# Increased Foreign Revenue Shares in the United States Film Industry: 2000 – 2014

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*Honors Thesis submitted in partial fulfillment of the requirements for Graduation with Distinction in Economics in Trinity College of Duke University.*

Duke University

Durham, North Carolina

2016

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**Acknowledgements**

I would like to express my deepest gratitude to my advisors, Professor James Roberts and Professor Kent Kimbrough, for their tremendous support, patience and inspiration through the entirety of this research project. Their feedback was instrumental in arriving at the final version of this paper.

I would also like to thank my classmates for their thoughtful suggestions in class. They played a valuable part in the development of the project.

I am very grateful for the support of the Duke Economics Department, which has generously funded the procurement of data from Nash Information Services LLC. I thank John Little and the wonderful staff at Duke Data Visualization Services for their help in data collection and processing. Their expertise was indispensable to the completion of this project in the time available.

Most importantly, I would like to thank my parents for all their encouragement and support. This is for them.

**Abstract**

The American film industry, which has historically been driven by the domestic market, now receives an increasing proportion of its revenue from abroad (foreign share). To determine the factors influencing this trend, this paper analyzed data from 11 countries of 2,337 American films released during 2000 – 2014. Both film and country attributes were analyzed to determine each attribute's effect on foreign share, whether its effect size has changed over time and whether each attribute has changed in frequency amongst films released. The results identified six attributes, star actors, sequels, releases in top markets, release time lag, GDP growth and a match in language, that contributed to the increase in foreign share over this period.

*JEL Classification:* L82, F40, Z11

Keywords: Motion Picture Industry, Foreign Share, International Box Office Revenue

## I. Introduction

The American film industry is arguably the most successful in the world. Its movies have broad cultural impact, both domestically and abroad. As an economic good, films are one of the largest exports from the United States to the rest of the world. In 2013, the industry generated $15.8 billion of exports and contributed $130 billion in sales to the U.S. economy, equivalent to 0.78% of its gross domestic product (MPAA, 2015). The film entertainment sector is also one of few industries in the U.S. that consistently maintains a positive trade balance, posting a surplus of $14.3 billion in 2012 (U.S. Department of Commerce, 2015).

Historically, the American film industry has thrived on the strength of the domestic market, with revenues from foreign territories considered an "additional" component of receipts (Walls & Mckenzie, 2012). Domestic revenues often covered the majority of the production and marketing costs to release a film. The remaining profits were then driven by video purchases, rentals and licensing deals with cable and network television. Given this cost structure, producers could often attain profitability by focusing on the preferences of the North American audience. However in recent years, the proportion of film revenues from abroad (foreign share) has risen rapidly. This reflects an underlying change in the industry towards one that is increasingly driven by foreign demand. This change in revenue composition has implications for decisions at multiple levels of the industry, from production and marketing to the distribution of a film. Furthermore, the reasons for this trend in foreign share appear not to have been extensively studied in the recent literature. This study aims to provide an explanatory model for the increase in foreign share.

Several changes in the industry have accompanied the increase in foreign share. Notably, international box office markets have grown considerably in recent years. As audiences abroad consume more American films, foreign share increases. Per Figure 1, strong growth can be seen in Asia Pacific and Latin America, where some of the world's fastest-growing emerging economies are located. Foreign investors are also showing more interest in American films – through co-productions and direct investment. In 2012, China's Wanda Group purchased AMC

Entertainment Holdings, one of the largest theatre chains in the United States. An increasing number of foreign companies have also financed the production of American films.

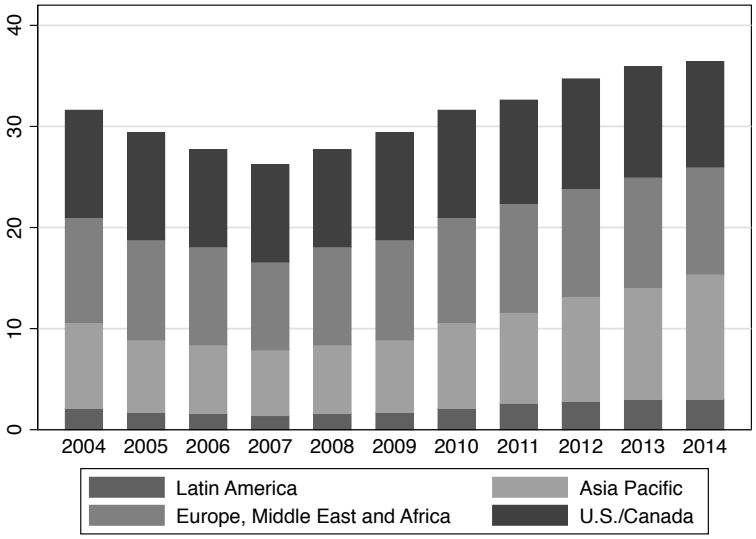


**Figure 1.** Global box office revenue from 2004 – 2014, by region (billion U.S. dollars). Source: Statista.

Next, the profitability of films based on domestic revenue alone has declined (Philips, 2004). This means that international revenue has become more important to producers, and is key to understanding the increase in foreign share. Films released in 1987 recouped 115% of its costs from domestic revenues. In 1997, that figure fell to just 37% costs recouped (Appendix A, Figure A1). This decline was likely due to increased marketing costs, which averages around $40 million per film for a studio film, as compared to $12.3 million in 1980 (McClintock, 2014)[1]. The decline in profitability from domestic revenues alone means that film producers have had to turn to additional revenue streams out of necessity. This is further heightened by the huge costs to produce a film and the high degree of uncertainty that characterizes the industry. Many studios have invested heavily in films that on all counts were expected to succeed, but instead became a huge flop. The unpredictability of a film's performance incentivizes producers to adapt quickly to the changing tastes of audiences as well as take measures to minimize their exposure to risk in revenues.

[1] Marketing costs are in terms of 2014 US dollars.

Most research on the film industry has focused on identifying variables and models that predict revenues, focusing on the domestic box office. In light of the recent changes in the industry, a more holistic picture could be achieved by analyzing both domestic and international revenues and how they relate to each other. This study aims to understand the country and film factors that have increased the share of foreign revenues for American films from 2000 – 2014.

## II. Motivation

Industry professionals believe that the foreign share of box office revenue has increased over time. The first objective of this study is to determine the extent to which this view is supported by empirical evidence. Domestic and international revenues were collected for films produced in the United States from 2000-2014 and the foreign share calculated using the formula below. A discussion of the data is presented in Section V.

$$\text{Foreign share} = \frac{\text{International Revenue}}{\text{Domestic + International Revenue}}$$

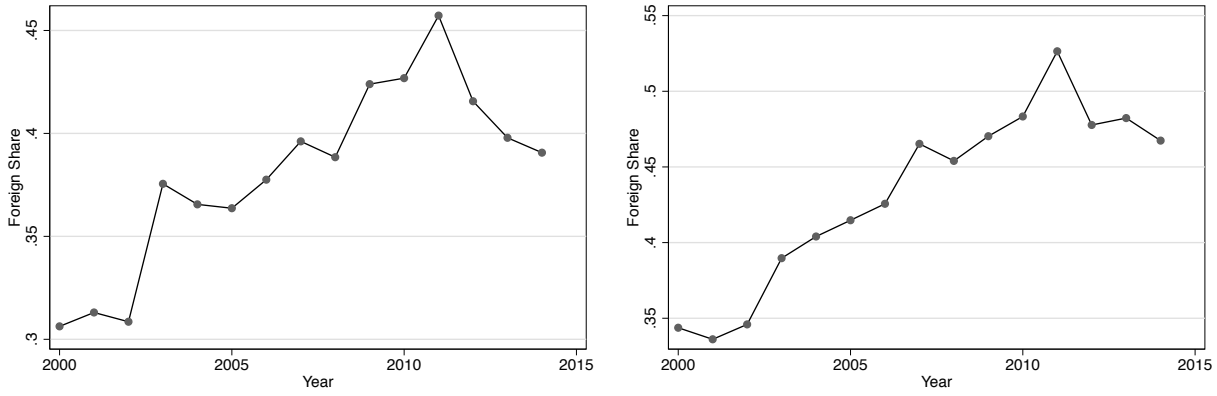


**Figure 2.** Foreign Shares of U.S. produced films (left) have increased steadily from 2000 – 2014. Restricting the sample to just films where both domestic and international data were available (right) also results in a similar trend. The values presented are per-film averages.

As seen from Figure 2 (left), foreign shares have increased over time from an average of 30.6% in 2000 to 39.1% in 2014, hitting a high of 45.7% in 2011. However, one concern is that the lack of international revenue data for some films in the early 2000s might artificially depress the average foreign share in those years. A graph was constructed using a restricted sample

comprising only films where international revenue was non-zero. As seen in Figure 2 (right), the positive time trend in foreign share is still present. This suggests that the growth rate of international revenue must be greater than that of domestic revenue. Three logical scenarios are presented:

- If domestic revenues are increasing, foreign revenues must be increasing at a greater rate;
- If domestic revenues are constant, foreign revenues must be increasing;
- If domestic revenues are decreasing, foreign revenues must be constant, increasing or decreasing at a slower rate.

From Figure 3 (left), average inflation-adjusted domestic revenue has declined from $77.7 million to $48.6 million per film. Average international revenue increased from $60.4 million to $72.0 million, although it is marked by large swings in value.

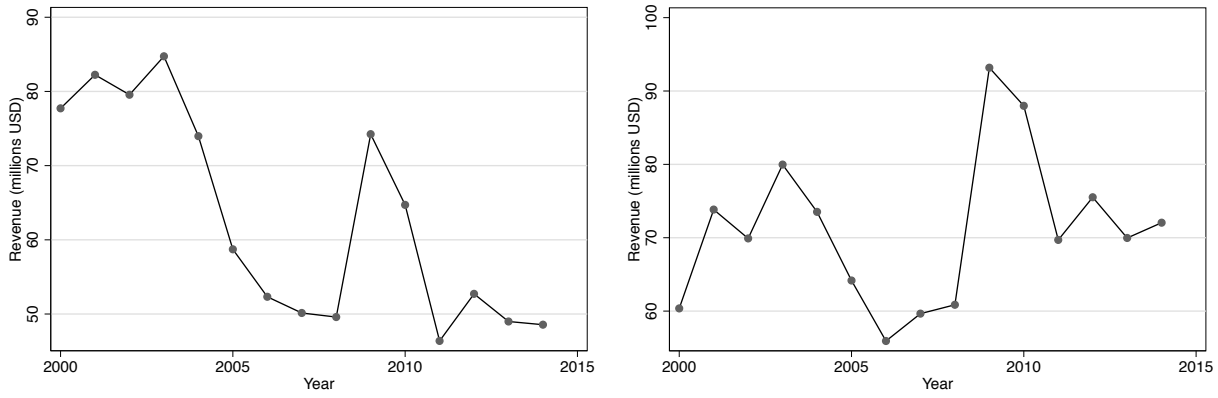


**Figure 3**. Average domestic (left) and international (right) revenue per film for US films released from 2000 – 2014. The values are per-film averages and have been adjusted for inflation. They do not indicate whether the overall domestic box office market is growing or shrinking, which would require additional data on non-U.S. produced films that were released domestically and an adjustment for the total number of films released each year.

To quantify the trend above, the following regression was conducted:

$$Y_i = \beta_0 + \beta_1 \, Year_i + \beta_2 \, Log(worldwide)_i + \varepsilon_i$$

$Y_i$ represents the variables of interest (*log(domestic)*, *log(international)* and *foreign share*) in each of the three runs of the regression, and $\beta_1$ indicates the direction of the time trend. Each

film's worldwide revenue, *log(worldwide)*, was included as a control for film performance. This ensured that the time trend is a broader phenomenon affecting all films as opposed to being driven by a small segment of well-performing films. This was pertinent given the nature of the industry, where a handful of exceedingly well-performing films often dominate the industry's annual revenue (Barnes, 2015). The results are displayed in Table 1 and the data is described in detail in Section V.

**Table 1. Time Trend for Logged Revenues and Foreign Share**

| | Log(domestic) | Log(international) | Foreign Share | Foreign Share (restricted) |
|---|---|---|---|---|
| Year | -0.0329*** | 0.0412*** | 0.0119*** | 0.013*** |
| | (0.004) | (0.005) | (0.001) | (0.001) |
| Log(worldwide) | 0.952*** | 1.129*** | 0.043*** | 0.019*** |
| | (0.005) | (0.011) | (0.002) | (0.002) |
| Constant | 66.194*** | -86.189*** | -24.151*** | -25.003*** |
| | (7.384) | (11.009) | (2.344) | (2.484) |
| $R^2$ | 0.942 | 0.843 | 0.246 | 0.0664 |
| Observations | 2337 | 2047 | 2337 | 2047 |

NOTE – All nominal variables are expressed in 2014 U.S. dollars. Standard errors are in parenthesis.
***,**,* p < 0.01, 0.05 and 0.10 respectively

Per Table 1, domestic revenues decreased by 3.29% yearly whereas international revenues increased by of 4.12% per year. These regressions lend the support to the third scenario, where increasing international revenues and decreasing domestic revenues have combined to result in increased foreign share. In addition, *releaseyear* is positive and significant in both the restricted and unrestricted sample for foreign share, suggesting that foreign share has indeed increased across time. Going forward, the unrestricted sample of films was used.

What is driving the increase in foreign share, and the trends in domestic and international spending? The analysis seeks to understand this phenomenon through the attributes of films and individual countries. The study hypothesizes that both film and country factors contributed to the increase in foreign share for U.S. produced films. In addition, this was due to the change in composition of films produced and the magnitude of the effect that each variable has on foreign share. The study differs from existing work in three ways. Firstly, it creates a novel dataset that

spans 15 years, a longer time frame than in most studies. The dataset also combines film level and country level statistics with box office revenues from eleven countries. In contrast, most studies have focused exclusively on only film or country attributes in their analysis. This novel dataset presents the opportunity for a more holistic picture.

Secondly, this study focuses on explaining the temporal dimensions of domestic and foreign revenues. As many studies focus on revenue forecasting, there is a gap in the literature that seeks to explain the underlying changes observed in the industry, especially with regards to foreign revenue. This analysis hopes to provide an explanatory model to understand these changes both domestically and abroad, and in doing so, provide some insights on future directions. This involves building on existing work in the literature on the determinants of domestic revenue, and extending them to international revenues.

Lastly, this study focused on the increase of foreign shares, which is a trend that has not been extensively researched. This is important as box office revenues in foreign territories continue to grow steadily. The study also informs how films may be strategically produced, marketed or distributed differently to appeal to international audiences. In a broader economic context, this study examines some of the conditions that compel an industry to undergo a systematic shift towards a greater international focus. In the rest of the paper, Section III and IV explore previous literature and economic theory supporting the proposed hypothesis and Section V and VI offers an in depth look into the data sample. Section VII and VIII detail the empirical methodology and report the findings, while Section IX concludes.

## III. Literature Review

Variables in the literature that were significant predictors of domestic box office revenue were incorporated as explanatory variables into the analysis. Since the goal of the present study is to understand why foreign share increased, studies discussed below that examined the temporal dimensions of these variables were especially important to the development of the paper's methodology.

*a. Film Attributes*

A pioneering study conducted by Litman (1983) is one of the earliest attempts to model motion picture revenue. Litman (1983) conducted an OLS regression of variables such as genre, MPAA rating and star actors on film revenues. This study formed the blueprint for the many others that followed. A variable that has often been investigated is the effect of star power. Nelson and Glotfelty (2009) examined the relationship between star power of actors and directors, and box office revenue using a sample of the top fifty films each year from 1999 – 2005. Star power was determined using IMDB's StarMeter, which ranks actors and directors based on the number of views on their IMDB page. Since the StarMeter is updated weekly and aggregated across millions of IMDB users worldwide, the study argues that it is a better measure of star power than the number of Oscar wins by the actors or directors of a film. The study estimated the effect of star power in the domestic market and eight foreign territories, and found the effect to be robust and significant across all countries.

Critics' reviews are also a significant predictor of box office performance, with many studies debating the role of critics as influencers or predictors of revenue. Whereas predictors are mere indicators of film performance, influencers have the capacity to shape consumer opinion and generate ticket sales. Eliashberg and Shugan (1997) found that reviews correlated with total revenues, but not with revenues from the first week of a film's release when a critic's opinion would have the greatest impact. The study concluded that critics were simply indicators of box office performance. On the contrary, Basuroy, Chatterjee and Ravid (2003) found evidence supporting the idea that critics played a dual-role, acting as both influencers and predictors. Basuroy et al. (2003) also found that negative reviews hurt box office performance more than positive reviews helped, indicating an asymmetrical effect of good and bad reviews.

