and countries of origin. For imported movies, the sales and GDP per capita of the exporting countries were positively correlated with the acceptance of Singaporean movie-goers. Cultural relationships among countries are key factors on influencing box office sales as well, since movie consumption takes place within a cultural context. The prevalence of Hollywood movies is explained as a consequence of cultural imperialism (Tomlinson 1991). The production budget was regarded as another quality indicator, which was also shown to be related to movie sales. They proposed that genres were jointly significant in influencing movie viewership given the evidence that the movie potpourri was bombarded with action, adventure and fiction blockbusters. By using Hofstede's cultural measurement (Hofstede 2013) to quantify and assess the cultural distance across the national boundaries, they explained that cultural affinity would further contribute to the oversea sales, which was consistent with previous findings (Craig Greene and Douglas 2005; Lee 2006; Lee 2008). Along this research line, an earlier research by Kim (2004) examined the dynamics of cultural discount and production expenditure in the Korean movie market. Fetscherin (2010) emphasized that a number of brand, product, distribution and consumer related variables had a significant influence on the opening week and accumulative box office sales in India.

Analyzing the expert reviews obtained from Gene Siskel and Roger Ebert, Reinstein and Snyder (2005) investigated how reviews would influence the opening weekend box office revenue. They find an influential effect of expert reviews which varied across different screen sizes and genres, with early positive reviews enlarging the entire magnitude of the viewership. They also found that expert reviews mattered more for dramas and narrowly released movies.

Some academic scholars have investigated the role of online word of mouth on movie sales. Liu (2006) found that the volume of word of mouth could significantly explain the weekly and aggregate box office revenue. Furthermore, Chintagunta, Gopinath, and Venkataraman (2010) found that the volume (valance) of word of mouth was the dominant driver of box office revenue at aggregated national (designated market area) level. Moon, Bergey and Iacobucci (2010) separately explained the dynamic effects of professional critics and online reviews on movie revenues. They found that early box office revenue could promote subsequent ratings. Total box office revenue could be maximized through the combination of big budgets and high ratings. However, as time went by, movie-goers became more skeptical about critics and reviews due to an increasing movie-watching experience. Their empirical results also showed that movie sequels considering the massive fan bases were conducive to reaping more revenues.

Regarding the seasonality, Einav (2007) showed the endogeneity of observed seasonal patterns by separately analyzing the observed seasonal effect and underlying seasonal effect. He discerned that blockbusters tried to gain the competitive advantage by means of releasing when demand was high, amplifying the underlying seasonal effect. Hand and Judge (2011), however, found that the seasonal pattern was dominated by the underlying seasonal effect rather than market expansion effect.

In the movie industry, the bigger movies get bigger box office numbers and the winner takes most of the revenues. Walls's (2005b) research focused on the distribution of box office revenue. He used the logarithmic skew-normal and logarithmic skew-student-t distribution to model the box office sales. Analyzing the data obtained from ACNielson EDI, he showed that movie business was inundated with extreme uncertainties.

These empirical studies on box office sales and international movie trade have largely examined the determination of movie trade strength and its sales performance. They have not investigated box office sales in the Chinese market and whether previous results are still valid. Whereas movie-goers may

choose the theatrical releases based on a host of criteria, the questions about how they treat homegrown movies differently from imported ones and how cultural and economic factors are subject to the disparate attitudes remain unanswered. Whether there exists a non-linear relationship between financial performance and its determinants, is one question; and whether movie evaluation differs due to different treatments towards homegrown movies and imported ones, is another. Those effects discussed earlier are likely to be different for various levels of box office proceeds and sales-revenue-to-cost (SRTC). This examination of movie sales in China will shed light on these research gaps and contribute to this line of literature.

### 2.2. Main Determinants of Box Office Profit

By using different indexes to gauge the financial performance of theatrical released movies, some relevant findings are highlighted in this section. De Vany and Walls (2004) modeled the box office profit which was calculated by deducting the production cost from the estimated film rental. They found that the movie business was filled with uncertainties and proposed that one of the reasons was that movie-goers followed others because of the limited time and information they had. The impact imposed by early movie-goers on subsequent audiences was termed as bandwagon effect or herd behavior in economic and financial literature. They also found that production budget and star power were associated with the box office profit. Along this similar research line, Bi and Giles (2009) found that, given the same investment dollars, the possibility of gains was larger than the possibility of loss using the extreme value analysis.

Previous works primarily focused on estimating the influences of superstar and budget on box office profit or return on investment, and were still relatively silent about other variables, such as cultural factors. Due to the specific economic and market situation, box office sales and returns in the Chinese market may differ from those of other countries in a systemic way since its short history, rapid development, and restrictive institutional arrangement. This paper analyzes Chinese market returns, which is measured by SRTC and will be discussed in detail later. Although our SRTC concept is quite similar to the return on investment measure proposed by Ravid (1999) and Palia, Ravid, and Reisel (2008), and the profit measure used by Walls (2005b), the focus of our study, however, is the Chinese market sales of imported movies relative to its production cost instead of the measure which focused

on domestic receipts. We contribute to the literature on box office returns by investigating the role of cultural similarities between China and western countries.

### 3. MODEL AND HYPOTHESES

In this section, five hypotheses and one research question will be proposed. They are based on two general themes: the determination of financial performance of theatrical released movies and the impact of cultural contexts on the international movie flows.

Well-constructed subject, plot and well-made audiovisual effect are possible reasons for the popularity of Hollywood movies. However, a cultural hurdle will arise along with the fact that imported movies require more effort to be understood due to the differences in languages and historical backgrounds. In China, national complex makes homegrown movies, or at least those movies with overlapping cultural features, more attractive for domestic consumers. Hypothesis 1a examines whether close cultural proximity promotes the box office revenue of a movie in China.[4] However, the United States still remains the dominant influence on world culture, which has yet to be challenged. In spite of the striking dissimilarity between cultural contexts, Hollywood movies are well accepted by Chinese audiences in recent years. Reasons may include sophisticated plots and effects, an increasing fascination with the American culture, and the rise of English education all over the nation. Hence, the effect cultural proximity is predicted to be nonlinear. Hypothesis 1b proposes that cultural affinity has a marginal diminishing effect on raising movie sales.

*H1a: The China box office revenue of a movie will increase if its origin's cultural context is similar to China's.*

*H1b: An increase in cultural similarity increases the effectiveness of cultural affinity to increase revenue.*

A mass of information is carried by the budget regarding a movie's star power, scenes, audiovisual effects, and post production. Thus, movie budget has been proposed as an ex-ante indicator of quality by

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[4]Cultural context can also explain that China is the major market for Chinese movies and movies produced in Hong Kong and Taiwan, but not for Hollywood movies and European movies. However, incorporating a dummy variable to code Chinese movie may incur severe multicollinearity problem. We will conduct an analysis of the box office revenue only for imported movies to isolate this market share effect.

movie-goers. Advertising budgets may also boost a movie's financial performance in that a movie is advertised to imply that it should be worth watching. Ravid (1999) assume that production budget was a constant proportion of total costs. Therefore, Hypothesis 2 only considers the impact of the production budget on the box office revenue. Although excluding the details on advertising budget and star power makes the model less complete, we will get a more accurate estimation of the effect of production budget on box office performance. It is unlikely that further information would fundamentally alter the conclusion in a systematic way.

**H2:** *An increase in production budget will increase a movie's China box office revenue.*

A movie sequel builds on its origin's financial success (Basuroy and Chatterjee 2008). A sequel has already enjoyed a massive fan base and familiarity in the potential market. Movie-goers tend to associate the quality of the original movie with the quality of the sequel because they categorize them as the same brand (Erdem, 1998). The advertisement expenditure for the original "hit" movie raises the brand awareness and the accumulative effect makes its sequel more likely than ever to succeed. Therefore, sequels are expected to reap more revenues than other movies. This is reflected in Hypothesis 3.

**H3:** *The China box office revenue of a movie will be higher on average if it is a sequel.*

Movies which are expected to perform well tend to be released when underlying cinema demand is high (Hand & Judge, 2011). Conventionally, the underlying seasonal pattern is widely considered as an important factor that influences the releasing decision for distributors because people have more leisure time during vacations and holidays. However, at the same time, movies released at the time of peak demand get into an overly competitive market for target audiences. On the other hand, the releasing decision may, in turn, intensify the seasonal pattern in a way that additional demands are generated by more movies available for the audiences (Einav, 2007). In Hypothesis 4, we propose that, the upturns of box office sales in China coincide with the summer vacation, year-end/winter vacation and public holidays.