Sequels have also been extensively studied in the literature. Sequels draw on an established audience who is already familiar with the narrative world and characters in the film. Sequels also rely on the success and reputation of the parent film to draw audiences to theaters. Several studies, including that of Walls and McKenzie (2012) and Brown et al. (2000) find that

sequels perform better financially. Basuroy and Chatterjee (2006) found that sequels do not necessarily perform as well as the parent film, but that they do outperform other non-sequels. This effect is enhanced if the sequel is released sooner, and when more sequels in the franchise have been released.

Film production companies have also been shown to exhibit risk-averse behavior. Research by Goettler and Leslie (2005) on major film studios from 1987 – 2000 found that studios co-financed one third of films they produced. In particular, studios were more likely to co-finance films that account for a larger portion of their annual budget, which reduced risk via diversification. Risk was measured using the variance of the risk of returns on films, and each studio's film slate was treated as a "portfolio". In addition, Phillips (2004) analyzed case studies of production companies "exporting" the risk of financing a film via deals with foreign insurance companies, private equity investors and foreign pre-sales[2]. Understanding that risk is an important element for production companies contributed to the interpretation of the study's findings. The firms' risk-averse behavior suggests that production companies are incentivized to use strategies to reduce risk, including for example, changing the attributes of films released over time to appeal to different target audiences.

*b. Foreign Box Office Markets*

Foreign revenues are increasingly important for the American film industry. Walls and Mckenzie (2012) observed films released in the domestic market and six other foreign countries from 1997 to 2007, and examined the drivers of revenue in each market separately. The study incorporated data on genre, budget, cast and rating, and observed how the film attributes have changed over time. The latter was achieved through comparing the revenue elasticities of the budget, sequel and star variables in two different time periods. The focus on international revenues and the use of time trends informed the analysis in this present study.

[2] A pre-sale involves selling the rights of a film to a foreign distributor in order to finance the production of a film. If the film does not perform well in that country, the foreign distributor bears a portion of the loss.

Another area of research has focused on understanding how America has historically dominated the global movie export trade despite protectionist measures from other countries and increasing production costs. In 2010, American films had a staggering 67.1% market share in the European Union (European Audiovisual Observatory, 2010). Previous studies have focused on cultural imperialism and general fascination with American products, the presence of a large middle class home market, and the prevalence of the English language in the world to explain this phenomenon (Jayakar & Waterman, 2000; Lee & Waterman, 2007). An alternative economic explanation is the Home Market Effect, which predicts that countries with greater domestic demand tend to have larger domestic market shares of a given product. Domestic demand is greater in countries that have larger, wealthier populations who consume more and support local production. The Home Market Effect also predicts that these countries will comprise a greater proportion of world exports of the product. As Hoskins and Mirus (1988) argue, both the size of the domestic market and the phenomenon of cultural discounting are sufficient conditions for U.S. dominance in the global film industry.

A historical retrospective by Miskell (2009) focused on American production companies in the 1940s. The study found that the companies' pursuit of projects that catered to the tastes of British consumers, who were the largest source of foreign revenue for their films, explains how the United States overtook Europe as the dominant player in global cinema at the turn of the 20$^{th}$ century. In addition, Miskell (2009) is one of few studies to empirically investigate foreign shares over time. The study found that from 1920 to 1950, foreign shares accounted for 30-40% of total revenue for five major film studios, MGM, Warner Brothers, United Artists, RKO and Universal (Appendix A, Figure A2). Similarly, Oh (2001) conducted an empirical analysis on the opposite of foreign shares, namely, domestic shares of local films. In accordance with the Home Market Effect, the study found that GDP, box office revenue and cultural distance from the United States were significant in predicting revenues of American films in different countries.

*c. Country Attributes*

Another area of research focuses on the factors that contribute to the success of imported films. Hoskins and Mirus (1988) uses the Cultural Discount Theory to describe how content rooted in a particular culture, with its own set of values, ideas and themes, decreases in value to viewers who are less able to identify with them. Fu and Lee (2008) studied cultural discounting for exported films, arguing that cultural distance is an important factor due to the inherent qualitative nature of the medium. The study measured cultural similarity using Hofstede's Cultural Dimensions Index, which is used extensively in Sociology studies. The study found that the performance of imported films in Singapore was predicted by how successful these films were in their home countries and the cultural similarity of both countries.

Fu and Govindaraju (2010) also investigated cross-cultural similarity in box office preferences by observing the correlation between U.S. box office revenues and revenues in other countries. Notably, the study incorporated a (cultural distance x year) interaction variable to allow for changes in the effect of cultural distance over time. This interaction term was adapted in the present study to analyze the variables over time. Fu and Govindaraju (2010) found that smaller cultural distance predicted how well two box office markets correlated with each other. These studies lend support to the role of sociological and cultural factors in understanding the performance of American films abroad. However, comparisons across countries is challenging as each country varies in market size. To address this, Nelson and Glotfelty (2009) incorporated income and population as control variables. Income was used as a measure of economic wealth, while population was a measure of the potential size of the movie-going market. Both variables were statistically significant in their study, although population had a negative coefficient.

Countries have also changed over time due to the impact of technology. Digital media has created many alternatives in the form of video-on-demand rentals and streaming services, such as Amazon Instant and Netflix (Eliashberg, Elberse & Leenders, 2006). The Internet has also enabled rampant piracy, which costs U.S. film studios $3 billion annually in lost revenue (De Vany & Walls, 2007). In fact, 70% of Europeans download or stream movies for free due to

the hassle of getting to a cinema, limited choices on screen or the ease of watching on smart devices and tablets (European Commission, 2014). With a greater number of alternatives to consuming content enabled by the Internet, audiences' theater-going patterns are likely to have changed over time. Unfortunately, there has not been much research on how digital streaming alternatives have impacted box office revenues.

## IV. Theory

This study combines theory from the film economics literature and the sociology literature to identify factors that predict box office revenue. Most of these variables have been analyzed using domestic box office revenue only. This study extends the analysis of these variables to determine if they also predict foreign share in addition to revenue in domestic and international markets.

### *a. Film Attributes*

Given the language barriers that exist when consuming any form of content, some genres would be more appealing than others for an international audience. For example, themes that are universal or can be expressed visually rather than through dialogue are more likely to be understood and well received by foreign audiences (Fu & Lee, 2008). This means greater international popularity for action and horror films, as opposed to comedies. In fact, Hoskins, McFadyen and Finn (1997) observed the licensing fees of various American television programs syndicated in foreign countries. The research found that more cultural-specific content such as situation comedies exhibited a negative correlation between price and cultural similarity, whereas this was not the case for less cultural-specific content such as children's programs and documentaries. Taken together, the genre and language of a film should have different impacts on domestic and foreign revenues and thereby contribute to the observed change in foreign share.

As discussed in Section III, budgets, the number of screens, star actor, star director, sequel and critics' reviews were significant predictors of international revenue in previous research. This analysis further incorporates *studio* as an indicator variable that distinguishes

between a film produced by a studio, its subsidiaries or an independent production company. Studios are unique because they have significant financial resources, international distribution channels and worldwide marketing capabilities. As a result, films produced by studios face lower barriers to entry and stand a greater chance of being distributed in multiple territories.

This is in contrast to films produced by an independent production company, which adopts a decentralized system of distribution and marketing. These films are distributed by multiple foreign distributors and often have a smaller reach since not every distributor would decide to import the film. In addition, having multiple distributors makes it more difficult for a coordinated worldwide marketing effort as compared to a single studio with a vertically integrated distribution channel. Subsidiaries of studios adopt a hybrid process – these companies have the rich resources available to studio films, but have greater creative control over the process and tend to produce films for a more niche audience (Scott, 2004). This suggests that films produced by major studios and their subsidiaries should perform better in the international market than independent films, and may play a role in the observed change in foreign share.

The timing of a film's release is critical. During the summer months and holiday season, there is a surge in box office revenue as theatergoers flock to cinemas. This seasonality in demand is further amplified by the way in which studios time their slate of film releases according to these surges in demand (Einav, 2007). As a result, the biggest-budget, star-studded family and action films are often released during these periods, whereas films targeted at more niche audiences are released during the Fall and early Spring. The timing of a film's release is important as the opening week is usually when a film captures its highest per-week revenue, after which weekly revenue declines rapidly and at a predictable rate. In this data sample, an average film's opening week accounted for 30.6% of its total domestic gross. Studios and firms are hence incentivized to release their films during the peak periods to boost revenue. In the U.S., historically high periods of demand include the summer months book-ended by Memorial Day and Labor Day, as well as the largest national holidays – Thanksgiving, Christmas and the Fourth of July (Einav, 2007). The present study incorporated two dummy variables, representing

a summer release and a release within a week of Christmas respectively to control for seasonality. Only Christmas was used to allow a fair comparison across U.S. and foreign countries, where the largest public holidays in terms of box office attendance could not be identified. This is modified from the method used by Brewer, Kelley and Jozefowicz (2009).

In addition, Elberse and Eliashberg (2003) argued that the longer the time lag between a film's domestic release and a foreign release, the more its hype and buzz fades away. The study found that increasing this time lag weakens the predictive relationship between domestic revenues and international revenues in four European markets, and suggests that distributors would be incentivized to have a foreign release as close to the domestic release as possible. Studios also sometimes use a same-day worldwide release date to generate greater hype surrounding the film. A same-day release also reduces the likelihood of theatergoers illegally streaming the film online instead. Thus, the time lag between a film's domestic and foreign release, *release lag*, should be negatively related to its performance abroad. The reduction of this time lag could lead to increased foreign share.

*b. Country Attributes*

The yearly gross domestic product of each country, *log(GDP)*, and its population, *log(population)*, was used as measures of the wealth and the size of the country's audience respectively. As market size increases, so should the demand for a normal good. Research by Dewenter and Westermann (2005) in the German box office have found theatre-going demand to have an income elasticity of 4.48, indicating that of a normal (luxury) good. Likewise, Macmillan and Smith (2001) found cinema consumption to be a normal good in the post-war U.K. market. On the contrary, Becker's Theory of Time Allocation argues for a more nuanced approach to understanding the effect of income on consumption (Becker, 1965). In fact, Becker argues that higher earnings would induce a substitution effect away from time-insensitive leisure activities (such as movies) towards greater work hours, as the cost of forgone wages has increased. Nonetheless, empirical findings of cinema tickets as an income elastic good indicates that the wealth effect dominates the substitution effect. Thus, increases in population and GDP

per capita should be positively related to film demand in overseas markets, and the growth in these factors over time could explain the increase in foreign share. In addition, firms would be incentivized to have a release in as many foreign territories as possible in order to capture the demand from these markets. By absolute numbers alone, releasing films in more territories over time would lead to an increase in foreign share. This is likely to occur over time due to factors such as lower barriers to entry and distribution costs.

In accordance with aforementioned work by Fu and Lee (2008) and Hoskins and Mirus (1988) on cultural discounting, a decrease in cultural distance between the U.S. and other countries should lead to better international performance of American films and increased foreign share. Unfortunately, Hofstede's cultural dimension index was not a feasible measure for this analysis as the values are updated approximately 15 years apart and would not provide the required sensitivity to yearly changes. This analysis instead uses data collected from the KOF social globalization index.[3] Cultural distance from the United States was tabulated as the absolute difference between the U.S.' score and the score for a country of interest:

$$\textit{Cultural Distance} = | U_{i,j} - U_{US,j}|$$

$U_{i,j}$ = Score for country *i* in year *j*
$U_{US,j}$ = Score for the U.S. in year *j*.

**Table 2. Cultural Distance By Country**

| Countries | Cultural Distance | Rank |
|---|---|---|
| Australia | 5.035 | 1 |
| Germany | 5.988 | 2 |
| France | 7.565 | 3 |
| United Kingdom | 8.739 | 4 |
| Russia | 11.017 | 5 |
| Japan | 14.657 | 6 |
| South Korea | 26.099 | 7 |
| Mexico | 26.104 | 8 |
| China | 26.613 | 9 |
| India | 48.102 | 10 |

NOTE – Values are averages across 2000-2014.

Countries that score closely on the globalization index should be more similar to each other, although this paper acknowledges that the globalization index is not a perfect measure of

[3] More information on the KOF Index can be found in the next section.

cultural similarity between two given countries. Based on the data collected from the KOF Index, *cultural distance* is reported in Table 2. The rank order concurs with anecdotal evidence that western countries are the most similar to the United States. In addition, a dummy variable was included to indicate whether the language of a film matched the local language of a particular country. Since audiences are more likely to be receptive to a film set in their native language, *language match* captured the effect on revenues of having a match between a film's language and the language of the country where it was released.

Finally, China presented a unique case as it has a quota of 34 international films that can be released in the country every year. Many of these quota slots are allocated to U.S. blockbusters. In addition, the quota is often reached three-quarters through the year, causing many films that are originally scheduled for the lucrative year-end holiday season to be pushed forward to the following year (Brzeski, 2015). The aforementioned variable, *release lag*, takes this into account by indicating the number of days between the film's U.S. release date and the territory-specific release date. Country fixed effects were included to minimize endogeneity and isolate the effects of protectionist measures, amongst other unobservable effects, on box office revenue. However, these effects are assumed to be time-invariant, which is not the case in China where the quota increased from 20 to 34 films in 2012. The inclusion of a dummy variable was considered that would distinguish films released under the new quota system. However, this was not adopted due to the other unobserved effects that the dummy variable would likely correlate with – any legislative, cultural or consumption changes in the country that occurred in 2012 and had a lasting impact through to 2014. This introduces ambiguity in interpreting the economic significance of the proposed dummy variable. The inability to completely capture the changing legislative quota is a limitation of the model. France and Korea also have film protectionist measures, but they were constant over time and would be isolated by the country fixed effects.

## V. Data

*a. Data Sources*

This analysis uses data obtained from OpusData, a subscription-based database operated by Nash Information Services LLC. The company is a premier provider of information and research services related to the motion picture industry. A range of clients, from large film studios to independent researchers, currently utilizes its services. Besides OpusData, Nash LLC also runs a publicly available box office tracking website, The Numbers. The database tracks all films since 1921 that were released in the domestic market, awarded an MPAA (Motion Picture Association of America) rating or released in the domestic video market. However, the accuracy and availability of metadata statistics per film diminishes rapidly for films released prior to 2000. Nash Information Services collects its data from production companies, distributors, trade press, major news outlets and international trade groups, such as the British Film Institute and the European Audiovisual Observatory. The company claims that its domestic box office data are accurate within 1% of the stated value, while international revenues are accurate within 10%.

An alternative source of international revenues is Box Office Mojo, which is a leading online box office reporting service and has previously been used in a variety of studies by Brown, Camerer and Lovallo (2012) and Kim, Park and Park (2013). However, unlike Opus Data, Box Office Mojo does not have documentation about its sources or the accuracy of its data. Nonetheless, data obtained from both sources were compared to see how they differed. Gross international box office revenue from both sources share a correlation of 0.97. When the two datasets were regressed against each other, the regression coefficient was not significantly different from 1.00 at the 5% confidence level. Given the similarity between international data obtained from both sources, combined with Opus Data's range of film statistics and ease of customizing the dataset, Opus Data was chosen as the primary data source for the analysis.

The dataset was then augmented with film attributes from The Internet Movie Database (IMDB), Box Office Mojo and Rotten Tomatoes. These sources have been used extensively in studies in the film economics literature. IMDB was used to identify star actors, Box Office Mojo

was used to collect territory-by-territory revenues for each film and Rotten Tomatoes was used to obtain a composite score of critics' reviews. Revenues were collected for the ten biggest international markets as of 2014: China, Japan, France, United Kingdom, India, South Korea, Germany, Russia, Australia & Mexico (Table 3).

**Table 3. Top International Box Office Markets in 2014 (billion USD)**

| Country | Box Office | Country | Box Office |
|---|---|---|---|
| 1. China | 4.8 | 11. Brazil | 0.8 |
| 2. Japan | 2.0 | 12. Italy | 0.8 |
| 3. France | 1.8 | 13. Spain | 0.7 |
| 4. U.K. | 1.7 | 14. Netherlands | 0.3 |
| 5. India | 1.7 | 15. Turkey | 0.3 |
| 6. South Korea | 1.6 | 16. Venezuela | 0.3 |
| 7. Germany | 1.3 | 17. Argentina | 0.2 |
| 8. Russia | 1.2 | 18. Sweden | 0.2 |
| 9. Australia | 1.0 | 19. Taiwan | 0.2 |
| 10. Mexico | 0.9 | 20. Indonesia | 0.2 |

Source: 2014 Theatrical Markets Statistics Report, MPAA

All revenues were adjusted to 2014 prices using the Consumer Price Index obtained from the U.S. Bureau of Labor Statistics (Appendix B, Table B1). Due to the lack of comprehensive territory-by-territory data prior to 2000, only films from 2000 – 2014 were used. To illustrate, for films with international revenue data available, only 25.8% released between 1990 and 2000 had territory-specific revenues (from Box Office Mojo), as compared to 80.6% from 2000 onwards. Per capita GDP and population statistics for individual countries were obtained from the World Bank's database. The World Bank is an international financial institution and a member of the United Nations. It conducts extensive demographic research and makes its findings publicly available through its website. A globalization score for each country over 15 years was obtained from the KOF Globalization Index. The scores were computed by the KOF Swiss Economic Institute, a leading think thank in Switzerland, which regularly publishes its research findings for use in academia. The KOF social globalization index scores countries on their economic, social and political globalization. The social domain captures each country's per capita Internet use, access to TV and foreign press products, its foreign population, as well as the level of integration

of mainstream brands, such as McDonald's and Ikea. For the purposes of this study, only the social globalization score was used to compute cultural distance between two countries.

*b. Data Characteristics*

Information was collected on 2,337 individual films spanning 2000 – 2014. This exceeds the 10 year span used by Walls and McKenzie (2012) to research the changing role of American films in the global film industry. Only films produced or co-produced by an American company were selected, since the study seeks to understand the factors driving the foreign consumption of a domestic product. The films also had to be released in theaters. This excludes films that went straight to video (DVD release), which were not a focus of the analysis.

Table 4 depicts the number of U.S. films each year that also received a theatrical release in each of the 10 foreign territories. European and Latin American countries such as France, Germany, the United Kingdom and Mexico had some of the highest number of films released, whereas Asian countries such as South Korea and Japan had fewer films. China has the smallest sample due to its quota of 34 imported films per year. For all countries, the number of films observed in the dataset increases relatively consistently every year. This may be due to more films being released overseas, or that records have become more complete in recent years. A combination of both reasons is likely to be true. For a full count of films released by country each year, refer to Appendix B (Table B2).

**Table 4. Film Count by Country and Release Year**

| | 2000-2004 | 2005-2009 | 2010-2014 | Total |
|---|---|---|---|---|
| United States | 550 | 819 | 968 | 2337 |
| Australia | 387 | 557 | 546 | 1490 |
| China | 27 | 83 | 124 | 234 |
| France | 290 | 541 | 589 | 1420 |
| Germany | 350 | 552 | 608 | 1510 |
| India | 61 | 216 | 194 | 471 |
| Japan | 168 | 373 | 310 | 851 |
| Mexico | 297 | 553 | 606 | 1456 |
| Russia | 171 | 493 | 568 | 1232 |
| South Korea | 120 | 397 | 407 | 924 |
| United Kingdom | 352 | 625 | 695 | 1672 |

NOTE – The United States box office is defined as the U.S. and Canada.

The ten foreign countries in the analysis represent a diverse sample of economies that vary in size, economic development, culture, protectionist policies and strength of the local film industries. Table 5, 6 and 7 outline the dependent and independent variables used in the analysis. With the exception of *Top10markets*, the film variables below have been used extensively in the literature as predictors of box office revenue. The natural logarithm transformation was applied to variables that had a skewed distribution.

**Table 5. Key Dependent Variables**

| Variable | Definition | Source |
|---|---|---|
| *Foreign Share* | The proportion of a film's worldwide revenue derived from foreign markets. | Constructed |
| *log(revenue)* | In regression (1a), it refers to a film's domestic and total international revenues. All values are in log 2014 US dollars. | Box Office Mojo, Opus Data |
| | In regression (4), it refers to a film's territory-specific box office revenue per by country of interest. All values are in log 2014 US dollars. | |

**Table 6. Film Variables**

| Variable | Definition | Source |
|---|---|---|
| *log(budget)* | Production budget of a film. It excludes advertising and marketing costs as well as distribution fees. | Opus Data, IMDB |
| *Screens* | The maximum number of screens that the film was screened on in any given week during its North American theatrical exhibition. | Opus Data |
| *Star actor* | IMDB calculates a person's StarMeter based on the number of views on their IMDB page aggregated across its millions of worldwide users.<br>1 = The actor is listed in IMDB's Top 500 men or women based on his/her StarMeter rank as of Nov 8, 2015.<br>0 = Otherwise | IMDB |
| *Star director* | 1 = The director is listed in IMDB's Top 500 men or women based on his/her StarMeter rank as of Nov 8, 2015.<br>0 = Otherwise | IMDB |
| *English* | 1 = Film's language is English; 0 = Otherwise | Opus Data |
| *Genre* | The films were grouped into categories by genre and coded using an indicator variable.<br>1 = Action/Adventure; 2 = Comedy; 3 = Drama<br>4 = Thriller/Suspense; 5 = Horror; 6 = Musical/Concert<br>7 = Documentary | OpusData, IMDB |
| *MPAA* | An indicator variable for the film's rating as determined by the Motion Picture Association of America.<br>1 = G; 2 = PG; 3 = PG-13; 4 = NC-17; 5 = R; 6 = Not Rated | Opus Data |
| *Sequel* | This indicates whether the film was based on an existing franchise or sequel.<br>1 = Sequel; 0 = Non-Sequel | Opus Data |

**Table 6. Film Variables (Continued)**

| Variable | Definition | Source |
|---|---|---|
| *Adaptation* | This indicates whether the film was based on an adaptation of a nonfiction book, fiction book, play, TV series, comic or graphic novel, or a spin-off of existing franchises.<br>1 = Adaptation; 0 = Otherwise | Opus Data |
| *Studio* | An indicator variable for whether a film was produced by a major studio or its subsidiaries. A list of companies is presented in Appendix B (Table B3).<br>0 = Films produced independently<br>1 = Films produced by a studio<br>2 = Films produced by subsidiaries of a studio | Opus Data, IMDB |
| *Critics* | A film's Rotten Tomatoes score, which indicates its percentage of positive published professional critic reviews. Scores range from 0 to 100. | Rotten Tomatoes |
| *Top10markets* | The number of markets, out of the ten major foreign territories, that the film was released in. The variable ranges from 0 to 10. | Constructed |

**Table 7. Country Variables**

| Variable | Definition | Source |
|---|---|---|
| *log(GDP)* | GDP Per Capita in the year of interest (thousands, normalized to 2014 USD) | World Bank |
| *log(population)* | Population of the country in the year of interest (millions) | World Bank |
| *Release lag* | The release date in the country minus the release date in the U.S., indicating the number of days between both. | Constructed |
| *Summer* | 1 = Film was released in the summer (May-Jul for countries in the Northern Hemisphere, Dec-Feb for countries in the Southern Hemisphere) (only Australia)<br>0 = Otherwise | Constructed |
| *Holiday* | 1 = Film was released within 1 week of Christmas; 0 = Otherwise | Constructed |
| *Cultural Distance* | Cultural Distance = $\lvert U_{i,j} - U_{U.S.,j} \rvert$<br>$U_{i,j}$ is the score on the social globalization index for country *i* in year *j* and $U_{U.S.,j}$ is the score for the U.S. in year *j*. The index is normalized to between 0 and 100. | KOF Economic Institute |
| *Language match* | A dummy variable indicating whether the film's language matches the main language used in the country<br>1 = Yes; 0 = Otherwise | World Bank |

*c. Summary Statistics*

Table 8 displays the summary statistics for key variables used in the analysis. The average foreign share for all films is 39%, with a standard deviation of 27%. On average, 39% of a film's total revenue is from abroad. The domestic box office remains the largest in comparison to foreign territories, with a per-film average of $59.74 million and a standard deviation of $82.74 million.

**Table 8. Summary Statistics for Key Variables**

| Variable | Mean | Median | Std. Dev. | Min | Max | Observations |
|---|---|---|---|---|---|---|
| Foreign Share | 0.389 | 0.414 | 0.267 | 0 | 1 | 2,337 |
| Revenues (mil USD) | | | | | | |
| United States | 59.738 | 31.486 | 82.741 | 2.00E-05 | 836.558 | 2,337 |
| Australia | 6.862 | 4.036 | 8.562 | 0.001 | 116.600 | 1,489 |
| China | 26.290 | 10.916 | 37.719 | 0.009 | 320.000 | 233 |
| France | 7.883 | 3.334 | 12.543 | 0.001 | 193.600 | 1,420 |
| Germany | 7.834 | 3.136 | 13.468 | 1.17E-06 | 178.200 | 1,509 |
| India | 1.485 | 0.376 | 3.258 | 0.003 | 38.883 | 467 |
| Japan | 13.761 | 5.039 | 25.516 | 0.009 | 249.037 | 846 |
| Mexico | 5.161 | 2.397 | 7.432 | 0.007 | 64.746 | 1,456 |
| Russia | 5.662 | 2.267 | 9.046 | 0.002 | 128.700 | 1,227 |
| South Korea | 5.862 | 1.990 | 10.255 | 0.0003 | 115.500 | 923 |
| United Kingdom | 12.122 | 5.206 | 19.002 | 0.0004 | 165.830 | 1,672 |
| International (only films with international release) | 80.714 | 26.961 | 144.118 | 0.0002 | 2225.753 | 2,047 |
| Budget (mil USD) | 45.432 | 26.520 | 52.522 | 0.001 | 467.500 | 2,337 |
| Screens (hundreds) | 19.445 | 24.330 | 13.812 | 0.01 | 44.680 | 2,337 |
| Critics | 50.704 | 51.000 | 26.708 | 0 | 100.000 | 2,337 |
| Genre Dummies | | | | | | |
| Action/Adventure | 0.209 | 0 | 0.407 | 0 | 1 | 2,337 |
| Comedy | 0.303 | 0 | 0.460 | 0 | 1 | 2,337 |
| Drama | 0.261 | 0 | 0.440 | 0 | 1 | 2,337 |
| Thriller/Suspense | 0.113 | 0 | 0.317 | 0 | 1 | 2,337 |
| Horror | 0.062 | 0 | 0.241 | 0 | 1 | 2,337 |
| Musical/Concert | 0.015 | 0 | 0.123 | 0 | 1 | 2,337 |
| Documentary | 0.036 | 0 | 0.186 | 0 | 1 | 2,337 |
| MPAA Dummies | | | | | | |
| G | 0.022 | 0 | 0.148 | 0 | 1 | 2,337 |
| PG | 0.144 | 0 | 0.351 | 0 | 1 | 2,337 |
| PG-13 | 0.371 | 0 | 0.483 | 0 | 1 | 2,337 |
| NC-17 | 0.002 | 0 | 0.046 | 0 | 1 | 2,337 |
| R | 0.409 | 0 | 0.492 | 0 | 1 | 2,337 |
| Studio Dummies | | | | | | |
| Major Studio | 0.269 | 0 | 0.443 | 0 | 1 | 2,337 |
| Subsidiary of Major Studio | 0.130 | 0 | 0.336 | 0 | 1 | 2,337 |
| Independent Production | 0.602 | 1 | 0.490 | 0 | 1 | 2,337 |
| Sequel | 0.101 | 0 | 0.302 | 0 | 1 | 2,337 |
| Adaptations | 0.280 | 0 | 0.449 | 0 | 1 | 2,337 |
| English Dummy | 0.991 | 1 | 0.092 | 0 | 1 | 2,337 |
| Star Actor | 0.452 | 0 | 0.498 | 0 | 1 | 2,337 |
| Star Director | 0.076 | 0 | 0.265 | 0 | 1 | 2,337 |
| Top 10 Markets | 4.880 | 6 | 3.391 | 0 | 10 | 2,337 |
| Release Lag | 54.207 | 27.000 | 94.832 | -1,177.00 | 2,330.00 | 13,597 |

NOTE – All values have been normalized to 2014 US dollars.

Other key markets in terms of expenditures include the United Kingdom and Japan at $12.12 and $13.76 million respectively per film. Overall, average foreign revenues ranged from $1.49 million in India to $26.29 million in China. With the log transformation, film revenues increasingly resembled a normal distribution. Histograms showing the distribution of the logged revenues can be found in Appendix B (Figure B1-4). In addition, many of these per-film averages are similar to those reported by Walls and Mckenzie (2012) of $51.0 mil, $8.8 mil $6.1 mil for the U.S., U.K. and Germany respectively for films released in 1997-2007.

The most popular genres were Action/Adventure (21%), Comedy (30%) and Drama (26%). A large proportion of films were given an MPAA rating of R (40%), while the next most common rating was PG-13 (37%). For the ten foreign countries in the sample, a U.S. film was released abroad 54 days later on average. The critics' scores have a mean of 50.7 and a median of 51 (out of 100), indicating a relatively even distribution of positively and negatively reviewed films in the sample. In addition, approximately 10% of the films in the dataset were sequels whereas a surprising 28% were adaptations. 45% were helmed by a "star actor" while much less were led by a star director (8%). The films were also released in 5 out of 10 of the top international markets on average. In order to investigate the possibility of multicollinearity, the correlations of key variables were tabulated and are presented in Table 9.

**Table 9. Correlations for Key Variables**

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | log(domestic) | 1.000 | | | | | | | | | |
| 2 | log(international) | 0.789 | 1.000 | | | | | | | | |
| 3 | Release Year | -0.169 | -0.053 | 1.000 | | | | | | | |
| 4 | log(budget) | 0.678 | 0.726 | -0.129 | 1.000 | | | | | | |
| 5 | Screens | 0.843 | 0.763 | -0.006 | 0.744 | 1.000 | | | | | |
| 6 | Critics | 0.079 | 0.091 | 0.031 | -0.110 | -0.118 | 1.000 | | | | |
| 7 | Star Actor | 0.063 | 0.140 | 0.158 | 0.135 | 0.086 | 0.059 | 1.000 | | | |
| 8 | Star Director | 0.139 | 0.172 | -0.052 | 0.146 | 0.077 | 0.180 | 0.055 | 1.000 | | |
| 9 | Sequel | 0.236 | 0.278 | 0.061 | 0.229 | 0.321 | -0.047 | 0.010 | -0.008 | 1.000 | |
| 10 | Adaptation | 0.199 | 0.201 | 0.013 | 0.227 | 0.175 | 0.117 | 0.004 | 0.060 | 0.095 | 1.000 |

From Table 9, variables with some of the highest correlations include *screens*, which is highly correlated with *log(domestic)* ($\rho = 0.843$), *log(international)* ($\rho = 0.763$) and *log(budget)* ($\rho = 0.744$). This is not surprising since films with higher budgets are often released on many screens due to their anticipated popularity. The log of domestic and international revenue is also highly correlated with each other ($\rho = 0.789$), suggesting that films that perform well at home in general also perform well abroad. Besides budget, screens, revenues and sequels ($\rho = 0.321$ with screens), the other variables do not have larger correlations than 0.201.

*d. Limitations of Data*

There were a large number of films with missing budget data. Missing information was especially apparent for films with very low domestic revenue. This is likely due to the lack of complete records kept for these films, and excluding them from the dataset led to a less representative sample. For example, the average domestic revenue and foreign share for the 1,248 films with missing budget data were $3.1 million and 0.086 respectively, as compared to $70.1 million and 0.388 for films with budget data. Two versions of a regression on foreign share (with and without including the budget variable) were conducted using this preliminary dataset. Dropping the budget variable, which increased the number of complete observations, resulted in different coefficients for the same variables. Some coefficients increased in magnitude while others decreased. The significance levels of several coefficients also changed. The results are presented in Appendix B (Table B4). Going forward, films with missing budget information were dropped from the dataset. However, the results would be less representative of all films in the industry, especially low revenue or non-mainstream films. Many studies have acknowledged this issue, with most restricting their dataset to only wide-released films or the top performing films each year.

A single dollar received in the domestic market is not equivalent to a dollar received in the foreign market. For every dollar in box office revenue in China for example, the studio only expects to recover 27 cents from its foreign distributor and video sales in that country after a decade. This is compared to $1.75 in the United States through a combination of theatrical

revenue, licensing deals, video sales and other merchandise. This is because the United States has a very strong DVD sales market but the opposite is true in China where pirated copies are extremely commonplace. In the U.K., Russia and South Korea, the value is $1.30, 65 cents, 55 cents respectively over a decade (Fritz, 2014). Hence, while this analysis uses the dollar value of box office revenues from various territories to quantify its contribution to a film's worldwide revenue, a caveat is that the actually dollar amount received by the production company varies depending on the composition of countries from which it received its box office revenue. This is likely to be an important consideration for production companies with regards to overall profitability, but that could not be captured in the analysis.