**H4:** *The China box office revenue of a movie will increase during peak seasons.*

Given the experiential and fashionable nature of theatrical released movies, audience rating serves as an indicator of word-of-mouth advertising and movie quality, and can critically influence subsequent acceptance (Liu 2006). With the help of Internet, everyone can share information with others and influence others' decision-making through word-of-mouth. Given limited time and information, most people are inclined to take advice from others because those people probably have ever experienced and know better. This makes average audience rating a sheer power in influencing box office sales. Hypothesis 5 considers the positive impact of audience average rating on the box office sales in Chinese market.

**H5:** *A higher average audience rating will increase a movie's China box office revenue.*

The genre of a movie is the most intuitive reference point for the audiences to understand the basic contents and formats. Audiences roughly categorize the movies based on their dramaturgic and aesthetic knowledge (Fu and Lee 2006). The China Movie-goer Survey Report conducted by EntGroup (2013b) showed that Chinese movie-goers had a fixed preference towards a certain set of genres. Action, comedy and sci-fi are most welcomed. In contrast, few audiences expressed interest in animation, documentary and drama. This research uses 21 categories to describe the type of movies: Adventure, Comedy, Drama, Action, Romance, Fantasy, Mystery, Thriller, Sci-fi, Animation, Family, Crime, Horror, War, History, Biography, Sport, Musical, Western, Documentary, and Music. The following research question aims to examine the impact of each movie genre on movie sales in the Chinese market.

**RQ1:** *What movie genres affect the box office revenue, controlling for other factors?*

## 4. METHODS FOR QUANTITATIVE ANALYSES

This section describes the variables used, data required, basic descriptive statistics, and regression models in validating H1-H5 and answering RQ1 with movies commercially released in China from January 2009 to July 2013, for a total of 55 months.[5] Even though the period is rather short, our samples provide a representative collection of movies in China since the sample sizes (198 for all movies and 159 for imported

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[5]2008 represents a structural break due to the Global Financial Crisis, moving the box office business toward a period of greater volatility. The observation period starts from 2009 to ensure that, from an economic and financial market perspective, box office data are drawn from the same distribution.

movies) are large enough and the samples have covered five calendar years.

Movie titles were selected from "Box Office Statistics and Analysis" (http://www.tbzs.sinaapp.com/), which publishes data for movies released after 2000. Chinese authorities are highly secretive about box office data and this is the only accessible data source available for analysis. Only movies with a budget of 10 million US dollars or 30 million China Yuan and above[6] are in the scope of our analysis. The sample selection in this study is more skewed towards big budget movies than is the case with others. The typical cut off is 1 million U.S. dollars (Ravid 1999) whereas here is it 10 million, since we do not have sufficient entries for some variables. The high budget cutoff is perhaps worrisome because small budgets sometimes lead to high returns (Ravid 1999). However, this is a limitation due to the available data. A total of 198 movies, among which 159 are imported ones, comprise the sample for our analysis[7].

## 4.1. Dependent Variables

### *Chinese Box Office Revenue & Chinese Market Sales Revenue to Cost Ratio*

To investigate the financial performance of theatrical movies released in China, this research uses the box office revenue (BO) during the entire exhibition weeks as the dependent variable. The box office revenue is the real data which has been adjusted for the population increase and inflation. To test the robustness of the regression model, an alternative measurement has also been constructed as the Chinese market SRTC. It is constructed as the ratio of a movie's accumulative Chinese box office revenue to its estimated production budget. SRTC analysis only focuses on the imported movies. Homegrown movies naturally have significantly higher China market returns, which may lead to the model specification error since our samples come from two different

distributions. Box office figures are obtained from the website of Box Office Statistics and Analysis (http://www.tbzs.sinaapp.com/). The data sources of budget number and original country are available at IMDb (http://www.imdb.com/). According to IMDb, the movie budget is estimated on the basis of media reports and is often close to the cost of producing or shooting the film. The producing country is defined as the place where the production companies for that movie are based.

## 4.2. Explanatory Variables

### *Cultural Distance*

Cultural Distance (CD) between China and the exporting country of a movie is operationalized to measure the effect of cultural affinity. Greet Hofstede delineated the national culture in terms of six dimensions (Hofstede 2013): power distance (PDI), individual versus collectivism (IDV), masculinity versus femininity (MAS), uncertainty avoidance (UAI), long-term versus short-term orientation (LTO), indulgence versus restraint (IVR). As some countries have no entries for LTO or IVR, only the first four dimensions are implemented to ensure a consistent measurement. The data are available at http://geert-hofstede.com/countries.html for each country. For movie i, the cultural distance between its exporting country and China, $CD_i$ is computed as stated in Equation 1. It imposes a "square root" adjustment of Kogut and Singh's (1988) formula because cultural distance is a one-dimensional measure.

$$CD_i = \left[ \sum\nolimits_{j=1}^{4} \frac{(I_{ij} - I_{Cj})^2}{Var_j} \right]^{1/2} \qquad (1)$$

$I_{ij}$ and $I_{Cj}$ are the indices for movie i's original country and China, in terms of the jth dimension. The difference between $I_{ij}$ and $I_{Cj}$ (j=1, 2, 3, 4) measures the cultural dissimilarity regarding PDI, IDV, MAS and UAI. The variance is used to correct for the differences of scales across all the indices. For co-produced movies, we first calculate the cultural distance between each imported country and China, and then take the average. A series of similar quantification methods have been used in research on trade of movies or other media contents (Fu and Lee 2008; Lee 2009; McFadyen Hoskins and Finn 2004). The range of cultural distance is between zero and positive infinity. The larger the cultural distance, the more cultural discrepancies exist between China and a movie's original country or countries.

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[6]Due to the low production costs of Chinese movies, titles with production budgets of 30 million China Yuan and above or equivalent amount of foreign currency are selected. Imported movies with budgets of 10 million US dollars and above or equivalent amount of foreign currency are recorded for examination.

[7]In fact, the percentage of Chinese movies is higher than indicated by the samples in this research. However, a large portion of Chinese movies which poorly performed do not have entries for such variables as production budget and audience ratings. Besides, their production budgets do not meet the sample selection criteria. Such movies are excluded from the data used in this paper. This paper focuses on movies with budgets above a certain benchmark mentioned above, although it may suffer from sample selection (survivorship) bias to some extent. Future study can modify this research with available data using stratified random sampling.

### Budget

The data on budgets (B) are obtained from the website of Internet Movie Database (IMDb). As in many cases, budget is considered as a business secret in the motion picture industry and therefore cannot be obtained for research purposes (Litman 1998). Hence, the budget data on IMDb are primarily based on estimation. Observations without budget entries are excluded from this analysis. Budget data are subject to inflation-related adjustment. Adjustment with regard to the population growth is also necessary because the larger the population, the higher the potential cinema demand, and the greater likelihood of a larger amount of budget (Fu and Lee 2006).

### Sequel

The dummy variable SQ implies whether a movie is a sequel. The value is unity for a sequel and zero for an original movie. The data are obtained from the movies' descriptions on IMDb and the website of http://www.hollywood.com/.

### Seasonality

An essential characteristic of cinema attendance is that cinema demand peaks around major holidays and vacations. Peak periods in China include Solar New Year, Lunar New Year, Tomb Sweeping Day, Labor Day, Dragon Boat Festival, Mid-autumn Festival, National Day, and Christmas. The summer recess (July and August) and year-end recess (January) are other peak periods because of the long school vacations for students. It is more likely for a movie to be financially successful if it is released during the peak attendance periods due to a higher underlying consumer demand across the year. By assuming that all the holidays and vacations have a same impact on the box office revenues, the seasonality variable (SS) is dummied as "1" if a movie is released during the peak periods, otherwise it is "0". The release dates in the Chinese market are collected from Mtime website (http://www.mtime.com/). This site lists the releasing date for each movie studied.

### Average Audience Rating

Average Audience Rating (AAR) is widely regarded as an overall evaluation of movies by ordinary movie-goers. Our measures of audience rating come from two most popular movie comments website http://www.douban.com/ and http://www.mtime.com/. These are chosen for their comprehensive coverage. The overall assessments of each movie are rated by

online users on a ten-point scale from 1 (awful) to 10 (excellent). We take the average of two assessments and get the AAR to reduce the evaluation bias. We also assume that average audience rating is a consistent indicator of movie quality. Professional reviews and critiques were shown to matter a great deal rather than just user reviews and ratings (Basuroy Chatterjee and Ravid 2003; Eliashberg and Shugan 1997). However, they will not be emphasized in this research since most of professional critical reviews are published on American websites and in English, to which Chinese movie-goers may not pay much attention.

### Movie Genres

The genres (**G**) of the sample movies are coded as a dichotomous dummy vector where the elements are taxonomised based on the categories obtained from IMDb. They are operationalized as an abstract generalization of a movie's content and are used to explain the variation in financial performances caused by different types of movie contents.

### 4.3. Regression Models and Data Collection

$BO_i$ and $SRTC_i$ are each regressed on $B_i, SQ_i, SS_i, AAR_i, CD_i, CD_i^2$ and $G_i$ for 198 movies in the full sample analysis and 159 movies in the imported movie analysis. Variable abbreviations, descriptions and data sources are presented in Appendix A. Equations 2, 3 and 4 below describe the regression models.

$$lnBO_i = \alpha_0 + \alpha_1 lnB_i + \alpha_2 SQ_i + \alpha_3 SS_i + \alpha_4 lnAAR_i + \alpha_5 CD_i$$
$$+ \alpha_6 CD_i^2 + \boldsymbol{\alpha_7' G_i} + \varepsilon_i, i \text{ from 1 to 198 for both homegrown and imported movies} \tag{2}$$

$$lnBO_j = \beta_0 + \beta_1 lnB_j + \beta_2 SQ_j + \beta_3 SS_j + \beta_4 lnAAR_j + \beta_5 lnCD_j$$
$$+ \beta_6 (\ln CD_j)^2 + \boldsymbol{\beta_7' G_j} + \mu_j, j \text{ from 1 to 159 for only imported movies} \tag{3}$$

$$SRTC_k = \gamma_0 + \gamma_1 lnB_k + \gamma_2 SQ_k + \gamma_3 SS_k + \gamma_4 lnAAR_k + \gamma_5 lnCD_k$$
$$+ \gamma_6 (\ln CD_k)^2 + \boldsymbol{\gamma_7' G_k} + \in_k, k \text{ from 1 to 159 for only imported movies} \tag{4}$$

Standard OLS regressions above summarize the average relationships between groups of explanatory variables and dependent variables on the basis of conditional mean. This only provides a partial view of the relationship, as this research also seeks to delineate the relationship at different levels of box office proceeds and returns. In fact, the effects of explanatory variables may differ across different quantiles of the box office numbers. Furthermore, least

**Table 1: Descriptive Statistics of the Variables in BO Analysis of all Movies**

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| BO | 198 | 14788.74 | 18801.89 | 65 | 125893.5 |
| B | 198 | 84973.7 | 67064.12 | 651.5933 | 250000 |
| SQ | 198 | 0.2272727 | 0.4201325 | 0 | 1 |
| SS | 198 | 0.3232323 | 0.4688962 | 0 | 1 |
| AAR | 198 | 7.010101 | 1.074496 | 2.55 | 9.15 |
| CD | 198 | 2.881164 | 1.247363 | 0 | 4.363055 |
| CDSQR | 198 | 9.849166 | 4.989385 | 0 | 19.03625 |

*Note.* (1) BO = the accumulative box office revenue in Chinese market for each movie denominated in 10000 China Yuan. (2) B = the production budget (negative cost) for each movie denominated in 1000 US dollars. (3) SQ = whether a movie is a sequel (Yes = 1, No = 0). (4) SS = whether a movie was released during the public holidays and vacation periods (Yes = 1, No = 0). (5) AAR = the average audience rating obtained from the Website of Douban and Mtime. The range is from 0 to 10. (6) CD = the overall cultural distance between China and the imported countries for each movie. (7) CDSQR = the square of cultural distance.

**Table 2: Descriptive Statistics of the Variables in BO and SRTC Analysis of Imported Movies**

| BO | 159 | 12820.09 | 17352.31 | 65 | 125893.5 |
|---|---|---|---|---|---|
| SRTC | 159 | 0.1504847 | 0.2083554 | 0.0021667 | 1.730531 |
| B | 159 | 98892.96 | 66013.32 | 651.5933 | 250000 |
| SQ | 159 | 0.2578616 | 0.4388396 | 0 | 1 |
| SS | 159 | 0.2704403 | 0.4455907 | 0 | 1 |
| AAR | 159 | 7.160063 | 0.99589 | 3.45 | 9.15 |
| CD | 159 | 3.456558 | 0.4008219 | 0.8038981 | 4.363055 |
| CDSQR | 159 | 12.10744 | 2.155326 | 0.6462522 | 19.03625 |

*Note.* (1) BO = the accumulative box office revenue in Chinese market for each movie denominated in 10000 China Yuan. (2) SRTC = box office revenue in Chinese market divided by production budget, which is defined as a movie"s Chinese market salesrevenue-to-cost ratio. The cost here refers to the estimated production budget or negative cost. (3) B = the production budget (negative cost) for each movie denominated in 1000 US dollars. (3) SQ = whether a movie is a sequel (Yes = 1, No = 0). (4) SS = whether a movie was released during the public holidays and vacation periods (Yes = 1, No = 0). (5) AAR = the average audience rating obtained from the website of Douban and Mtime. The range is from 0 to 10. (6) CD = the overall cultural distance between China and the imported countries for each movie. (7) CDSQR= the square of cultural distance.

squares estimates can be severely distorted by atypical data points, especially for thick tailed disturbance distribution. Quantile regression with a semi-parametric or non-parametric specification of the model has the capability to accommodate those problems.

Tables **1** and **2** report the descriptive statistics for the variables modeled. Overall, the imported movies have a greater percentage of sequels, are more inclined to be released during off-peak periods because of institutional arrangement and political restrictions on movie importation. Imported movies also, on average, receive higher ratings due to their higher quality. The greater proportion of sequels implies that foreign movie markets are relatively more mature and their products have already built a larger scale of potential audiences. The superior movie quality does also result from a larger allocation for the production budget. Although the average box office revenue of mixed samples is much higher than that of the imported movies, the comparison here should be meaningless because of

the different targeting markets for homegrown movies and imported ones.[8]

The zero-order correlation coefficients among the variables in BO analysis and SRTC analysis are listed in Tables **3** and **4**. A movie's production budget is significantly related to other explanatory variables to some extent[9], except for seasonal indicator. This implies that production budget is one of the key determinants of a movie's box office success.

## 5. FINDINGS AND DISCUSSION

### 5.1. Ordinary Least Squares Regressions

Table **5** reports the result of the Breusch-Pagan/Cook-Weisberg test for heteroskedasticity using

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[8]The homegrown movies are primarily released in China, whereas market of imported movies mainly focuses on their domestic countries. Therefore, the comparison of Chinese market sales should be meaningless.
[9]The magnitudes of correlation coefficients range from .3280 to .4633, and all are significant with p < .001.

**Table 3:    Zero-Order Correlations among the Variables in BO Analysis of all Movies**

|        | BO        | B         | SQ       | SS        | AAR       | CD        |
|--------|-----------|-----------|----------|-----------|-----------|-----------|
| BO     |           |           |          |           |           |           |
| B      | 0.3214*** |           |          |           |           |           |
| SQ     | 0.3280*** | 0.3262*** |          |           |           |           |
| SS     | 0.2278**  | -0.0156   | 0.089    |           |           |           |
| AAR    | 0.2673*** | 0.3443*** | 0.1602*  | 0.0167    |           |           |
| CD     | -0.2175** | 0.4604*** | 0.1457*  | -0.2342** | 0.2688*** |           |
| CDSQR  | -0.1918** | 0.4633*** | 0.1409*  | -0.2212** | 0.2475*** | 0.9864*** |

*Note.* *p<.05. **p<.01. ***p<.001.

**Table 4:    Zero-Order Correlations among the Variables in BO and SRTC Analysis of Imported Movies**

|        | BO        | SRTC       | B         | SQ       | SS      | AAR     | CD        |
|--------|-----------|------------|-----------|----------|---------|---------|-----------|
| BO     |           |            |           |          |         |         |           |
| SRTC   | 0.3488*** |            |           |          |         |         |           |
| B      | 0.5245*** | -0.1509    |           |          |         |         |           |
| SQ     | 0.3338*** | 0.1043     | 0.2965*** |          |         |         |           |
| SS     | 0.1262    | 0.0967     | 0.0937    | 0.1266   |         |         |           |
| AAR    | 0.3481*** | 0.2018*    | 0.2839*** | 0.1084   | 0.1158  |         |           |
| CD     | 0.0541    | -0.5917*** | 0.2270**  | 0.0282   | -0.0059 | -0.102  |           |
| CDSQR  | 0.0431    | -0.5268*** | 0.2145**  | 0.0109   | -0.0075 | -0.0687 | 0.9859*** |

*Note.* *p<.05. **p<.01. ***p<.001.