In addition, the analysis would ideally take into account not only film revenues but also revenues from ancillary exhibition markets such as television licensing fees, video rentals, video sales and online purchases in both domestic and foreign markets. This is because production companies also consider secondary revenue streams when deciding to produce a film. Revenue data on DVD and Blu Ray sales were available for the domestic market, but not for foreign markets. This could have otherwise contributed towards a more holistic understanding of why some types of films that had poor box office prospects were still produced. Lastly, an additional limitation is that advertising costs were not captured in the model. Different sources have estimated these marketing costs at ranging from 30% to 50% of a film's production budget, although this varies widely depending on the type of film (Phillips, 2004). However, there has been little transparency by distributors on their marketing spend.

## VI. Preliminary Analysis

### *a. Cross-Country Revenue Correlations*

Table 10 depicts the correlations of film revenues across the eleven countries in the dataset. All correlations are positive, indicating that a film that performs well in one country would also perform well in other countries. Countries in the same geographical region exhibit relatively large correlations, such as between France and Germany ($\rho = 0.880$), France and the United Kingdom ($\rho = 0.804$) and Germany and Russia ($\rho = 0.617$). However, the correlations

between western countries are greater in magnitude than those of comparable Asian countries, indicating that tastes across Europe may be more homogenous. For example, the correlation between France and Germany ($\rho = 0.880$) is much greater than between Japan and Korea ($\rho = 0.566$) even though Japan and Korea are relatively similar in terms of culture, population and economic development.

**Table 10. Correlation of Film Revenues By Country**

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Australia | 1.000 | | | | | | | | | | |
| 2 | China | 0.445 | 1.000 | | | | | | | | | |
| 3 | France | 0.828 | 0.327 | 1.000 | | | | | | | | |
| 4 | Germany | 0.821 | 0.281 | 0.880 | 1.000 | | | | | | | |
| 5 | India | 0.508 | 0.469 | 0.415 | 0.351 | 1.000 | | | | | | |
| 6 | Japan | 0.553 | 0.169 | 0.635 | 0.636 | 0.228 | 1.000 | | | | | |
| 7 | Mexico | 0.666 | 0.492 | 0.594 | 0.487 | 0.433 | 0.423 | 1.000 | | | | |
| 8 | Russia | 0.69 | 0.662 | 0.658 | 0.617 | 0.493 | 0.447 | 0.649 | 1.000 | | | |
| 9 | South Korea | 0.667 | 0.583 | 0.591 | 0.493 | 0.448 | 0.566 | 0.559 | 0.599 | 1.000 | | |
| 10 | United Kingdom | 0.863 | 0.259 | 0.804 | 0.835 | 0.408 | 0.594 | 0.58 | 0.472 | 0.553 | 1.000 | |
| 11 | United States | 0.871 | 0.383 | 0.777 | 0.762 | 0.519 | 0.615 | 0.793 | 0.63 | 0.644 | 0.838 | 1.000 |

Revenues in the U.S. are most highly correlated with Australia, France, Germany, Mexico and the United Kingdom, indicating that these countries may have tastes that are more similar to domestic audiences than others. This is consistent with the rank order of the *cultural distance* variable constructed using the KOF index in Table 2, which ranks Australia, France, Germany and the U.K. as amongst the most culturally similar countries to the United States. The exception is Mexico, which has a large correlation of 0.793, but is ranked 8$^{th}$ in cultural distance. The high correlation between the U.S. and Mexico might instead be due to the geographical proximity of the two countries. The relatively small correlation between the U.S. and China ($\rho = 0.383$) is also consistent with its rank (9$^{th}$) in cultural distance. One advantage is that films that do poorly domestically can still have the potential for a successful run in China. For example, *Terminator Genysis* (2015) employed that strategy, using foreign markets as a safety net when its domestic run flopped. The film eventually grossed $89.8 million domestically and $112.8 million in China.

*b. Distribution of Film Revenues*

Figure 4 shows how each country contributes to the total revenue received by films in the dataset. There are two insights from this chart. Firstly, traditionally strong markets such as the U.K., France and Australia made up the largest share of foreign revenue, accounting for 5%, 3% and 3% respectively of receipts. The smallest contributors were South Korea, China and India at 1%, 1% and 0.1% each. Secondly, this figure highlights a limitation of this empirical analysis. The ten foreign countries only explain approximately half of all non-U.S. revenues received, leading to a less representative sample in the second half of analysis where territory-specific data was used. Nonetheless, these are the countries that should matter the most to producers, since they are the largest foreign box office markets (Table 3).

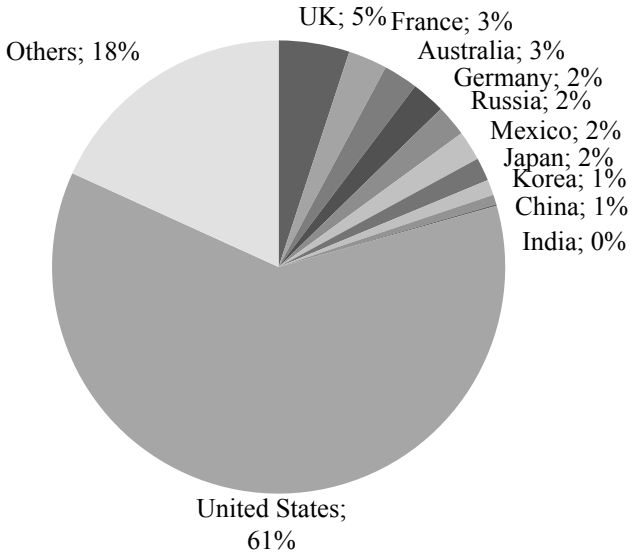


**Figure 4.** Average revenue distribution for all films in the dataset, 2000-2014. The unconditional average was used, so countries with fewer films released, such as China, would have lower averages.

In the context of media flows, the gravity model of international trade predicts that countries with greater market size and smaller cultural distance with its trading partners will have greater bilateral trade flows (Wildman, 1995). This is because market size corresponds to the size of the local demand and a smaller cultural distance leads to a greater overlap in consumer preferences. From Figure 4, the prominence of the U.K., France and Australia lends support to this theory. These are countries with some of the largest domestic markets, and share great

cultural and language similarities with the United States. Surprisingly, the opposite is observed for India, China and South Korea, although these countries do have large market sizes. Cultural dissimilarity might be responsible for the smaller trade flows. For example, based on census data in 2005, approximately 3.8% of the Indian population reported fluency in English, while 16.2% had some conversational ability in English (Azam, Chin & Prakash, 2013). Accordingly, a vast majority of the population watches films produced by the local film industry, which produces films in Hindi and numerous other local dialects.

However, the gravity model does not fully account for the size of the local film industry in explaining bilateral trade flows. Since any given two films are substitutes in consumption, a strong domestic film industry would limit Hollywood's success in that country. In 2012 alone, India's film industry produced a staggering 1,602 films with a combined gross of over US$1.6 billion (McCarthy, 2014). This contributed to India's low 0.1% share of total revenue in the dataset. The complete dominance of the local film industry despite the absence of any protectionist measures is unique to India, and limits the presence of American films in the country. Unfortunately data that estimates the yearly size of the local film industry could not be obtained for all countries in the dataset. Ideally, this would be included as a control in the model.

The remainder of the paper is divided into two sections that focus on film and country attributes respectively. Each section begins with the empirical methodology and is followed by the results and discussion of findings. The goal of each section is to understand the role of different attributes in explaining the increase in foreign share over time.

## VII. Methodology and Results I: Film Attributes

This section focuses on analyzing the direct role of film attributes through foreign share data. Country attributes were not included in this part of the analysis since foreign share is a metric that describes the international market as a whole rather than the nature of individual territories. Ordinary least squares (OLS) regressions were used for all analyses in the paper.

*a. Methodology*

In regression (1), the dependent variable is each film's foreign share and the independent variables are the film attributes (*Film Attributes*) listed in Table 6. $\alpha_1$ is a vector of the corresponding coefficients. $\mu_k$ represents year fixed effects and $\varepsilon_i$ is the error term.

$$Foreign\ share_i = \alpha_0 + \alpha_1\, Film\ Attributes_i + \mu_k + \varepsilon_i \quad (1)$$

This following model supplements regression (1) to facilitate in the interpretation of its coefficients. An increase in foreign share could be due to underlying changes in domestic revenue, international revenues, or both. Therefore, this regression seeks to quantify the effect of each variable on domestic revenues and international revenues separately. Each film contributes up to two observations to the regression (domestic and total international revenue).

$$Log(revenue)_i = \psi_0 + \psi_1\, Film\ Attributes_i + \psi_2\, Film\ Attributes_i{*}international + \mu_k{*}international + \varepsilon_i \quad (1a)$$

The same vector of film attributes (*Film Attributes*) as in (1) was used and $\psi_1$ is a vector of the corresponding coefficients. Regression (1a) differs from regression (1) in two ways. Firstly, the dependent variable is logged domestic or total international revenue instead of its foreign share. Secondly, a dummy variable, *international*, was added as an interaction term with each independent variable and fixed effects term. The dummy variable took the value of 1 for international revenue observations and 0 for domestic revenue observations. The effect of a variable on domestic revenues is given by $\psi_1$ while the effect on gross international revenue by $\psi_1 + \psi_2$. The coefficient, $\psi_2$, indicates the additional effect of the variable in the international market over and above its effect in the United States. The statistical significance of $\psi_2$ indicates whether the effects of the variable on domestic and international revenues are statistically different from each other. $\varepsilon_i$ represents the error term while $\mu_k$ represents year fixed effects.

The previous two regressions established the effect of each variable on foreign share, domestic and international revenues. Next, an interaction term, *FilmAttributes*Year*, was added to regression (1) to allow the coefficient of each attribute to vary by year. Tastes and preferences

may have changed over this 15-year span. Instead of using a single value to estimate the coefficient of these variables in predicting foreign share, allowing the coefficient to vary by year through the interaction term would add an additional temporal dimension to the analysis. For example, if sequels became more popular abroad during the time period, its increasing effect in predicting foreign share each year would be reflected in a positive $\beta_2$ coefficient. *Year* is a continuous variable for the film's release year and ranges from 2000 to 2014. Year fixed effects, $\mu_k$, were maintained as a control. The new regression, (2), is presented below.

$$Foreign\ Share_i = \beta_0 + \beta_1\ Film\ Attributes_i + \beta_2 FilmAttributes*Year_i + \mu_k + \varepsilon_i \qquad (2)$$

Next, a time trend regression was run to observe how each film attribute varied with time. For categorical attributes such as genre, it indicates how the proportion of a given genre among films released has changed. For continuous variables such as budget, it indicates how average budget has changed over time. The base number of films released per year (*Basefilms*) was included as a control. *Basefilms* allowed the time trend to capture the proportional increase of a particular attribute, as opposed to an absolute increase due to more films being released overall.

$$Film\ Attribute_i = \gamma_0 + \gamma_1 Year_i + \gamma_2 Basefilms_i + \varepsilon_i \qquad (3)$$

From (2) and (3), an attribute can influence foreign share over time in two aspects. Firstly, the magnitude of a variable's effect on foreign share (it's coefficient in (2)) could change over time. Hence each unit of the explanatory variable changes foreign share by a greater amount each year. Secondly, if an attribute that significantly predicts foreign share changes in frequency over time, this would also predict a change in foreign share over time. For example, if sequels positively predict foreign share, more sequels released over time would increase foreign share. From regression (2), each attribute's effect on foreign share is given by:

$$\frac{\partial \text{ Foreign share}}{\partial \text{ Attribute}} = \beta_1 + \beta_2 \text{ x Year}$$

From regression (3), each attribute's change in frequency per year is approximated by:

$$\frac{\partial \text{ Attribute}}{\partial \text{ Year}} = \gamma_1$$

For a given year, the product of the two components, labeled θ, indicates how foreign share is changing over time as a result of the change in frequency of a given variable. In addition, $\beta_2$ allows the *magnitude* of each variable's coefficient to vary by year.

$$\theta = \frac{\partial \text{ Foreign share}}{\partial \text{ Attribute}} \text{ x } \frac{\partial \text{ Attribute}}{\partial \text{ Year}} = (\beta_1 + \beta_2 \text{ x Year}) \text{ x } \gamma_1$$

For the analysis in part (b.vi) of this section, the median year, 2007, was used to evaluate the coefficients ($\beta_1 + \beta_2$ x Year) of each variable. This is equivalent to obtaining the average of the estimated coefficient over 2000 – 2014.

Huber-Eicker-White standard errors were used for all regressions in the paper. To test for the presence of heteroskedasticity, a Breusch-Pagan test was conducted. The independent variables (*Film Attributes*) were regressed on the squared residual terms ($\varepsilon_i^2$) from the regression of interest:

$$\varepsilon_i^2 = \theta_0 + \theta_1 \, Film\ Attributes_i + u_i$$

The independent variables were then jointly tested under the null hypothesis that their coefficients were not significantly different from zero. Rejecting the null would indicate the presence of heteroskedasticity since the variance of the residuals ($\varepsilon_i^2$) depends linearly on the independent variables. If the data was homoskedastic, the variance should be constant and independent of the variables used. A Breusch-Pagan test conducted on regression (1) and (1a) indicated the presence of heteroskedasticity as the null was rejected in both cases ($p < 0.01$). The residual plots of regression (1) and (1a) also visually suggest heteroskedasticity, and are presented in Appendix C (Figure C1-2). As the sample size increases, the robust standard errors used in the analyses should converge to the true standard errors.

*b. Results*

Due to the number of variables used, the results from regression (1) and (1a) are presented across Tables 11A-D. The coefficients in column (1) and (1a) across all tables were from a single run of each regression respectively. Regression (1) has an $R^2$ of 0.468, indicating

that 46.8% of the variability in foreign share was explained by the variability in the independent variables. The $R^2$ of 0.805 in (1a) was higher, with 80.5% of the variability in revenues explained with the model.

*b.i. Budget, Screens and Star Power*

Table 11A displays the coefficients for budget, screens and star power. *Log(budget)* is positive and highly significant in predicting foreign shares, domestic and international revenues. A 1% increase in budget is associated with a 0.00043 unit increase in foreign share, a 0.183% increase in revenues domestically and a 0.316% increase abroad. The significance of $\psi_2$ suggests that films with larger budgets had higher international than domestic revenues, which might explain the variable's positive effect on foreign share. Larger budget also allow for more resources to hire well-known actors, have a longer production period, and engage in strategies that enhance the overall appeal of the film. Budgets are also often positively correlated with marketing spend. The positive effect of budgets on revenue is consistent with the literature (Brewer, Kelley & Jozefowicz, 2009; Litman, 1983).

When a film is first released in theaters, it has a "wide" or "limited" release. A wide release is defined as screenings on 600 or more screens during its opening week. The number of screens often peaks in its first week in theatres and declines steadily after. Conversely, a limited release starts off with a smaller number of screens in its opening week, and expands further if demand is strong. Every additional 100 screens that a film is released on is associated with a 0.00012 decrease in foreign share, a 13.8% increase in domestic revenue and a 4.1% increase in international revenue. For a sense of scale, a blockbuster such as *Gladiator (2000)* was released on 3,188 screens, while an independent film released that same year, *Memento (2000)*, reached 531 screens at its height. However, caution is required in interpreting the coefficient as a causal relationship. This is because the number of screens is a proxy for distributors' expectations of film performance, but it also determines the maximum possible revenue collected. Thus, *screens* functions as both an indicator and determinant of film performance (Elberse & Eliashberg, 2003). Consistent with the literature, *screens* positively predicts domestic and international

revenues in this paper. However, its negative coefficient on foreign share is surprising and is discussed further in part (b.vi) of this section.