**Table 5:    Breusch-Pagan / Cook-Weisberg Test for Heteroskedasticity of BO Regression Using all Movies**

| Ho: Constant variance |                   |              |
|-----------------------|-------------------|--------------|
| **Variables**         | **chi2**          | **Prob > chi2** |
| fitted values of lnBO | 11.23 with df=1   | 0.0008       |
| RHS variables         | 38.71 with df=27  | 0.0673       |

the traditional OLS regression and we use a robust technique to estimate the standard errors of the coefficients. The result of BO regression for all movies is reported in Table **6**. The non-cultural factors[10], cultural factors, and genres are sequentially entered into the regression.

To test H1a and H1b, the coefficients of CD and CDSQR $(CD^2)$ are significant and the signs are both consistent with expectation (p = .000 and p = .005, respectively). The key variable of interest is CDSQR which is used to capture the nonlinear effect. To elaborate this idea further, the cultural dissimilarity has

a negative effect on box office revenue. As the cultural distance increases, the marginal effect decreases at a constant rate, implying a nonlinear relationship between cultural distance and box office revenue. For example, if the cultural distance is 2, a one-unit increase in cultural distance will reduce the box office revenue by 77.5%. Alternatively, if the cultural distance becomes 3, a one-unit increase in cultural distance will reduce the box office sales only by 30.3%. One controversial issue here requires particular attention. If the movie is homegrown, namely the cultural distance equals to zero, a one-unit increase in cultural distance will reduce the box office sales by 171.9%. This is inadmissible because box office revenue can never be negative.

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[10] The non-cultural factors do not include movie genres.

**Table 6: Hierarchical Regression with Robust Estimation Testing the Predictors of Box Office Revenue of both Homegrown and Imported Movies (lnBO)**

| N=198 | lnBO | | |
|---|---|---|---|
| **Variables** | **Coef.** | **t** | **D$R^2$** |
| Non-Cultural | | | 0.218*** |
|     lnB | 0.600*** | 6.240 | |
|     SQ | 0.779*** | 5.500 | |
|     SS | 0.116 | 0.820 | |
|     lnAAR | 1.881*** | 4.070 | |
| Cultural | | | 0.292*** |
|     CD | -1.719*** | -6.690 | |
|     CDSQR | 0.236*** | 3.880 | |
| Genres | | | 0.124*** |
|     Adventure | 0.114 | 0.650 | |
|     Comedy | 0.025 | 0.130 | |
|     Drama | -0.387* | -2.220 | |
|     Action | 0.024 | 0.140 | |
|     Romance | -0.080 | -0.400 | |
|     Fantasy | 0.216 | 1.190 | |
|     Mystery | -0.127 | -0.640 | |
|     Thriller | 0.076 | 0.410 | |
|     Sci-Fi | 0.380* | 2.260 | |
|     Animation | -0.452 | -1.530 | |
|     Family | -0.285 | -1.110 | |
|     Crime | -0.168 | -0.790 | |
|     Horror | 0.128 | 0.450 | |
|     War | 0.027 | 0.090 | |
|     History | -0.507 | -1.640 | |
|     Biography | -0.348 | -1.110 | |
|     Sport | 0.573 | 1.530 | |
|     Musical | 0.455 | 1.390 | |
|     Western | -0.550 | -0.760 | |
|     Documentary | 0.643 | 0.500 | |
|     Music | -2.358 | -1.850 | |
| _cons | 1.220 | 0.930 | |
| $R^2$ | | | 0.634 |

*Note.* Reported unstandardized coefficients (Coef.) are for the final model in which all variables are entered. t-values are calculated based on the robust estimation of standard error. $\Delta R^2$ is defined as the increment to $R^2$. Namely, it is the change in the dependent variable"s variance explained by the additional variable block of explanatory variables. The block of Non-cultural factors first enters, followed by cultural block and genres block. The non-cultural block does not include genres.
*p<.05. **p<.01. ***p<.001.

Two explanations are offered here. First, the effect of cultural distance is evaluated controlling for other factors. It can be offset by the positive effects due to the increase in production budget and average audience rating. Table **3** shows that cultural distance is positively related to production budget (Corr. = .4604, p = .000) and average audience rating (Corr. = .2688, p = .000). Second, the negative influence of cultural distance can be amplified by the loss of market share, where the loss of market share is difficult to separately

measure. The cultural distance hypothesis in our study automatically takes the market share effect into account, in a way that a small increase in cultural distance within its lower range makes a movie suffer severe market share loss in China. Nevertheless, the effect of first order term is consistent with the findings of movie sales in other countries, such as Singapore (Fu and Lee 2008). In China, all foreign movies suffer from such loss due to the dissimilarity between the cultural contexts. However, the positive sign of its quadratic term provides us with some new insights and implies a diminishing marginal effect. In other words, the U.S. "cultural imperialism" (Schiller 1992), the fascination with the American and European cultures, and the sophistication of imported media products may turn this situation around to a certain extent. The effect is statistically and economically significant. Therefore, our empirical results support H1a and H1b accordingly, when modeling the whole set of observations.

For H2, increase in budget appreciably generates more box office revenue (p= .000). A 1% increase in budget will bring .6% more box office revenue on average. This result suggests that production budget is an indicator of a movie's quality and it is perceived as such by the movie-goers. Therefore, H2 is supported.

SQ also has a significantly positive influence on BO (p = .000). The coefficient reads that the sequel will help a movie reap 117.93% greater box office revenue compared with other movies, on average, controlling for other factors. This suggests that a sequel's origin acts as an avenue of advertising and raises the brand awareness before the sequel's releasing. For the average movie-goers, movie brand dominates all other factors in their judgment of cultural products. On the other hand, the original movie helps to accumulate a large crowd of potential audiences, boosting the box office sales of its sequel during the opening day and opening week. Movies with financial success during the earlier stage will realize disproportionately greater movie-goer acceptance because the bandwagon effect contributes to amplify the initial success. The regression results lend strong support to H3.

On further analysis, it is noted that a movie released during peak season captures a higher level of box office success, but the effect is not statistically significant (p = .414). It is likely that market expansion effect intensifies the competition among movies during the public holidays and vacation periods, making a greater amount of movie suppliers compete for a proportionally increased box office revenue. On the other hand, the underlying seasonal effect is not as strong as it was proved to be in previous studies (Einav 2007; Hand and Judge 2011). The consumers are inclined to be rational by avoiding consuming movies during the peak periods. Even when they do, they choose the best movie to watch due to limited time and income, which only makes the winners even more successful. Our results indicate that the agglomeration of supply and the increase in underlying demand do not necessarily increase the box office ranking of individual movies in a statistical sense. H4 is not supported.

The average audience rating retains a positive relationship with the natural log box office revenue and a strong level of statistical significance (p = .000). The coefficient estimate implies that every 1% increase in average audience rating will attribute 1.88% more box office sales with other factors controlled. This large impact of "collective intelligence" implies a strong bandwagon effect and herd behavior among movie-goers in China. Conventional media economics suggests that movie quality is a significant determinant of cinema attendance and box office sales (Fu and Lee 2008). Internet accessibility makes online audience ratings a reasonable quality indicator for most people who know little before they actually watch the movie. H5 is therefore supported.

For RQ1, the empirical results indicate that "drama" generates significantly lower box office revenues, reducing revenues by 32.09% (p = .028), while "sci-fi" provides significantly higher box office revenues, boosting sales by 46.23% (p = .025). Therefore, it seems that "sci-fi" increases a movie's popularity in China, whereas "drama" decreases. Previous studies found that "family" movies did well (Lee 2008). However, we find a negative effect of family although it is not statistically significant (p = .268), and that the result for "family" movies is consistent with Fu and Lee (2008). One possible reason is that, in China, people prefer to enjoy the sophistication of Dolby Stereo system and 3-D technique fabricated in "sci-fi" movies in the cinema but think that they can download and watch the "drama" and "family" movies at home.

To ensure the robustness of the preliminary regression model stated in section 4.1.3, regression results exclusively for imported movies (presented in Table **7**) are examined. The results are qualitatively similar. In Model 1, the empirical results support H2, H3 and H5, but do not support H1a, H1b and H4, possibly due to multicollinearity or small sample size (N=159). Importantly, both the linear and quadratic effects of

**Table 7: Hierarchical Regressions with Robust Estimation Testing the Predictors of Box Office Revenue and Sales-Revenue-to-Cost of Imported Movies (lnBO and SRTC)**

| N=159 | Model 1: lnBO | | | Model 2: lnBO | | | Model 3: lnBO | | | Model 4: lnBO | | | Model 5: SRTC | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Variables | Coef. | t | $DR^2$ | Coef. | t | $DR^2$ | Coef. | t | $DR^2$ | Coef. | t | $DR^2$ | Coef. | t | $DR^2$ |
| Non-Cultural | | | 0.438*** | | | 0.438*** | | | 0.438*** | | | 0.438*** | | | 0.303*** |
| lnB | 0.627*** | 4.150 | | 0.602*** | 4.310 | | 0.617*** | 4.290 | | 0.618*** | 4.310 | | -0.102* | -2.550 | |
| SQ | 0.742*** | 4.610 | | 0.732*** | 4.590 | | 0.744*** | 4.620 | | 0.737*** | 4.660 | | 0.099*** | 3.950 | |
| SS | 0.067 | 0.390 | | 0.059 | 0.350 | | 0.069 | 0.410 | | 0.066 | 0.390 | | 0.029 | 1.020 | |
| lnAAR | 2.485*** | 3.290 | | 2.616*** | 3.700 | | 2.526*** | 3.490 | | 2.542*** | 3.550 | | 0.396*** | 3.270 | |
| Cultural | | | 0.039** | | | 0.035** | | | 0.038** | | | 0.038*** | | | 0.224*** |
| CD | -1.502 | -1.350 | | -0.485* | -2.350 | | | | | | | | | | |
| CDSQR | 0.191 | 0.950 | | | | | | | | | | | | | |
| lnCD | | | | | | | -1.655# | -1.950 | | -1.192** | -2.680 | | -1.085*** | -4.000 | |
| lnCDSQR | | | | | | | 0.327 | 0.580 | | | | | 0.363# | 1.870 | |
| Genres | | | 0.148*** | | | 0.151*** | | | 0.149*** | | | 0.149*** | | | 0.099** |
| Adventure | 0.102 | 0.520 | | 0.126 | 0.660 | | 0.105 | 0.540 | | 0.115 | 0.600 | | 0.053 | 1.480 | |
| Comedy | -0.143 | -0.620 | | -0.146 | -0.640 | | -0.143 | -0.620 | | -0.144 | -0.630 | | 0.029 | 0.700 | |
| Drama | -0.356 | -1.610 | | -0.353 | -1.590 | | -0.351 | -1.590 | | -0.353 | -1.600 | | -0.031 | -1.150 | |
| Action | 0.196 | 0.880 | | 0.192 | 0.860 | | 0.205 | 0.920 | | 0.198 | 0.890 | | 0.043 | 1.260 | |
| Romance | -0.105 | -0.440 | | -0.112 | -0.470 | | -0.105 | -0.440 | | -0.104 | -0.440 | | 0.025 | 0.560 | |
| Fantasy | 0.258 | 1.270 | | 0.245 | 1.200 | | 0.259 | 1.280 | | 0.254 | 1.250 | | 0.053 | 1.520 | |
| Mystery | -0.183 | -0.750 | | -0.185 | -0.750 | | -0.183 | -0.750 | | -0.181 | -0.740 | | -0.014 | -0.430 | |
| Thriller | 0.041 | 0.200 | | 0.031 | 0.150 | | 0.037 | 0.180 | | 0.040 | 0.200 | | -0.021 | -0.640 | |
| Sci-Fi | 0.324# | 1.700 | | 0.296 | 1.620 | | 0.325# | 1.730 | | 0.313# | 1.740 | | 0.034 | 1.130 | |
| Animation | -0.369 | -1.080 | | -0.381 | -1.130 | | -0.369 | -1.090 | | -0.371 | -1.100 | | -0.059 | -1.390 | |
| Family | -0.320 | -1.040 | | -0.314 | -1.020 | | -0.317 | -1.030 | | -0.316 | -1.030 | | -0.059 | -1.310 | |
| Crime | -0.212 | -0.880 | | -0.211 | -0.880 | | -0.216 | -0.900 | | -0.211 | -0.880 | | -0.034 | -1.050 | |
| Horror | 0.220 | 0.660 | | 0.226 | 0.690 | | 0.226 | 0.680 | | 0.229 | 0.690 | | 0.005 | 0.090 | |
| War | 0.506 | 1.130 | | 0.671# | 1.680 | | 0.555 | 1.330 | | 0.608 | 1.490 | | 0.086 | 0.850 | |
| History | -1.048* | -2.080 | | -1.232** | -2.740 | | -1.068* | -2.270 | | -1.140* | -2.580 | | -0.159 | -1.210 | |
| Biography | -0.413 | -0.700 | | -0.293 | -0.480 | | -0.411 | -0.690 | | -0.338 | -0.580 | | -0.062 | -0.410 | |
| Sport | -0.198 | -0.620 | | -0.336 | -1.140 | | -0.170 | -0.560 | | -0.245 | -0.890 | | -0.117 | -1.470 | |
| Musical | 0.693 | 1.630 | | 0.661 | 1.590 | | 0.688 | 1.630 | | 0.683 | 1.630 | | 0.006 | 0.090 | |
| Western | -1.583*** | -5.290 | | -1.632*** | -5.950 | | -1.588*** | -5.500 | | -1.599*** | -5.700 | | -0.112* | -2.570 | |
| Documentary | 0.544 | 0.410 | | 0.470 | 0.350 | | 0.530 | 0.400 | | 0.512 | 0.390 | | -0.052 | -0.600 | |
| Music | -2.366# | -1.790 | | -2.367# | -1.750 | | -2.367# | -1.780 | | -2.357# | -1.770 | | -0.112 | -1.300 | |
| _cons | -0.489 | -0.250 | | -1.661 | -1.010 | | -1.811 | -1.080 | | -1.915 | -1.160 | | 1.212*** | 3.370 | |
| $R^2$ | 0.625*** | | | 0.623*** | | | 0.635*** | | | 0.625*** | | | 0.625*** | | |

*Note.* Reported unstandardized coefficients (Coef.) are for the final model in which all variables are entered. t-values are calculated based on the robust estimation of standard error. $\Delta R^2$ is defined as the increment to $R^2$. Namely, it is the change in the dependent variable's variance explained by the additional variable block of explanatory variables. The block of Non-cultural factors first enters, followed by cultural block and genres block. In the regression models, lnCDSQR is the square of lnCD.
The non-cultural block does not include genres.
#p<.10. *p<.05. **p<.01. ***p<.001.

cultural distance on box office revenue are economically significant, and the magnitude of effects is comparable to the result in Table **6**.

Model 2 discards the quadratic term of cultural distance and the coefficient of CD becomes significant (p = .020) with little changes in the coefficients of other variables. The reduction in the absolute value of cultural coefficients for both Model 1 and Model 2 implies that a considerable amount of loss of market share for imported movies is explained by the cultural distance effect when analyzing both imported and domestic movies as described earlier (Table **6**). The regression results lend strong support to H1a.

In Model 3, the coefficient of squared log cultural distance becomes non-significant (p = .565) and the coefficient of log cultural distance implies that 1% increase in cultural dissimilarity will lead to 1.655% decrease in box office revenue only with a moderate significance level (p = .053). The VIFs of lnCD and lnCDSQR are 14.31 and 13.66, which again indicate the existence of multicollinearity. When only considering the linear term of natural-log cultural distance in Model 4, its coefficient suggests that a 1% increase in the differences between cultures will reduce the box office proceeds by 1.192% (p = .008). The results support H1a, but lend no support to H1b.

For the genres block, all the models, from Model 1 to Model 4, suggest that "history", "western" and "music" generate significant lower box office sales while the positive influence of "war" is only supported by Model 2 with a moderate significance level. Model 1, 3 and 4 lend support to the positive relationship between Sci-fi and box office revenue. This is significantly different from the finding using the complete set of movie titles, and indicates that Chinese audiences have different evaluation criteria regarding homegrown and imported movies.

Model 5 treats the Chinese market SRTC as the dependent variable and tests whether the results still hold. Both lnCD (p = .000) and $(lnCD)$-2. (p = .063) are significant, suggesting that, given a 1% change in cultural distance, Chinese market return on production investment will decrease by 1.085 if the cultural distance is one, and decrease by .582 if the cultural distance is two. This negative association attests to the influence of cultural dissimilarity on both box office revenues and overseas returns for imported movies. More importantly, the impact of cultural discount on SRTC is less effective for movies with greater differences in cultural contexts. Both H1a and H1b are supported. It is worth noting that the coefficient of lnB is negative, implying that a 1% increase in negative cost tends to reduce the SRTC by an absolute value .102 (p = .012). This follows the uncertain success probabilities in motion picture industry proposed by Walls (2005b) and accords to the results obtained by Ravid (1999). In our setting, an increasing allocation for production budget increases the numerator of SRTC, but the denominator will not be able to meet the increasing rate of budget. H2 cannot be supported. Other results lend support to H3 and H5, but not H4. For RQ1, certain movie genres tend to generate lower SRTC. Western (p = .011) movies are found, compared with others, to be inversely related to the SRTC. These findings again are different from those using box office revenue as the dependent variable, because revenues (BO) and returns (SRTC) are two different measures of performance. However, both conclusions mirror the movie-going trends for Chinese audiences, and perhaps Asian audiences as well.