**Table 11A. Regression Results on Foreign Share and Log(revenue)**

| | (1) Regression on Foreign Share | (1a) Regression on Log(revenue) | | |
|---|---|---|---|---|
| | | Main Effects ($\psi_1$) | *Variable*International* Interaction Terms ($\psi_2$) | $\psi_1 + \psi_2$ |
| Log(budget) | 0.043*** | 0.183*** | 0.133** | 0.316*** |
| | (0.005) | (0.035) | (0.056) | |
| Screens | -0.012*** | 0.138*** | -0.097*** | 0.041*** |
| | (0.001) | (0.004) | (0.006) | |
| Star Director | 0.026** | 0.036 | 0.250** | 0.286*** |
| | (0.014) | (0.079) | (0.115) | |
| Star Actor | 0.029*** | -0.044 | 0.070 | 0.026 |
| | (0.009) | (0.055) | (0.075) | |
| Constant | -0.02 | 10.022*** | | |
| | (0.102) | (0.736) | | |
| $R^2$ | 0.502 | 0.833 | | |
| Observations | 2,337 | 4,384 | | |

NOTE – All nominal variables are expressed in 2014 U.S. dollars. Standard errors are in parenthesis. The statistical significance of $\psi_1 + \psi_2$ was tested using an F-test under the null that $\psi_1 + \psi_2 = 0$.
***,**,* $p < 0.01$, 0.05 and 0.10 respectively

From Table 11A, *star actor* is associated with a greater foreign share by 0.029 units. However, films with and without star actors do not differ significantly from each other in terms of revenue. *Star director* is also associated with an increase in foreign share by 0.026 units. Films led by star directors have 28.6% higher revenues in the international market than films without. The positive effect of star directors on international revenue is consistent with the idea that these individuals bring greater visibility, skill and talent to a film. However, the lack of significance of star actors and directors in predicting domestic revenues is surprising. The correlation between both variables is 0.075, so multicollinearity was unlikely to be an issue. When *star actor* and *star director* were jointly tested with an F-test, they remained insignificant.

Previous research is divided, with studies finding different effects of star power. Walls and Mckenzie (2012) found that films with star actors had 36.5% and 55.3% higher revenues domestically and abroad. Nelson and Glotfelty (2009) included variables for star power and its

squared term in their study, and found both terms to be significant. On the contrary, Brewer et al. (2009) did not find significant effects of star power in the domestic market. Previous studies varied widely in how the variable was characterized. Some used the presence of an Oscar win, whereas others used some version of a popularity index. Therefore, star power appears to be highly sensitive to the specification of the model. This might also be due to the changing notion of a "movie star" in today's terms. In the past, Hollywood relied on the draw of highly bankable stars such as Tom Hanks and Brad Pitt to score a successful theatrical run. Today, a famous actor is unlikely to guarantee box office success. In accordance with this idea, Walls and McKenzie (2012) found that the effect of star power has declined from 1996 to 2007. In the present study, discussed later, the magnitude of the *star director* coefficients also decrease over time, although this change was marginally significant.

*b.ii. Critics, Genre, Sequels and Adaptations*

As seen in Table 11B, *critics* was significant in predicting foreign share. A unit increase in a film's Rotten Tomatoes score (out of 100) indicates a 0.0004 decrease in foreign share and a 1.3% and 0.6% increase in domestic and international revenue respectively. As discussed earlier, scholars have debated the role of critics as a box office indicator or leader. Nonetheless, a positive effect of film reviews is consistent with previous findings. Brewer et al. (2009), for example, found that a unit increase in aggregate critics' scores on Rotten Tomatoes was associated with a 0.3% increase in revenues in the United States.

In predicting foreign share, all genres except Horror had a significantly negative coefficient when compared to the baseline category, Action. This suggests that action and horror films were associated with the highest foreign share values. From regression (1a), all other genres performed better than actions films in the domestic market ($\psi_1$ was positive). Horror also performed best relative to other genres abroad ($\psi_1 + \psi_2$). The large coefficients of Musicals and Documentaries in predicting domestic revenues ($\psi_1$) were surprising. This may be due to the small fraction of these genres in the dataset (1.54% and 3.59% respectively). In addition, many documentaries in particular lacked budget information and had to be dropped from the dataset.

The remaining documentaries were better known at the time of their release and had higher box office performances. This would lead to an upward bias in the estimation of the documentary coefficient in the regression.

**Table 11B. Regression Results on Foreign Share and Log(revenue)**

| | (1) Regression on Foreign Share | (1a) Regression on Log(revenue) | | |
|---|---|---|---|---|
| | | Main Effects ($\psi_1$) | *Variable*International* Interaction Terms ($\psi_2$) | $\psi_1 + \psi_2$ |
| Critics | -0.0004** | 0.013*** | -0.007*** | 0.006*** |
| | (0.0006) | (0.001) | (0.002) | |
| Genre (Baseline = Action) | | | | |
| Comedy | -0.073*** | 0.860*** | -0.674*** | 0.186*** |
| | (0.011) | (0.072) | (0.098) | |
| Drama | -0.097*** | 0.922*** | -0.892*** | 0.030 |
| | (0.014) | (0.088) | (0.118) | |
| Thriller | -0.027* | 0.279*** | -0.188 | 0.091 |
| | (0.015) | (0.096) | (0.128) | |
| Horror | 0.035 | 0.545*** | 0.074 | 0.619*** |
| | (0.022) | (0.128) | (0.172) | |
| Musical | -0.116*** | 1.307*** | -1.684*** | -0.377 |
| | (0.031) | (0.238) | (0.337) | |
| Documentary | -0.132*** | 1.101*** | -1.159*** | -0.058 |
| | (0.024) | (0.255) | (0.404) | |
| Sequel | 0.050*** | -0.109* | 0.321*** | 0.212*** |
| | (0.011) | (0.063) | (0.088) | |
| Adaptation | -0.009 | 0.142*** | -0.165** | -0.023 |
| | (0.008) | (0.052) | (0.075) | |

NOTE – All nominal variables are expressed in 2014 U.S. dollars. Standard errors are in parenthesis. The statistical significance of $\psi_1 + \psi_2$ was tested using an F-test under the null that $\psi_1 + \psi_2 = 0$.
***,**,* $p < 0.01$, 0.05 and 0.10 respectively

In discussing genre, $\psi_2$ is of special interest as it indicates whether a genre's performance domestically and abroad significantly differs from each other. All genres, except Thriller and Horror, have differential success domestically and abroad ($\psi_2$ was significant). Per Table 11B, comedy and drama films, which tend have dialogue-driven narratives, performed worse abroad. In contrast, thriller and horror films, which are usually more visual and less dependent on culture-specific knowledge, performed similarly in both markets. These findings are consistent with the Cultural Discount Theory discussed in Section III and IV that different genres would be "discounted" in varying degrees by cultural barriers. Similarly in previous studies, Lee (2008)

found the effects of Action to be positive and Comedy to be negative on box office revenues in Hong Kong, Taiwan, South Korea and Japan. Brewer et al. (2009) found positive effects of Action, Comedy and Horror in the American box office.

In addition, evidence that the same genre has differential success in the domestic and foreign markets is interesting. It suggests that a trade-off – giving up revenue from the domestic market in return for higher revenues from the international market (or vice versa) – occurs when choosing one genre over another. Through this trade off, a change in the genre compositions of films produced each year would result in a change in foreign share. As a side note, Horror was significant in predicting domestic and international revenues but was not significant in predicting foreign share. This was likely because it performed equally well in both markets, leading to increases in both domestic and international revenues and thus no change in foreign share.

Next, *sequel* positively predicts foreign share but *adaptation* does not. *Sequel* is associated with 10.9% less revenue domestically, but 21.2% more revenue abroad. The negative coefficient of *sequel* in the domestic market differs from the findings of Basuroy and Chatterjee (2008) that sequels outperform other non-sequels at the box office by 84.5%. However the study uses data from films released between 1991-1993. Consequently, the different findings for sequels might be due to changes in consumer preferences or a decline in the quality of sequels with time. Another study by Walls and Mckenzie (2012) found that sequels perform better abroad than in the domestic market. The results in Table 11B support this view.

*Adaptation* does not significantly predict foreign share. Like sequels, adaptations draw on audiences that are familiar with the context of the story. The positive relationship between adaptations and revenue was empirically supported in the domestic market but not for the international market where it has no significant effect. Here, *adaptation* was defined as a film that was adapted from a book, play, TV series, graphic novel, or a spin-off from a franchise. To investigate further, *adaptation* was re-coded to only include adaptations from books and graphic

novels. However, the same outcome as before was obtained for foreign share, domestic and international revenues. Going forward, the broader definition of *adaptation* was maintained.

*b.iii. Major Studios and MPAA Rating*

As reported in Table 11C, films produced by studios and their subsidiaries decrease foreign share by 0.033 and 0.017 as compared to independent films. Films of subsidiaries performed 38.3% better in the U.S. as compared to independently produced films, but were not significantly better abroad. In contrast, studio films were not significantly different from independent films at all in both markets. This is surprising given the resources and international distribution network that studios have, as discussed in Section IV. Perhaps the presence of a major distributor, as opposed to the nature of the production company, is a more suitable variable to measure the distributional resources available to a film instead. For example, Litman (1983) found that major distributors were positively associated with higher revenues for films in the domestic market. The inclusion of a variable to capture the presence of a major distributor is a potential modification for future work.

PG-13 was the only MPAA rating that was significant in predicting foreign shares, although R was marginally significant. All MPAA ratings did not have a significant effect on domestic revenues relative to the baseline. This is surprising since a film's rating directly determines its potential audience by enforcing minimum age requirements in some cases. Internationally, all ratings except NC-17 performed worse than the reference category, G. The G rating is intended for family-friendly films and imposes no age restrictions in the U.S., which might explain its popularity across different cultures. Note that each country has its own rating system and different standards for age restrictions. These MPAA ratings are proxies for the type of rating a film is likely to receive abroad. In the literature, the effect of MPAA ratings on box office revenue has been mixed. Consistent with the present study, Brewer et al. (2009) found no effect of a film's rating on domestic revenues, whereas Simonoff, and Sparrow (2000) found a significant effect. Most empirical studies continue to include MPAA ratings as controls in regressions on box office revenue. In future work, it might be helpful to distinguish between the

different reasons for which a particular rating was awarded. For example, an R rating can be imposed due to adult themes, language or violence content. Films with different themes may share the same rating, but could still differ in their effect on revenues. Films that were "Not Rated" either did not receive a rating or were not submitted for assessment, and comprised 5.13% of films in the dataset. Most were documentaries or small-scale films with a niche audience, resulting in the heavily negative coefficient of -0.115 in (1). Since they represented a very specific type of film with a small audience, "Not Rated" was not a core part of the analysis.

**Table 11C. Regression Results on Foreign Share and Log(revenue)**

| | (1) Regression on Foreign Share | (1a) Regression on Log(revenue) | | |
|---|---|---|---|---|
| | | Main Effects ($\psi_1$) | *Variable*International* Interaction Terms ($\psi_2$) | $\psi_1 + \psi_2$ |
| Studio (Baseline = Independent production) | | | | |
| Subsidiary | -0.033*** | 0.383*** | -0.409*** | -0.026 |
| | (0.01) | (0.066) | (0.093) | |
| Major Studio | -0.017** | 0.046 | -0.117 | -0.071 |
| | (0.008) | (0.051) | (0.072) | |
| MPAA (Baseline = G) | | | | |
| PG | -0.034 | -0.075 | -0.390* | -0.465*** |
| | (0.026) | (0.161) | (0.228) | |
| PG-13 | -0.073*** | 0.209 | -0.731*** | -0.522*** |
| | (0.025) | (0.161) | (0.227) | |
| NC-17 | -0.0004 | 0.581 | -0.893 | -0.312 |
| | (0.075) | (0.412) | (0.796) | |
| R | -0.045* | 0.105 | -0.609** | -0.504*** |
| | (0.026) | (0.167) | (0.236) | |
| Not Rated | -0.115*** | -1.972*** | 0.755 | -1.217*** |
| | (0.034) | (0.266) | (0.534) | |

NOTE – All nominal variables are expressed in 2014 U.S. dollars. Standard errors are in parenthesis. The statistical significance of $\psi_1 + \psi_2$ was tested using an F-test under the null that $\psi_1 + \psi_2 = 0$.
***,**,* $p < 0.01$, 0.05 and 0.10 respectively

*b.iv. English and Top 10 Markets*

Table 11D shows the regression results for *English* and *Top10markets*. English films decreased foreign share relative to non-English films by 0.146, which is consistent with the idea that language barriers would deter non-English speaking audiences. English films fared 61.5% worse domestically (marginally significant) and 109.2% worse abroad. The large magnitude of these coefficients may be explained by the low variability in *English*, with 99% of the films in

the dataset being English films. This may have led to an overestimation of the performance of the non-English films in the dataset.

**Table 11D. Regression Results on Foreign Share and Log(revenue)**

| | (1) Regression on Foreign Share | (1a) Regression on Log(revenue) | | |
|---|---|---|---|---|
| | | Main Effects ($\psi_1$) | *Variable*International* Interaction Terms ($\psi_2$) | $\psi_1 + \psi_2$ |
| English | -0.146*** | -0.615* | -0.477 | -1.092*** |
| | (0.053) | (0.363) | (0.500) | |
| Top10markets | 0.063*** | 0.167*** | 0.361*** | 0.528*** |
| | (0.002) | (0.015) | (0.023) | |

NOTE – All nominal variables are expressed in 2014 U.S. dollars. Standard errors are in parenthesis. The statistical significance of $\psi_1 + \psi_2$ was tested using an F-test under the null that $\psi_1 + \psi_2 = 0$.
***,**,* $p < 0.01$, 0.05 and 0.10 respectively

The more top markets in which a film is released, the greater its foreign share as evidenced by the positive coefficient for *Top10markets*. An additional top ten country in which a film was released increases overall international revenues by 52.8%, due to having a larger audience that is now able to see the film. Ideally, the grand total number of countries in which a film was released, weighted by population size, should be used in the model to capture the scope of a film's international distribution and its effect on foreign share. Unfortunately, this data was not available. Nonetheless, *Top10markets* is still a meaningful variable, as it should be highly correlated with a film's total number of releases abroad.

*b.v. Regression Fixed Effects*

Figure 5A plots the year fixed effects from regression (1), with time on the X-axis and the value of the fixed effects on the Y-axis. All fixed effects were negative and significant at the 5% level, suggesting that a film released after 2000 had a lower foreign share than the base year. In addition, the upward trend suggests that foreign share is increasing over time, holding the film variables constant in (1). The fixed effects trend is very similar to the trend in actual trend in foreign share in Figure 2, both of which increase with time, peak in 2011 and decline slightly afterwards. This suggests that the unobserved effects captured in the fixed effects terms could help explain the change in foreign share over time. This would be of interest in future research.

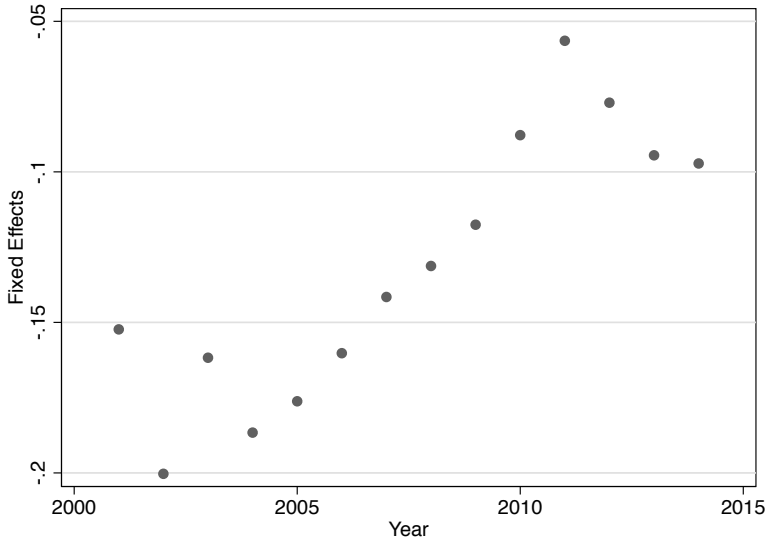


**Figure 5A.** Year Fixed Effects in regression (1). The base year is 2000.

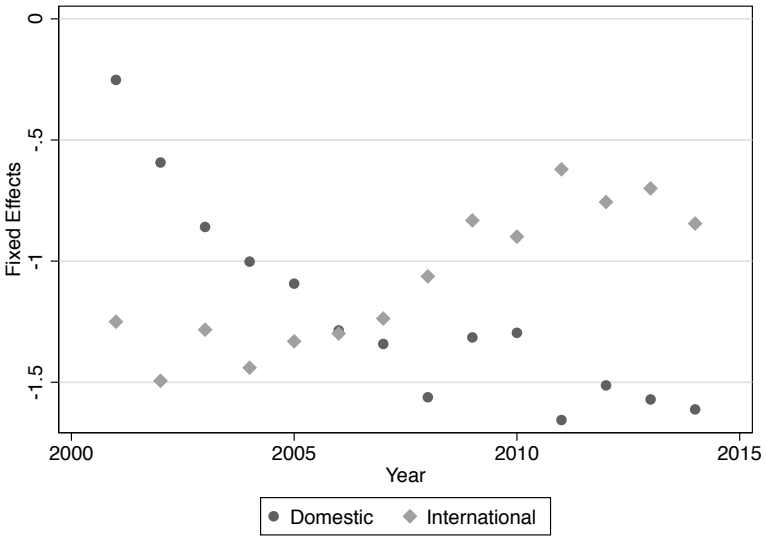


**Figure 5B.** Year Fixed Effects on domestic and international revenues in regression (1a). The base year is 2000.

Figure 5B above plots the year fixed effects from regression (1a). All fixed effects were significant except the year 2001 for domestic revenues. The figure shows that, controlling for all variables in the regression, domestic revenues displayed a downward trend while international revenues displayed an upward trend over time. In addition, the fixed effects for international revenues supersede those for domestic revenues approximately at 2006-2007. This implies that,

with controls, a film would be earning more abroad than domestically after this period. The trends in Figure 5A and 5B are an interesting point of inquiry for future research. A fixed effect representing all international revenues was also added to (1a) and was positive and not significant.