Empirically, one of the most important contributions of our study is the diminished effect of cultural distance on movie financial performance, as evidenced by the positive coefficient on the quadratic terms CDSQR and lnCDSQR. This non-linear effect is statistically effect in Table **6** (where dependent variable is natural-log box office revenue) and marginally significant in Model 5 of Table **7** (where dependent variable is sales-revenue-to-cost) but not in Model 1 and Model 3 of Table **7**, probably because of multicollinearity and/or small sample size. However, as we discussed earlier, the effect is economically significant in all four specifications. Theoretically, our results are consistent with the existence of a production function for movies such that the factor input, cultural affinity, enter with positive marginal products but with a diminishing marginal product.[11] To elaborate, a simplified movie production function may have a Cobb–Douglas form, $Q = AB^m C^n$, where A is total-factor productivity, B is budget, and C is cultural affinity. Our results are consistent with diminishing returns to scale where the m and n add up to less than one.

### 5.2. Quantile Regressions

Assuming the data are well behaved, the estimators obtained from quantile regression are asymptotically normally distributed. Figure **1** illustrates the empirical

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[11]We thank the referee for suggesting this point.
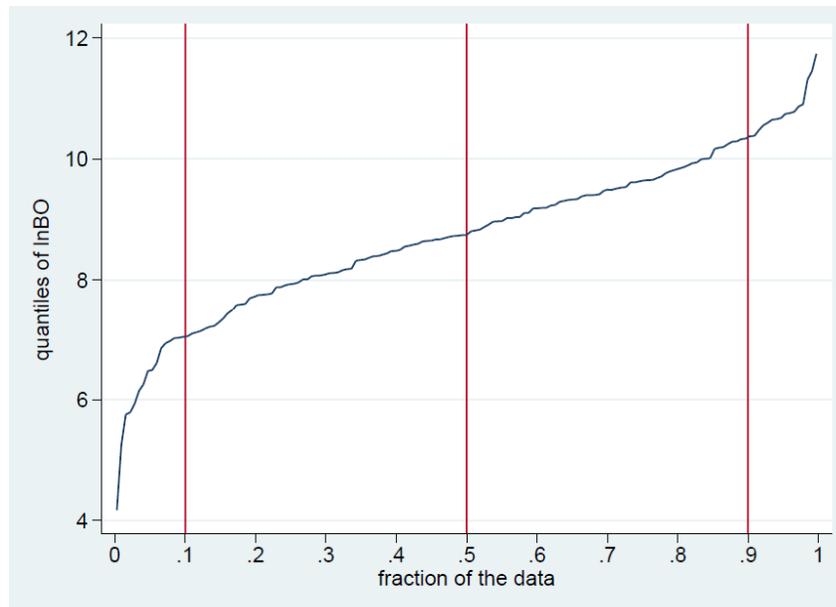
**Figure 1:** Empirical Cumulative Density Function of Natural-log Box Office Revenues.

cumulative density function of natural-log box office revenues. It is clear that the 10th, 50th and 90th quantiles are roughly 7, 8.75, and 10.5 on a natural-log scale. Using the data on the natural-log box office revenues of imported movies, comparing the robust OLS estimates with the quantile regression estimates results in Table **8**.

Note that the effects of explanatory variables differ to a certain extent across different quantiles. For movies whose box office revenues reside at lower quantiles, increase in production budget and such strategy as releasing during the seasonal peaks are effective approaches to generate higher box office revenues measured by percentage. The quantile regression results with regard to the production budget are consistent with those obtained by De Vany (2004). He found that increasing budgets and screens pushed up the lower quantiles of revenue far more than the upper quantiles. In our study, the contribution of production budget is reduced at upper quantiles with a strong significance level. On the other side, the cultural discount should be a great threat for movies with lower sales (p = .084 for 10th quantile). However, it will never be a barrier for a movie's sales overseas at upper quantiles (p = .386 for 25th quantile, p = .534 for 50th quantile, p = .614 for 75th quantile and p = .605 for 90th quantile). This is consistent with earlier results that, for blockbusters, audiences pay more attention to the sophisticated plots and audiovisual effects, rather than the cultural compatibility. Sequel and average audience rating are always regarded as the indicators of movie quality across all the quantiles. Finally, out results

indicate that the effects of movies genres are sensitive to model specification.

The equivalence of the estimates of non-genre variables across different quantiles was formally tested. However, the results of F-tests in Table **9** cannot reject all the null hypotheses that the coefficient estimates are equal across the key quantiles.

Figure **2** shows the empirical cumulative density function of SRTC ratios. All the key quantiles are below .5, indicating the inequality of returns in the movie business, in which the winners take all. When using SRTC as the dependent variable, Table **10** shows that production budget is inversely related to the SRTC across all the quantiles, and the impact is especially intense and significant at upper quantiles. However, on the other hand, for movies with higher SRTC, sequel and average audience rating have a greater positive impact accordingly. As a general rule, negative effects imposed by larger negative cost can be reversed by the positive effects brought by sequel and higher average audience rating to some degree. It is noteworthy that movies with greater cultural discount effect have significantly lower SRTCs at 50th quantile and below (Coef. lnCD = -1.476 with p = .000, Coef. lnCDSQR = .576 with p = .000 at 10th quantile; Coef. lnCD = -1.486 with p = .000, Coef. lnCDSQR = .607 with p = .000 at 25th quantile; Coef. lnCD = -1.361 with p = .000, Coef. lnCDSQR = .591 with p = .000 at 50th quantile), but it is less strong and not statistically significant at 75th quantile and 90th quantile (for lnCD and lnCDSQR, p = .405, p = .696 at 75th quantile, and p = .109, p = .537 at

**Table 8: Robust Ordinary Least Squares Regression and Quantile Regressions Testing the Predictors of Box Office Revenue of Imported Movies (lnBO)**

| N=159 | OLS robust | | QR 10th quantile | | QR 25th quantile | | QR 50th quantile | | QR 75th quantile | | QR 90th quantile | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Variables** | **Coef.** | **t** | **Coef.** | **t** | **Coef.** | **t** | **Coef.** | **t** | **Coef.** | **t** | **Coef.** | **t** |
| Non-Cultural | | | | | | | | | | | | |
| lnB | 0.617*** | 4.290 | 0.963*** | 10.820 | 0.590*** | 3.730 | 0.524*** | 3.270 | 0.427** | 2.990 | 0.339*** | 3.300 |
| SQ | 0.744*** | 4.620 | 0.824* | 6.120 | 1.016*** | 4.240 | 0.794*** | 3.280 | 0.628** | 2.900 | 0.608*** | 3.910 |
| SS | 0.069 | 0.410 | 0.283* | 2.300 | 0.158 | 0.720 | -0.036 | -0.160 | 0.157 | 0.800 | 0.060 | 0.420 |
| lnAAR | 2.526*** | 3.490 | 3.172*** | 6.860 | 2.458** | 2.990 | 2.800*** | 3.370 | 2.098** | 2.830 | 2.830*** | 5.300 |
| Cultural | | | | | | | | | | | | |
| lnCD | -1.655# | -1.950 | -1.926# | -1.740 | -1.707 | -0.870 | -1.238 | -0.620 | -0.897 | -0.510 | -0.662 | -0.520 |
| lnCDSQR | 0.327 | 0.580 | -0.825 | -1.140 | -0.036 | -0.030 | 0.019 | 0.010 | 0.701 | 0.600 | 0.901 | 1.080 |
| Genres | | | | | | | | | | | | |
| Adventure | 0.105 | 0.540 | 0.107 | 0.710 | 0.195 | 0.730 | 0.006 | 0.020 | -0.033 | -0.140 | -0.174 | -1.000 |
| Comedy | -0.143 | -0.620 | -0.311 | -1.620 | 0.074 | 0.220 | -0.188 | -0.550 | -0.342 | -1.110 | 0.017 | 0.080 |
| Drama | -0.351 | -1.590 | -0.511*** | -3.570 | -0.401 | -1.570 | -0.274 | -1.060 | -0.414# | -1.800 | -0.481** | -2.900 |
| Action | 0.205 | 0.920 | 0.163 | 1.050 | 0.302 | 1.100 | 0.433 | 1.560 | 0.083 | 0.330 | 0.284 | 1.590 |
| Romance | -0.105 | -0.440 | 0.397# | 1.970 | -0.319 | -0.890 | 0.007 | 0.020 | -0.356 | -1.100 | 0.079 | 0.340 |
| Fantasy | 0.259 | 1.280 | 0.487* | 3.250 | 0.345 | 1.290 | 0.433 | 1.610 | -0.028 | -0.110 | 0.358* | 2.070 |
| Mystery | -0.183 | -0.750 | -0.006 | -0.030 | 0.058 | 0.180 | 0.086 | 0.260 | -0.504# | -1.720 | -0.458* | -2.170 |
| Thriller | 0.037 | 0.180 | 0.170 | 1.120 | 0.095 | 0.350 | -0.002 | -0.010 | -0.084 | -0.340 | -0.283 | -1.610 |
| Sci-Fi | 0.325# | 1.730 | 0.162 | 1.140 | 0.217 | 0.860 | 0.541* | 2.120 | 0.157 | 0.690 | 0.167 | 1.020 |
| Animation | -0.369 | -1.090 | -0.572* | -2.420 | -0.441 | -1.050 | -0.415 | -0.970 | -0.544 | -1.430 | 0.129 | 0.470 |
| Family | -0.317 | -1.030 | -0.385# | -1.830 | -0.684# | -1.820 | -0.231 | -0.610 | -0.186 | -0.550 | -0.688** | -2.820 |
| Crime | -0.216 | -0.900 | -0.069 | -0.340 | -0.198 | -0.560 | -0.141 | -0.390 | -0.507 | -1.570 | -0.789*** | -3.410 |
| Horror | 0.226 | 0.680 | 0.577* | 2.020 | 0.280 | 0.550 | 0.204 | 0.400 | -0.086 | -0.190 | -0.213 | -0.640 |
| War | 0.555 | 1.330 | 2.252*** | 4.980 | 0.848 | 1.050 | 1.089 | 1.340 | -0.265 | -0.370 | -0.674 | -1.290 |
| History | -1.068* | -2.270 | -2.695**** | -5.370 | -1.107 | -1.240 | -1.600# | -1.770 | -0.253 | -0.310 | 0.089 | 0.150 |
| Biography | -0.411 | -0.690 | 3.111*** | 4.220 | 0.346 | 0.260 | 0.230 | 0.170 | -2.627* | -2.220 | -3.481*** | -4.090 |
| Sport | -0.170 | -0.560 | 0.197 | 0.280 | 0.337 | 0.270 | -0.468 | -0.370 | -0.330 | -0.290 | -0.668 | -0.820 |
| Musical | 0.688 | 1.630 | 1.172* | 2.400 | 1.275 | 1.470 | 0.321 | 0.360 | 0.366 | 0.470 | -0.504 | -0.890 |
| Western | -1.588*** | -5.500 | -0.356 | -0.520 | -0.865 | -0.710 | -1.270 | -1.030 | -2.502* | -2.280 | -2.779*** | -3.530 |
| Documentary | 0.530 | 0.400 | -0.027 | -0.050 | -0.285 | -0.290 | -0.684 | -0.690 | -2.005* | -2.250 | -2.340*** | -3.660 |
| Music | -2.367# | -1.780 | -2.397*** | -4.330 | -3.134** | -3.180 | 0.556 | 0.560 | 0.440 | 0.490 | 0.238 | 0.370 |
| _cons | -1.811 | -1.080 | -6.012*** | -5.420 | -1.473 | -0.750 | -1.665 | -0.830 | 0.814 | 0.460 | 0.111 | 0.090 |
| $R^2$ | 0.635*** | | 0.528 | | 0.447 | | 0.402 | | 0.414 | | 0.469 | |

*Note.* In the regression models, the non-cultural block does not include genres.
R squares reported for quantile regressions are Pseudo R squares.
#p<.10. *p<.05. **p<.01. ***p<.001.

**Table 9: Test for the Equivalence of the Estimates of Non-Genre Variables across Different Quantiles Dependent Variable: lnBO**

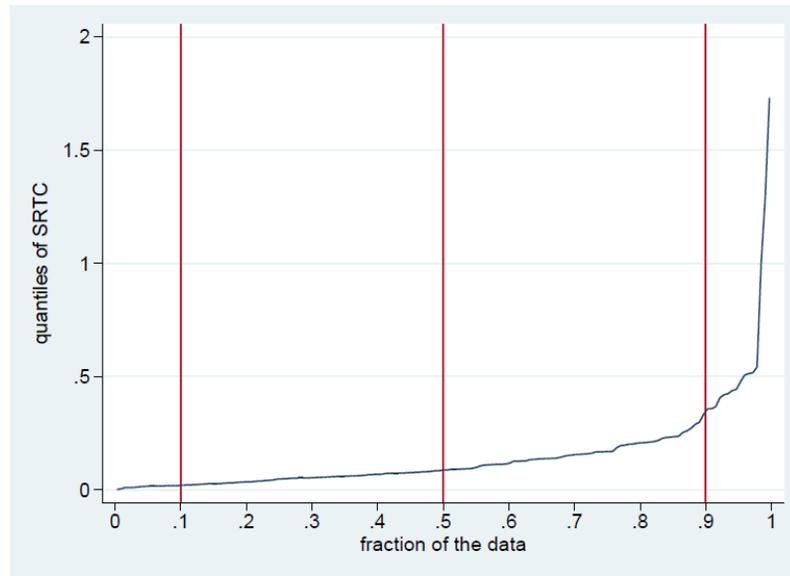| Null hypothesis | F statistics | p-value |
|---|---|---|
| test [q10=q25=q50=q75=q90]: lnB | $F_{(4, 131)} = 1.77$ | 0.1380 |
| test [q10=q25=q50=q75=q90]: SQ | $F_{(4, 131)} = 0.65$ | 0.6252 |
| test [q10=q25=q50=q75=q90]: SS | $F_{(4, 131)} = 0.63$ | 0.6415 |
| test [q10=q25=q50=q75=q90]: lnAAR | $F_{(4, 131)} = 0.56$ | 0.6911 |
| test [q10=q25=q50=q75=q90]: lnCD | $F_{(4, 131)} = 0.02$ | 0.9994 |
| test [q10=q25=q50=q75=q90]: lnCDSQR | $F_{(4, 131)} = 0.07$ | 0.9909 |

**Figure 2:** Empirical Cumulative Density Function of Sales-Revenue-to-Cost.

**Table 10: Robust Ordinary Least Squares Regression and Quantile Regressions Testing the Predictors of Sales-Revenue-to-Cost Ratios of Imported Movies (SRTC)**

| N=159 | OLS robust | | QR 10th quantile | | QR 25th quantile | | QR 50th quantile | | QR 75th quantile | | QR 90th quantile | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Variables** | **Coef.** | **t** | **Coef.** | **t** | **Coef.** | **t** | **Coef.** | **t** | **Coef.** | **t** | **Coef.** | **t** |
| Non-Cultural | | | | | | | | | | | | |
| lnB | -0.102* | -2.550 | -0.003 | -0.730 | -0.005 | -0.650 | -0.047* | -2.570 | -0.120*** | -3.350 | -0.200*** | -6.160 |
| SQ | 0.099*** | 3.950 | 0.028* | 4.920 | 0.056*** | 4.490 | 0.072** | 2.610 | 0.073 | 1.350 | 0.103* | 2.090 |
| SS | 0.029 | 1.020 | 0.007 | 1.420 | -0.002 | -0.140 | 0.010 | 0.400 | 0.004 | 0.080 | 0.022 | 0.480 |
| lnAAR | 0.396*** | 3.270 | 0.064*** | 3.310 | 0.063 | 1.480 | 0.293** | 3.110 | 0.474* | 2.550 | 0.587*** | 3.490 |
| Cultural | | | | | | | | | | | | |
| lnCD | -1.085*** | -4.000 | -1.476*** | -31.830 | -1.486*** | -14.620 | -1.361*** | -6.040 | -0.371 | -0.840 | -0.650 | -1.610 |
| lnCDSQR | 0.363* | 1.870 | 0.576*** | 18.960 | 0.607*** | 9.100 | 0.591*** | 4.000 | -0.114 | -0.390 | 0.163 | 0.620 |
| Genres | | | | | | | | | | | | |
| Adventure | 0.053 | 1.480 | 0.015 | 2.400 | 0.010 | 0.730 | 0.012 | 0.400 | 0.069 | 1.150 | 0.007 | 0.130 |
| Comedy | 0.029 | 0.700 | -0.013 | -1.550 | -0.017 | -0.960 | -0.004 | -0.100 | -0.033 | -0.420 | -0.082 | -1.170 |
| Drama | -0.031 | -1.150 | -0.014 | -2.380 | -0.012 | -0.870 | -0.006 | -0.200 | -0.027 | -0.470 | -0.062 | -1.180 |
| Action | 0.043 | 1.260 | 0.012 | 1.780 | 0.017 | 1.160 | 0.038 | 1.220 | 0.031 | 0.510 | 0.096# | 1.700 |
| Romance | 0.025 | 0.560 | 0.023 | 2.680 | 0.018 | 0.980 | -0.014 | -0.350 | -0.040 | -0.500 | 0.007 | 0.090 |
| Fantasy | 0.053 | 1.520 | 0.017 | 2.690 | 0.012 | 0.880 | 0.050 | 1.620 | -0.020 | -0.330 | 0.025 | 0.460 |
| Mystery | -0.014 | -0.430 | 0.009 | 1.200 | 0.005 | 0.320 | -0.009 | -0.250 | -0.048 | -0.650 | -0.106 | -1.590 |
| Thriller | -0.021 | -0.640 | 0.006 | 0.950 | -0.007 | -0.480 | 0.024 | 0.770 | -0.016 | -0.260 | -0.210*** | -3.780 |
| Sci-Fi | 0.034 | 1.130 | 0.009 | 1.520 | 0.023# | 1.760 | 0.062* | 2.140 | -0.002 | -0.030 | 0.068 | 1.320 |
| Animation | -0.059 | -1.390 | -0.010 | -0.980 | -0.013 | -0.610 | -0.068 | -1.400 | -0.099 | -1.040 | 0.028 | 0.330 |
| Family | -0.059 | -1.310 | -0.011 | -1.280 | -0.018 | -0.940 | 0.004 | 0.090 | -0.017 | -0.200 | -0.105 | -1.370 |
| Crime | -0.034 | -1.050 | 0.002 | 0.220 | 0.028 | 1.520 | -0.027 | -0.660 | -0.101 | -1.250 | -0.090 | -1.230 |
| Horror | 0.005 | 0.090 | 0.020# | 1.700 | 0.053* | 2.000 | -0.015 | -0.250 | -0.025 | -0.220 | -0.216* | -2.070 |
| War | 0.086 | 0.850 | 0.059** | 3.110 | 0.054 | 1.290 | 0.096 | 1.040 | -0.072 | -0.390 | -0.257 | -1.560 |