*b.vi. Analysis of Film Attributes Over Time*

This section combines the results from regression (2) and (3). The coefficients in the $\beta_1$ and $\beta_2$ column are from the same regression, whereas each coefficient in the $\gamma_1$ column was from a different time trend regression for each variable respectively. As detailed in part (a) of this section, $\theta$, indicates how the change in a variable's frequency over time has contributed to the change in foreign share. $\theta$ was calculated only for variables that had a significant time trend ($\gamma_1$ was significant) and that predicted foreign share ($\beta_1$ and $\beta_2$ were jointly significant). In comparison to (1), many variables that significantly predicted foreign share were no longer significant in (2). Fu and Govindaraju (2010) likewise noted that adding year interaction terms to their model on box office revenues resulted in the loss of explanatory power for individual coefficient terms. As a result, the joint significance, as opposed to the individual significance of $\beta_1$ and $\beta_2$, was used in this study. Only key variables of interest are presented. For the full results of regression (2) and (3), refer to Appendix C (Table C1-2).

Overall, three variables, *screens*, *star actors* and *English*, had an effect on foreign share through a change in frequency over time. Per Table 12, *screens* has a negative coefficient ($\beta_1 + \beta_2$*year) when predicting foreign share. The coefficient became more negative from 2000 to 2014, suggesting that screens had a greater dampening effect on foreign share over time. The negative coefficient combined with the positive time trend suggests that *screens* decreased foreign share over this period. *Screens*' negative coefficient in predicting foreign share is surprising but should be interpreted with caution. The variable refers to the number of screens on which a film was shown domestically. It is unlikely to be correlated with the number of screens on which a film was shown on abroad, which would depend on the size of the country, amongst other factors. Thus, a more appropriate interpretation of *screens* is as a proxy for domestic

advertising and movie hype, as Elberse and Eliashberg (2003) also argue. The interpretation of *screens* as a proxy for domestic advertising is consistent with the findings in Table 11A that *screens* has a negative coefficient in predicting foreign share and a greater impact on domestic revenues than international revenues.

**Table 12. Effect of Film Attributes on Foreign Share Over Time**

| | Regression (2) | | Regression (3) | (Constructed) |
|---|---|---|---|---|
| | $\beta_1$ | $\beta_2$ | $\gamma_1$ | $\theta$ |
| Log(budget)[a] | -0.829 | 0.0004 | -0.001 | - |
| | (2.524) | (0.001) | (0.018) | |
| Screens[a] | 1.992*** | -0.001*** | 0.360** | -0.0054 |
| | (0.331) | (0.0002) | (0.148) | |
| Star Director | 11.773* | -0.006* | -0.002 | - |
| | (6.732) | (0.003) | (0.003) | |
| Critics[a] | 0.313 | -0.0002*** | 0.330 | - |
| | (0.08) | (0.00003) | (0.280) | |
| Star Actor[a] | 5.215 | -0.00258 | 0.022*** | 0.0008 |
| | (4.360) | (0.002) | (0.005) | - |
| Genre (Baseline = Action) | | | | |
| Comedy[a] | -0.346 | 0.0001 | -0.009* | - |
| | (5.529) | (0.003) | (0.005) | |
| Drama | 15.412** | -0.008** | 0.003 | - |
| | (6.369) | (0.003) | (0.005) | |
| Thriller | -5.141 | 0.003 | 0.002 | - |
| | (7.178) | (0.004) | (0.003) | |
| Horror | -4.151 | 0.002 | -0.0004 | - |
| | (11.864) | (0.006) | (0.003) | |
| Musical[a] | -1.984 | 0.001 | -0.001 | - |
| | (16.781) | (0.008) | (0.001) | |
| Documentary[a] | 8.204 | -0.004 | -0.001 | - |
| | (12.111) | (0.006) | (0.002) | |
| Sequel[a] | -12.726** | 0.006** | 0.006* | - |
| | (5.095) | (0.003) | (0.003) | |
| Studio (Baseline = Independent production) | | | | |
| Subsidiary[a] | 9.072* | -0.005* | -0.003 | - |
| | (4.758) | (0.002) | (0.003) | |
| Major Studio | 7.472* | -0.004* | -0.019*** | - |
| | (4.184) | (0.002) | (0.004) | |

NOTE – Standard errors are in parenthesis. $\theta = (\beta_1 + \beta_2 * year) * \gamma_1$, where year = 2007. Coefficients before rounding were used to calculate $\theta$.

[a] $\beta_1$ and $\beta_2$ were jointly significant at the 5% level

***,**,* p < 0.01, 0.05 and 0.10 respectively

**Table 12. Effect of Film Attributes on Foreign Share Over Time (Continued)**

| | Regression (2) | | Regression (3) | (Constructed) |
|---|---|---|---|---|
| | $\beta_1$ | $\beta_2$ | $\gamma_1$ | $\theta$ |
| Adaptation | 6.377 | -0.003 | 0.007 | - |
| | (3.891) | (0.002) | (0.005) | |
| MPAA (Baseline = G) | | | | |
| PG | -10.874 | 0.005 | 0.007* | - |
| | (12.439) | (0.006) | (0.004) | |
| PG-13[a] | -5.305 | 0.003 | -0.003 | - |
| | (12.343) | (0.006) | (0.005) | |
| NC-17 | -35.396 | 0.018 | 0.0001 | - |
| | (37.098) | (0.018) | (0.0004) | |
| R | -2.093 | 0.001 | -0.002 | - |
| | (12.721) | (0.006) | (0.005) | |
| Not Rated[a] | 15.472 | -0.008 | 0.003 | - |
| | (15.987) | (0.008) | (0.002) | |
| English [a] | 22.578 | -0.0113 | 0.002** | -0.0002 |
| | (27.129) | (0.014) | (0.001) | |
| Top10markets[a] | -7.158*** | 0.004*** | 0.063* | - |
| | (1.102) | (0.001) | (0.036) | |

NOTE – Standard errors are in parenthesis. $\theta = (\beta_1 + \beta_2 * year) * \gamma_1$, where year = 2007. Coefficients before rounding were used to calculate $\theta$.

[a] $\beta_1$ and $\beta_2$ were jointly significant at the 5% level

***,**,* $p < 0.01$, 0.05 and 0.10 respectively

For *star actors*, the proportion of films with famous actors increased by 2.2 percentage points yearly on average. $\beta_1$ and $\beta_2$ were jointly significant and $(\beta_1 + \beta_2 * year)$ was positive for each year, hence *star actors* positively predicted foreign share. However, the effect of star actors on foreign share did not vary with time as $\beta_2$ was insignificant. Overall, this suggests that star power, in the form of famous actors, increased foreign share in this period. In this paper, the variable only considered whether the lead actor in the film was a star actor or not. For future work, star power can be modified to include the presence of multiple star actors in a film. Next, English films negatively predicted foreign share in this model, which is consistent with the notion of cultural discounting. Since there were more English films released each year, this led to a decrease in foreign share over time. However, this change is very small as an overwhelming majority (99%) of the films in the dataset are English films. Hence this variable likely played a small role in influencing foreign share over time.

Even though some variables did not influence foreign share over time through the mechanism outlined for θ, the effect of the variable, as measured by the magnitude of its ($\beta_1$ + $\beta_2$*year) coefficient, had changed significantly over time. The significance of $\beta_2$ implies that the relative popularity of the attribute domestically and abroad was changing over time, giving rise to a change in its impact on foreign share each year. The finding that the relatively short duration (15 years) of the dataset was sufficient to observe such changes in audience preferences is interesting. Holding all else constant, these variables would change foreign share over time.

These variables include *sequels*, *critics*, *top10markets* and *genre*. The coefficient ($\beta_1$ + $\beta_2$*year) of *sequels* in predicting foreign share is negative during this time period, but was less negative (more positive) over time, as evidenced by the positive sign for $\beta_2$. This is consistent with anecdotal evidence that sequels have become increasingly successful worldwide. In 2014, seven out of the ten films with the largest worldwide gross were sequels, as compared to only one out of ten in 1994 (Garrahan, 2014). This may also reflect the change in the type of sequels produced over time, to more sequels from mega-franchises such as *The Hunger Games*, *Star Wars* and *X-Men*, which have global appeal. From regression (3) and (4), the proportion of sequels released over time was unchanged but each sequel released now has a more positive effect on foreign share each year. Hence *sequels* potentially helps to explain the increase in foreign share over time.

Critics' ratings had a negative effect on foreign share. Average critics' score each year remained unchanged but the same score now decreased foreign share by a greater amount each year ($\beta_2$ is negative). This suggests that *critics* decreased foreign share over time. Nonetheless, the magnitude of its yearly change, $\beta_2$, is rather small. For *critics*, an additional caveat is that many of the reviews compiled by Rotten Tomatoes are from American publications, and may not reflect how international audiences feel about a film. The coefficient of *Top10markets* is positive and increases over time. Hence, the effect of releasing a film in a top ten foreign market increases foreign share by a greater amount each year and is a candidate to explain the observed trend in foreign share.

The composition of genres has remained consistent over time ($p < 0.05$), with the exception of comedy films which had a marginally significant decrease of 0.9 percentage points annually. Comedy has historically posed challenges in appealing to foreign audiences. Film critic Matt Singer writes for the BBC that "talky comedies don't tend to translate...(and) the humor doesn't necessarily play well in Asia or in parts of Europe" (Brook, 2014). However, drama was the only genre that significant predicted foreign shares in this model. Its coefficient, when allowed to vary by year, was more negative over time. Based on the Cultural Discount Theory, genres were expected to play a greater role in influencing foreign share over time. However, a limitation in the methodology is that *genre* classifies each film into one of seven mutually exclusive categories. In reality, most films are best described by a combination of multiple genres. Even films within the same science-fiction genre, such as *Back to the Future (1985)* and *Blade Runner (1982)*, are vastly different from each other. Ideally, a specification with more specific genre labels or the ability to list films across multiple genres would be used.

The remaining variables were unlikely to have influenced foreign share over time. These variables did not have a significant time trend and the magnitude of their coefficients in predicting foreign share did not change over time or were not significant in the first place. These include *log(budget)*, *star director*, *adaptation* and *MPAA*.

**VIII. Methodology and Results II: Country Attributes**

The second half of the analysis seeks to understand how country attributes influence international revenues, and by extension, foreign share. There are two caveats in this analysis. Firstly, the scope of the analysis does not cover all the possible countries that a given film is released in, but only the ten largest foreign markets. Since these countries are ones that producers likely care about the most, this is less likely to be a limiting factor. Secondly, the analysis assumes that country variables (of foreign markets) do not affect domestic revenues. For example, assuming Australia's per capita GDP only affects revenues in Australia and has no effect on the domestic USA market, then a positive coefficient for GDP can be said to increase international revenues and by extension, foreign share. If these country variables "spill over" and

affect domestic revenues for any reason, then a direct inference on foreign share cannot be drawn. This assumption is likely to hold as films are usually released in foreign countries *after* they are released in the U.S. In addition, there are no indications in the literature that factors specific to a foreign country would affect the consumption of a product in its home country in the same time period. Granted, films produced may change over time in response to foreign factors. To test this, lagged country variables would need to be incorporated in the model to observe, for example, the effect of China's GDP in previous time periods on films today. This was outside the scope of the study.

*a. Methodology*

Box office revenues for all 2,337 films in each of the 10 foreign countries were grouped into a single large dataset. In contrast to previous studies in the literature where individual regressions were run for separate countries, this model combines data from all countries into a single regression. Combining the data allowed the model to capture the effect of these variables as they varied across both time and country. Each film contributed up to ten observations to the dataset, resulting in a total of 23,133 observations[4]. Of these, 11,895 were "censored observations" with no revenue data as the film was not released in a particular country. The country attributes were independent variables that were synchronized with the year of the film's release in the country.

Year and country fixed effects were also included to isolate unobserved effects that may be correlated with the regression covariates but were not captured in the model. The year fixed effects captured country-invariant events such as the 2008 financial crisis, which resulted in changes in consumer sentiment and spending habits in multiple countries. In contrast, country fixed effects captured time-invariant characteristics across countries, such as prevalent attitudes towards American films (may be correlated with *cultural distance*), piracy in the country (may be correlated with *log(GDP)*), and competition with the country's own domestically-produced films (may be negatively correlated with *log(budget)*). For China, France and South Korea, the

[4] Some films in dataset were released abroad in 2015. They were not included in the analysis.

fixed effects would also account for the country's protectionist measures in the form of film import quotas and compulsory screenings for local movies (Marvasti & Canterbery, 2005). If the year and country fixed effects capture the unobserved variables that do not change across country and time respectively, then any changes in revenues can be attributed to influences other than the fixed characteristics, ideally the independent variables in the model.

$$Log(revenue)_{i,j} = \alpha_0 + \alpha_1 \, Film\ Attributes_i + \alpha_2 \, Country\ Attributes_{i,j} + \mu_j + \mu_k + \varepsilon_{i,j} \quad (4)$$

$\mu_j$ = country fixed effects $\mu_k$ = year fixed effects
$i$ = each film in the dataset $j$ = each country in the dataset

*Log(revenue)* refers to a film's revenue in a given country. *FilmAttributes* represents the vector of film attributes listed in Table 6. One new variable was added as a control – domestic revenue. A film that performs well in the U.S. may generate positive buzz that boosts its performance abroad. The film's domestic revenue, *log(domestic)*, was added to control for this effect. *Country Attributes* represents a vector of country attributes listed in Table 7. $\alpha_1$ and $\alpha_2$ are vectors of the respective coefficients. $\mu_j$ represents fixed effects for each of the ten countries and $\mu_k$ represents fixed effects for each of the fifteen years in the dataset.

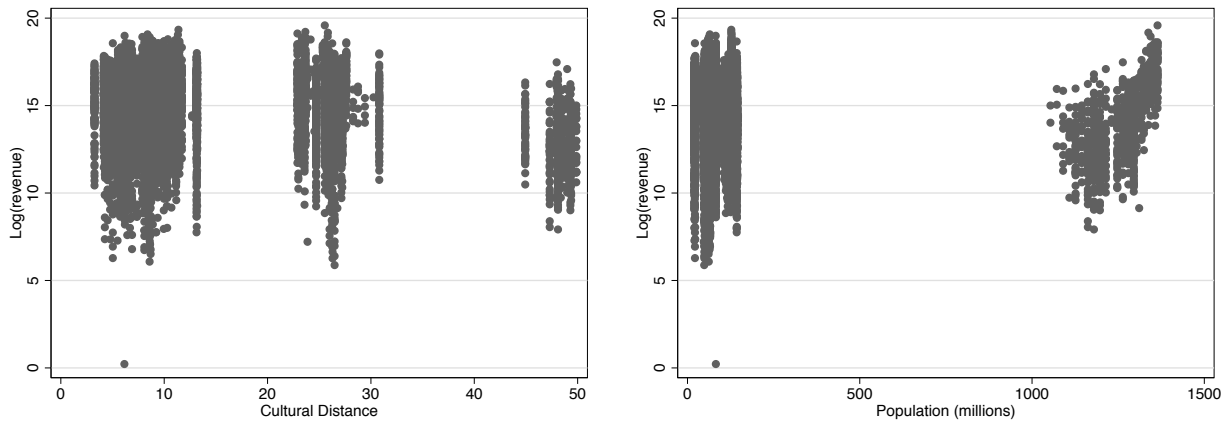


**Figure 6.** Scatter diagram of Cultural Distance (left) and Population (right) against log(revenue)

A scatter plot of *cultural distance* and *population* against the dependent variable, *log(revenue)*, revealed a clear multi-modal distribution. This was not observed for other

covariates. Dummy variables, which correspond to the "clusters" in Figure 6, were created and included as interaction terms in the regression. This allowed the coefficients to capture the effect of varying the independent variable within each cluster, rather than across it. For *cultural distance*, three dummy variables were constructed, representing all countries (*culture_1*), except South Korea, Mexico and China (*culture_2*) and India (*culture_3*). Two population dummy variables were created, representing all countries (*popn_1*), except China and India (*popn_2*). Each dummy term was interacted with its respective independent variable in the regression.

After establishing the effects of each variable on international revenues, an interaction term, *CountryAttributes*Year*, was added to allow the coefficient of each variable to vary by the year in which the film was released. *Year* is a continuous variable and ranges from 2000 to 2014. The new regression, (5), is presented below. Film attributes, year fixed effects, $\mu_j$ and country fixed effects, $\mu_k$, were included in the model.

$$Log(revenue)_i = \beta_0 + \beta_1 \, Country\ Attributes_i + \beta_2 \, CountryAttributes*Year_i + \beta_3 \, Film\ Attributes_i + \mu_j + \mu_k + \varepsilon_i \quad (5)$$

Next, regression (6) observed how each attribute varied with time. Each country attribute is the dependent variable and the release year is the independent variable. The number of films released each year (*Basefilms*) and country fixed effects, $\mu_k$, were added as controls.

$$CountryAttribute_i = \gamma_0 + \gamma_1 \, Year_i + \gamma_2 \, Basefilms_i + \mu_k + \varepsilon_i \quad (6)$$

The following is analogous to the analysis of film attributes in the previous section. Instead of foreign share, international revenues from each of the ten foreign countries are the dependent variable. From regression (5), each attribute's effect on international revenues is:

$$\frac{\partial \text{ International revenues}}{\partial \text{ Attribute}} = \beta_1 + \beta_2 \text{ x Year}$$

From regression (6), each attribute's change in frequency per year is approximated by:

$$\frac{\partial \text{ Attribute}}{\partial \text{ Year}} = \gamma_1$$

The product of these two components, labeled θ, indicates how a given variable leads to a change in international revenues over time. In addition, $\beta_2$ allows the *magnitude* of each variable's coefficient to vary by year.

$$\theta = \frac{\partial \text{ International revenues}}{\partial \text{ Attribute}} \text{ x } \frac{\partial \text{ Attribute}}{\partial \text{ Year}} = (\beta_1 + \beta_2 \text{ x Year}) \text{ x } \gamma_1$$

*a.i Heckman Correction for Selection Bias*

The Heckman correction was applied to regression (4) and (5). In the dataset, missing revenue observations followed a non-random pattern. There were two likely reasons for this. Firstly, the film was not released in a particular territory. For films produced through the studio system, getting a worldwide release is relatively easy as major studios have a global network of distributors. However, films produced independently need to sell their rights to distributors in order for the film to be released. These decisions are based largely on the anticipated success of the film in a given territory, which depends on how well the attributes of the film match the preferences of the local audience. This means that the sample of international revenues in the dataset is likely to exhibit a selection bias favoring well-performing films. Secondly, missing observations could also be due to records being poorly kept, such that data was not available even though the film was released. This is more likely to be an issue in non-English speaking countries where information collection by sources (such as Box Office Mojo) was possibly hindered by language. Records are also more likely to be intact for films that performed well at the box office, leading to an over-representation of films with high box office receipts in the sample. The Two-Stage Heckman correction was applied to correct for selection bias (Heckman, 1979). The model is outlined below.

The first step in the Heckman correction is a selection equation modeled as a probit regression. The dependent variable, $y_1$ indicates whether an observation is present or not. $z_i$ is a vector of variables that predicts the likelihood of the dependent variable being observed. γ is a vector of the corresponding probit coefficients and $u_{1i}$ is the error term. Since the selection equation requires at least one variable that was not included as a independent variable in the original regression, the log of a film's opening weekend revenue in the United States,

*log(opening)*, was used. *Log(opening)* served as a proxy for a film's anticipated performance abroad, which should be positively related to the distributor's decision to import the film. Similarly, Walls and McKenzie (2012) also used opening weekend revenue in the Heckman selection equation when predicting international revenues. However, a limitation was that the correlation between *log(opening)* and *log(revenue)*, the dependent variable of interest, was slightly high at 0.560. All other film attributes were included in the selection model, as foreign distributors presumably decide whether or not to import a film based on its attributes.

$$y_{1i} = z_i \gamma + u_{1i} \qquad u_1 \sim N(0,\sigma_1)$$

The second step is the regression equation with the independent ($x_i$) and dependent ($y_2$) variables of interest. 'Rho' measures the correlation between the two error terms, $u_1$ and $u_2$. If the observations were missing at random, then the error terms would be independent and rho would be zero. In addition, 'sigma' refers to the estimated standard error of the residuals in the regression equation, $\sigma_2$, and 'lambda' is the inverse Mills ratio (Heckman, 1979).

$$y_{2i} = x_i \beta + u_{2i} \qquad u_2 \sim N(0,\sigma_2)$$

As an illustration on the effect of the Heckman correction, regression (4) was also run without the Heckman correction and the results presented in Appendix D (Table D1). With the correction, the magnitude of the coefficients increased for some variables and decreased for others, but the changes were relatively small. *Adaptation* and some *MPAA* dummies were negative with the correction and positive without, but were insignificant in both cases. The only other difference is that all year fixed effects were insignificant with the correction but significant without. Overall, the same set of variables were significant and retained the same sign in both cases with and without the correction, hence the conclusions drawn would be the same. This suggests a relatively robust relationship between the dependent and independent variables.

*b. Results*

The country variables are the focus of the analysis and the film attributes here function as control variables. Since the dependent variable in regression (4) is territory-specific international revenue, this allowed country demographics, such as GDP and population, to vary with the dependent variable. Revenue data from the United States was excluded from the dependent

variable in this regression as the focus lay in understanding the determinants of international revenues. All the coefficients presented across Tables 13A-E were from regression (4) and corrected for selection bias. The probit coefficients of the first stage selection model are presented in Appendix D (Table D2).

*b.i. Selection Model and Control Variables*

Table 13A below shows the regression coefficients for the control variables. A film's domestic revenue, *log(domestic)*, was highly positive and significant. A 1% increase in domestic revenue is associated with higher revenue in these ten countries by 0.592%. The positive coefficient for *log(domestic)* supports the hypothesis that a strong release in the U.S. generates positive buzz for a film's subsequent release abroad. The coefficients of the control variables were then compared against the coefficients of the same variables used in regression (1a) ($\psi_1$ + $\psi_2$ column) to see if these ten countries might be representative of total international revenues. Even though (1a) and (4) have a different set of independent variables, most of these film variables retained the same sign and statistical significance in both cases. The exception is *screens*, which is no longer significant, and *star actor*, which now is. The *genre*, *MPAA* and *studio* dummies were not compared due to different reference categories in each regression.

In addition, Table 13A shows that rho is 0.449 (positive), which indicates that the unobserved attributes that are related to the likelihood of a film being screened in a foreign territory is positively related to revenue. This indicates selection bias in the model and is consistent with the theory that foreign distributors would select positively for films that they believe will perform well in their home market. Possible unobserved attributes that contributed to the positive correlation include the presence of multiple star actors in the film and the theatrical themes that were popular at that time.

**Table 13A. Regression Coefficients for Control Variables**

| | Coefficient | Std Err. |
|---|---|---|
| log(domestic) | 0.592*** | 0.022 |
| log(budget) | 0.389*** | 0.021 |
| Screens | 0.004 | 0.003 |
| Star Director | 0.120*** | 0.040 |
| Critics | 0.006*** | 0.001 |
| Star Actor | 0.120*** | 0.026 |
| Genre (Baseline = Action) | | |
| Comedy | -0.474*** | 0.040 |
| Drama | -0.421*** | 0.040 |
| Thriller | -0.119*** | 0.042 |
| Horror | 0.069 | 0.058 |
| Musical | -0.672*** | 0.100 |
| Documentary | -0.522*** | 0.124 |
| Sequel | 0.349*** | 0.035 |
| Studio (Baseline = Independent production) | | |
| Subsidiary | -0.081** | 0.034 |
| Major Studio | -0.064** | 0.027 |
| Adaptation | 0.005 | 0.025 |
| MPAA (Baseline = G) | | |
| PG | 0.024 | 0.082 |
| PG-13 | 0.039 | 0.082 |
| NC-17 | 1.102*** | 0.297 |
| R | 0.072 | 0.087 |
| Not Rated | 0.763*** | 0.202 |
| English | -0.492*** | 0.153 |
| Constant | -3.879* | 2.096 |
| Prob > $chi^2$ | 0.000 | |
| Rho | 0.449 | |
| Sigma | 1.230 | |
| Lambda | 0.552 | |
| Censored Observations | 11,895 | |
| Uncensored Observations | 11,238 | |

NOTE – All nominal variables are in 2014 U.S. dollars.
***,**,* p < 0.01, 0.05 and 0.10 respectively

*b.ii. Timing of Release*

Per Table 13B, the timing of a film's release abroad predicts its revenue. The longer it takes to release a film in a foreign territory, the lower its revenue as interest and novelty wear off. In the digital age, a later release also means more illegal copies of the film can be leaked online, diminishing its box office revenue. The coefficient of *release lag* may seem small (0.5%

decline in revenue per day), but is actually rather large for films that are released overseas months after its U.S. release date. The inverse relationship between release time lag and international revenues replicates the findings of Elberse and Eliashberg (2003) in France, Germany, Spain and the U.K. In addition, Table 13B indicates that films released during the holidays and summer (marginally significant) have higher revenues of 37.5% and 5.1% respectively. Similarly, Einav (2007) found that movie-going traffic increases around key holidays and in the summer months in the domestic market, contributing to the presence of a seasonality effect. The positive coefficient for *holiday* supports the seasonality effect in these ten countries. The seasonality effect was also tested in the domestic market, and was observed for *holiday* but not *summer*.

**Table 13B. Regression Coefficients for Release Timing**

| | Coefficient | Std Err. |
|---|---|---|
| Release Lag | -0.005*** | 0.000 |
| Holiday | 0.375*** | 0.058 |
| Summer | 0.051* | 0.026 |

***,**,* p < 0.01, 0.05 and 0.10 respectively

*b.iii. Market Size*

*Log(population)* was multiplied by a dummy variable that clustered countries by their population size. Per Table 13C, the effect of a 1% increase in population on revenues is -0.645% for the reference group, and -0.109% (-0.645 + 0.536) for the second group of countries (*popn_2)*. The coefficients were not significant for either group. This is contrary to expectations that a larger population leads to greater consumer demand. The lack of significance of the population variable is likely due to its collinearity with *log(GDP)* ($\rho$ = -0.458). When the same regression was run without *log(GDP)*, the baseline population variable remained negative and insignificant. However, *popn_2* (China and India), was now positive and highly significant. When GDP and both population variables were jointly tested with an F-test, they were jointly significant at the 1% level. Both population and GDP variables were kept in the regression going forward. A 1% increase in GDP per capita was associated with higher revenues by 1.190%. This

is in accordance with previous studies' findings that movies are a normal good. In this analysis, they are luxury goods since the magnitude of the coefficient is greater than 1.

**Table 13C. Regression Coefficients for Market Size**

| | Coefficient | Std Err. |
|---|---|---|
| Log(population) | | |
| (Baseline = Popn_1) | -0.645 | 0.475 |
| Popn_2 | 0.536 | 1.257 |
| Log(GDP) | 1.190*** | 0.073 |

***,**,* p < 0.01, 0.05 and 0.10 respectively

*b.iv. Culture and Language*

Since movies are a cultural product, their performance abroad should depend on how well they are understood by international audiences. Table 13D shows the effect of language and cultural distance on international revenues.

**Table 13D. Regression Coefficients for Cultural Distance and Language**

| | Coefficient | Std Err. |
|---|---|---|
| Cultural Distance | | |
| (Baseline = Culture_1) | 0.024*** | 0.007 |
| Culture_2 | -0.012 | 0.023 |
| Culture_3 | -0.044 | 0.049 |
| Language Match | 0.645*** | 0.211 |

***,**,* p < 0.01, 0.05 and 0.10 respectively

A match between the language of the film and the local audience is associated with an increase in revenues by 64.5%. This is in accordance with expectations that language plays a role in the audience's appreciation of a film. However, *cultural distance* was positive and significant for *culture_1* countries (Australia, France, Germany, U.K., Japan, Russia). A unit increase in *cultural distance* leads to a 1.2% (2.4 – 1.2) and -2.0% (2.4 – 4.4) change in revenues for the second and third group of countries. However the coefficients for both groups were not significant. A negative coefficient was expected for all three groups instead since smaller cultural distance was associated with higher revenues in the literature. A possible reason for the findings is explored in Part (b.vi) of this section.

As a side note, the dummy interaction terms (*popn_1-2*, *culture_1-3*) were included because an initial analysis of regression (4) without any interaction terms yielded coefficients for *log(population)* and *cultural distance* that were contrary to theoretical predictions. *Log(population)* insignificant and *cultural distance* was positive. To rule out the possibility that outlier countries were increasing the standard error of the coefficients and causing them to be insignificant, dummy variables for each cluster of countries were added. However, the coefficients retained their sign and significance after adding interaction terms, indicating that outliers were unlikely to explain these results.

*b.v. Regression Fixed Effects*

The fixed effect for the year 2001 was insignificant and 2002 was marginally significant. All other year fixed effects were significant and negative with p-values less than 0.05. Figure 7 suggest that after controlling for film and country variables, revenues in these ten foreign markets exhibit a downward trend over time relative to the base year, 2000.

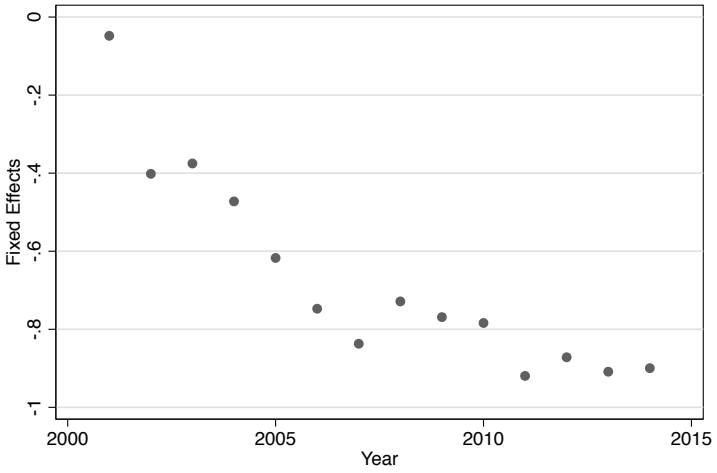


**Figure 7.** Year fixed effects from Regression (4). The base year is 2000.

The country fixed effects are presented in Table 13E. The coefficients suggest that, relative to the U.K., a film performed better in Japan, Mexico and Russia, and worse in Australia. In future research, it would be interesting to understand what made these countries differ in box

office revenues, besides the variables tested in the model. The fixed effects were jointly significant at the 1% level using a F-test.

**Table 13E: Country Fixed Effects from Regression (4)**

| | Coefficient | Std Err. |
|---|---|---|
| Australia | -1.117** | 0.507 |
| China | 1.487 | 8.949 |
| France | 0.230 | 0.214 |
| Germany | 0.403 | 0.253 |
| India | 1.215 | 10.036 |
| Japan | 0.807** | 0.409 |
| Mexico | 2.153*** | 0.653 |
| Russia | 2.136*** | 0.464 |
| South Korea | 0.089 | 0.612 |

NOTE – Omitted variable is the United Kingdom.