**(Table 10). Continued.**

| N=159 | OLS robust | | QR 10th quantile | | QR 25th quantile | | QR 50th quantile | | QR 75th quantile | | QR 90th quantile | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Variables** | **Coef.** | **t** | **Coef.** | **t** | **Coef.** | **t** | **Coef.** | **t** | **Coef.** | **t** | **Coef.** | **t** |
| History | -0.159 | -1.210 | -0.072** | -3.420 | -0.081# | -1.760 | -0.085 | -0.830 | -0.006 | -0.030 | 0.235 | 1.290 |
| Biography | -0.062 | -0.410 | 0.098* | 3.160 | 0.077 | 1.140 | -0.016 | -0.110 | -0.385 | -1.300 | -0.933*** | -3.480 |
| Sport | -0.117 | -1.470 | 0.017 | 0.560 | -0.005 | -0.080 | -0.060 | -0.420 | -0.326 | -1.150 | -0.483# | -1.870 |
| Musical | 0.006 | 0.090 | 0.071** | 3.460 | 0.050 | 1.120 | 0.019 | 0.190 | -0.025 | -0.130 | -0.150 | -0.840 |
| Western | -0.112* | -2.570 | 0.002 | 0.070 | -0.017 | -0.270 | -0.062 | -0.440 | -0.268 | -0.980 | -0.365 | -1.470 |
| Documentary | -0.052 | -0.600 | 0.026 | 1.130 | 0.015 | 0.300 | -0.061 | -0.540 | -0.301 | -1.350 | -0.487* | -2.410 |
| Music | -0.112 | -1.300 | -0.004 | -0.160 | -0.022 | -0.430 | 0.044 | 0.390 | 0.079 | 0.350 | 0.034 | 0.170 |
| _cons | 1.212*** | 3.370 | 0.850 | 18.270 | 0.869*** | 8.510 | 0.750*** | 3.310 | 1.252** | 2.810 | 2.022*** | 5.000 |
| $R^2$ | 0.625*** | | 0.246 | | 0.244 | | 0.268 | | 0.365 | | 0.565 | |

*Note.* In the regression models, the non-cultural block does not include genres.
R squares reported for quantile regressions are Pseudo R squares.
#p<.10. *p<.05. **p<.01. ***p<.001.

**Table 11: Test for the Equivalence of the Estimates of Non-Genre Variables across Different Quantiles Dependent Variable: SRTC**

| Null hypothesis | F statistics | p-value |
|---|---|---|
| test [q10=q25=q50=q75=q90]: lnB | $F_{(4, 131)} = 2.00$ | 0.0986 |
| test [q10=q25=q50=q75=q90]: SQ | $F_{(4, 131)} = 1.51$ | 0.2030 |
| test [q10=q25=q50=q75=q90]: SS | $F_{(4, 131)} = 0.26$ | 0.9038 |
| test [q10=q25=q50=q75=q90]: lnAAR | $F_{(4, 131)} = 3.23$ | 0.0144 |
| test [q10=q25=q50=q75=q90]: lnCD | $F_{(4, 131)} = 0.46$ | 0.7650 |
| test [q10=q25=q50=q75=q90]: lnCDSQR | $F_{(4, 131)} = 0.43$ | 0.7848 |

90th quantile). The results corroborate that the cultural hurdle is less significant in impairing the Chinese market returns for movies with higher SRTC ratios.

For SRTC quantile regressions, the test for the equivalence of the estimates of non-genre variables across different quantiles is displayed in Table **11**. The results significantly reject the equality of the estimated coefficients for natural-log average audience rating (p = .0144), and reject the equivalence of the coefficient estimates of natural-log budget with a moderate significance level (p = .0986). Online word of mouth and collective intelligence are especially effective in improving the Chinese market return on production investment across the upper quantiles.

## 6. CONCLUSIONS AND FUTURE WORK

This research is an exploratory investigation of the financial performance of movies released in China. It has drawn a nuanced but comprehensive picture of the Chinese movie industry. The introduction of such

ingredients as the comprehensive exploration across all levels of financial performance by virtue of the quantile regression, and the detailed investigation of the cultural contexts will add to the richness and variety of media economics research on movie business.

Theoretically, our findings imply a nonlinear effect of cultural dissimilarity on a movie's Chinese market return. Media economics scholars should recognize the possible nonlinear and interactive influences imposed by factors and how the explanatory variables may disproportionally affect the movie financial success across different quantiles. Quantile regression should be a useful instrument for scholars to investigate the financial performance of media products in detail. Besides, the results are bound to vary according to model specifications as implied in Table **7**.

For industry, the research findings are helpful for movie producers, distributors and exhibitors to make appropriate investment strategies. Under the institutional arrangement such as the movie import

quota, distributors should select which movies to exhibit in the Chinese market after careful consideration. They should know how to seize the opportunities along with the emerging challenges in the rapidly growing market, how to improve the competitiveness of their products, and how to analyze the needs and tastes of their audiences. More specifically, producers and distributors should pay particular attention to the movies with high box office revenues and SRTCs. They should be clear about why such movies have a ready market, i.e., opening day/week box office proceeds. The choice of movies and screenings can be tailored to the needs and preferences of the audiences from the initial of movie projections. However, a blind budget allocation for movie production would be unwise. One can use big budgets to insure against catastrophically low revenues, but a blockbuster cannot be seeded through this strategy.

It will be insightful for future research to construct a life table and conduct a corresponding survival analysis to figure out how theatrical releases play out in the Chinese exhibition market across time. These can be compared directly to similar analyses done for the U.S., Hong Kong, Australian, and other markets. It would also be interesting to investigate the institutional characteristics of China's movie market and their impact on movie importation and financial performance. These would complement our discussion of the financial success and shed light on the main features of the distribution and exhibition contracts.

## APPENDIX A

**Data Sources of the Variables for Movie Analysis**

| Variable Abbreviation | Variable Description | Data Source |
|---|---|---|
| BO | Box office revenue | http://www. tbzs.sinaapp.com/ |
| B | Budget | Internet Movie Database (IMDb) |
| SQ | Sequel | Internet Movie Database (IMDb) http://www.hollywood.com/ |
| SS | Seasonality (Releasing date) | http://www.mtime.com/ |
| AAR | Average audience rating | http://www.douban.com/ http://www.mtime.com/ |
| CD | Cultural distance | http://geert-hofstede.com/countries.html |
| G | Movie genres | Internet Movie Database (IMDb) |
| | Producing country | Internet Movie Database (IMDb) |
| | Population growth | China Statistical Yearbook World Bank |
| | Consumer Price Index (CPI) | China Data Online Chinese Statistical Yearbook |

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