*b.vi. Analysis of Country Attributes over Time*

This section combines the results from regression (5) and (6) detailed in part (a) of this section. All $\beta_1$ and $\beta_2$ coefficients are from a single regression, whereas each $\gamma_1$ coefficient is from a different time trend regression for each variable respectively. Similar to Table 12, $\theta$ was calculated only for variables where $\gamma_1$ was significant and $\beta_1$ and $\beta_2$ were jointly significant ($p < 0.05$). Each variable could influence international revenues over time in two ways – through a change in its coefficient ($\beta_1 + \beta_2$*year) and through its change in frequency captured in ($\theta$). For the full results of regression (5) and (6), refer to Appendix D (Tables D3-4).

Per Table 14, films are increasingly being released earlier in foreign countries, and this has resulted in more revenues received. The negative coefficient for *release lag* is less negative (more positive) over time, suggesting that its dampening effect on foreign share is diminished each year. The variable's negative coefficient combined with fact that average lag has decreased by 9 days a year, suggests that *release lag* had a positive effect on international revenues over time. Since the production company and distributor decide the date of a film's release, the decrease in release time lag suggests that both parties may have attempted to close the gap between domestic and foreign releases as a strategy to increase international revenue. Films such

as *Iron Man 3 (2013)*, *The Avengers (2012)* and *Minions (2015)*, were even released abroad first and in the United States after.

**Table 14. Effect of Country Attributes on International Revenues Over Time**

| | Regression (5) | | Regression (6) | (Constructed) |
|---|---|---|---|---|
| | $\beta_1$ | $\beta_2$ | $\gamma_1$ | $\theta$ |
| Release Lag[a] | -0.151** | 0.00007** | -9.127*** | 0.0959 |
| | (0.067) | (0.00003) | (0.500) | |
| Holiday[a] | -14.127 | 0.007 | 0.0001 | - |
| | (29.265) | (0.015) | (0.001) | |
| Summer | -17.399 | 0.009 | 0.001 | - |
| | (13.758) | (0.007) | (0.002) | |
| Log(popn) (Baseline = Popn_1) | 38.942 | -0.02 | 0.006*** | - |
| | (29.912) | (0.015) | (0.003) | |
| Popn_2 | -82.199 | 0.012 | 0.010*** | - |
| | (55.846) | (0.018) | (0.001) | |
| Log(GDP) | 99.076*** | -0.049*** | 0.030*** | 0.0220 |
| | (28.651) | (0.014) | (0.004) | |
| Cultural Distance (Baseline = Culture_1) | -2.276 | 0.001 | 0.018** | - |
| | (3.206) | (0.002) | (0.006) | |
| Culture_2 | 3.387 | -0.001 | 0.001 | - |
| | (2.329) | (0.001) | (0.009) | |
| Culture_3 | 4.725 | -0.001 | -0.114*** | - |
| | (8.52) | (0.004) | (0.024) | |
| Language Match[a] | -14.361 | 0.0075 | 0.001*** | 0.001 |
| | (23.311) | (0.012) | (0.0002) | |

NOTE – Standard errors are in parenthesis. $\theta = (\beta_1 + \beta_2 * year) * \gamma_1$, where year = 2007. Coefficient values before rounding were used to calculate $\theta$.

[a] $\beta_1$ and $\beta_2$ were jointly significant at the 5% level

***,**,* p < 0.01, 0.05 and 0.10 respectively

Higher GDP per capita is also associated with increased expenditure on American films. In 2007, a 1% increase in GDP per capita predicted a 0.733% (= 99.076 - 0.049*2007) increase in foreign share. In addition, individual wealth has increased by an average of 3.0% per year for the countries in the dataset. This suggests that GDP growth has been driving the increase in international revenues. Interestingly, the effect of GDP on revenues is diminishing over time ($\beta_2$ is negative). The estimated coefficient of *log(GDP)* for each year using regression (5) was calculated, confirming that its coefficient remains positive through this time period.[5] This

[5] Appendix D (Table D3) shows the calculations conducted for the coefficients of *release lag* and *log(GDP)*.

suggests that GDP increased international revenues, but at a decreasing rate each year. Some of the countries with the highest GDP growth during this period are China, India and Russia (Appendix D, Table D5). Even though these countries currently comprise a small fraction of total receipts (Figure 4), their share is likely to increase over time.

The third variable that influences international revenues over time via θ is *language match*. Every year, the proportion of films that match the language of the local population increased by 0.1 percentage points. This may suggest producers' greater sensitivity to language barriers and attempts to overcome them. In addition, *language match* was associated with increased film revenues. This is likely because the content of the film could be transmitted with higher fidelity to the foreign audience, which resulted in its greater appeal. Overall, this variable increased international revenues over time.

The next group of variables had a significant time trend, but did not predict international revenues in this model. Hence they did not influence the change in international revenues over time. This includes *log(popn)* and *cultural distance*. Countries in the dataset increased in population size over time, but the variable was not a significant predictor of revenues in this model. As mentioned earlier, multicollinearity with other variables such as GDP might have resulted in the lack of explanatory power for the *log(popn)* variable. A potential modification for future work would be to narrow the definition of the variable to just the demographic group that is of prime theatre-going age. In the U.S., individuals between the ages of 18 and 50 account for the greatest proportion of the movie tickets purchased (MPAA, 2015). This might be a better measure of population effects on ticket revenues in a particular country.

The findings for *cultural distance* are contrary to predictions. All three groups (*culture_1 – 3)* do not significantly predict international revenues. In addition, *cultural distance* has increased for the reference group of countries (Australia, France, Germany, U.K., Japan, Russia). This is not consistent with anecdotal evidence that a more connected world has led to smaller cultural distances between countries. One possible reason for this finding is the way in which

cultural distance was characterized, with a globalization index ranking of all countries, as opposed to an explicit measure of cultural similarity between two given countries. Finding a more direct measure of cultural distance is a means of improvement in future research. Of the remaining variables, *holiday* did not change in its frequency or the magnitude of its coefficient, and *summer* was insignificant in all regressions.

*b.v. Limitations of Findings*

Several strategies were used to account for potential bias in the model, such as fixed effects to isolated unobserved variables and the Heckman correction to address selection bias. However, it is likely that omitted variable bias is still present. This would result in the coefficients estimated being biased. For example, one key predictor of revenues that could not be incorporated into the model, due to lack of availability, is advertising expenditure for each film. In general, advertising increases revenue by generating interest in a film. In these models, the effects of advertising on foreign share or international revenues were captured in the residuals. Since production budget is highly correlated with advertising expenditure, this in turn causes *log(budget)* to be positively correlated with the residuals in the regression. This leads to an over-estimation of the true coefficient. Other coefficients are likely to be slightly biased in a similar way. Examples include *studio* and *star actor*, which are positive correlated with advertising.

Another potential cause of omitted variable bias is the competition that films face against each other at the box office. In the domestic box office, a film may be performing poorer than expected because it was released at the same time as another film that appeals to the same target audience. The intensity of competition from other films would be present in the residuals, and would likely be negatively correlated with *log(budget)*. Films with smaller budgets and are likely face more intense competition as compared to blockbuster films. The same occurs in the foreign box office, where American films have to compete with local films. To measure the level of competition faced by a film, studies have previously used the number of other local and foreign films of the same genre that were screening in theatres at the same (Elberse & Eliashberg, 2003). This would be feasible to undertake with additional time.

Lastly, the ten foreign countries analyzed have diversity in cultures, wealth, size and geographical location. However, they represent only 54% of international revenue received by these films, limiting the external validity of the findings. Ideally, a larger sample of countries would be included to obtain coefficient estimates that are more representative of consumption patterns of international audiences.

## IX. Conclusion

Has foreign share increased because American films have evolved or because the countries that demand them have changed? The study concludes that both factors likely contributed to the observed phenomenon. Previous research in the literature has focused on identifying film attributes that predict revenues. However, the evidence shows that the country in context also matters. The main challenge this study faced was in developing a systematic approach to analyze the change in foreign share over time, since foreign share does not appear to have been empirically studied in the recent literature. To do so, the paper first identified film and country variables that were significant in the literature in predicting revenues domestically and abroad. Next, each variable was analyzed, allowing its coefficient in predicting foreign shares as well as its frequency to vary with time.

The first half of the analysis focused on the role of film attributes. The evidence suggested that *star actors*, *sequels* and *top10markets* increased foreign share over this period. The former positively predicts foreign share and its increased frequency amongst films released suggested an increase in foreign share over time. The latter two variables were constant in number, but the effect of each unit of the variable was greater over time. The study also identified variables that decreased foreign share – *screens*, *critics*, *drama* and *English*. It is uncertain whether the film variables that increased foreign share dominated those that decreased it. However, the findings are still useful as it suggests which variables were likely to be driving the phenomenon of increased foreign share and could be further investigated. In addition, the main insight from this section is that film attributes often have a differential impact on domestic and international revenues. For example, comedy films perform worse abroad than domestically.

When a production company chooses to produce a comedy film, as opposed to another genre, potential revenue from the international market is now forgone. Through this tradeoff, foreign share changes.

The second half of the analysis focused on the role of country attributes in increased international revenues. The variables were analyzed using an analogous approach to that of film attributes. The results show that the lag time between a film's local and U.S. release date, GDP per capita and having a match in language likely explained the increase in international revenues over time. Holding domestic revenues constant, this suggested an increase in foreign share. Country attributes did now show evidence of decreasing international revenues. In addition, country attributes do not display the same tradeoff in revenues that is present for film attributes. This is because each country attribute differs for each market. Once a film is released, revenue driven by changes within a given country is not directly at the expense of revenue from another. Furthermore, the strong growth of foreign box office markets in Figure 1, suggests a greater role of country attributes in driving the changes in foreign share in the future. Table 15 summarizes the findings for each variable. The list is neither definitive nor exhaustive. Variables could increase foreign share in two ways – by having a significant impact on foreign share that changed in magnitude over time ($\beta_2$) or by having a significant impact on foreign share and changing in frequency over time ($\theta$). Variables that were not significant ($p > 0.05$) had no impact on foreign share.

**Table 15. Summary of Findings**

| | Increased Foreign Share | Decreased Foreign Share |
|---|---|---|
| Film Variables | Star Actor<br>Sequels<br>Top10markets | Screens<br>English<br>Critics<br>Drama (genre) |
| Country Variables | Release Lag<br>Log(GDP)<br>Language Match | |

NOTE – Variables that were marginally significant ($0.05 < p < 0.10$) were not considered to have an impact on foreign share.

This analysis could be extended in several ways. First, the year fixed effects display a time trend that is very similar to that for the observed data. These unobserved effects may have influenced foreign share over time as well. It would be interesting to investigate further, and if possible, identify and include them as explanatory variables in the model. Second, other key aspects of the industry that unfortunately could not be captured in the model include advertising spend and the size of the local film industry in the foreign country. In addition, premium formats such as IMAX and 3-D films have become increasingly prevalent in recent years, and influence revenues through higher ticket prices. Third, consumer habits and preferences have changed with the advent of digital streaming alternatives. These changes have revolutionized the way in which content is being created today and distributed to the audience. These would be important factors to consider in future work.

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# Appendix A

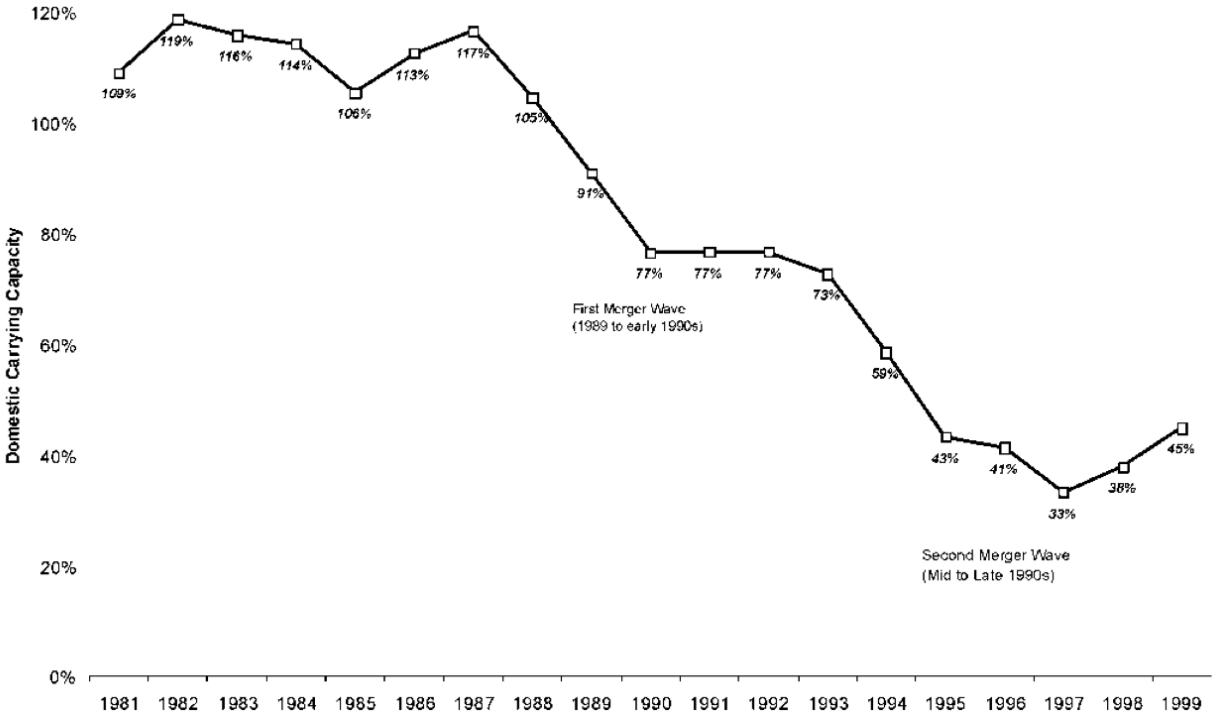


**Figure A1.** Size of domestic box office relative to estimated costs (studio overhead, production spend and marketing) of all features released by Hollywood Majors, 1981 – 1999. Source: Phillips (2004)

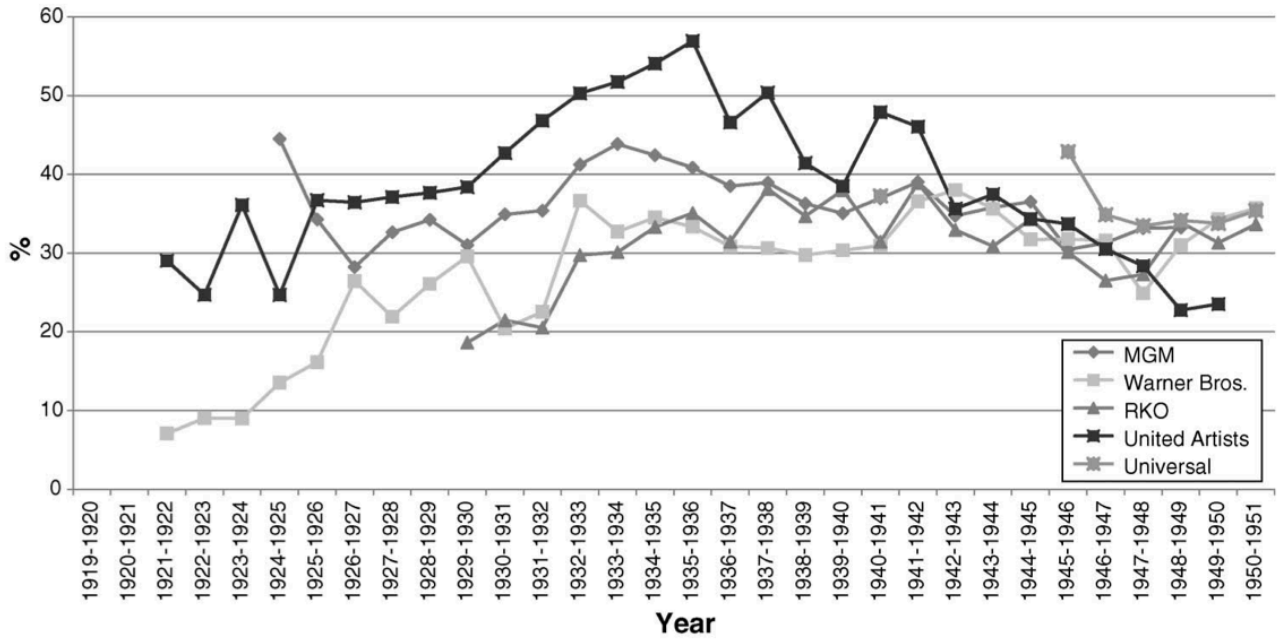


**Figure A2**. Foreign share of films released by selected U.S. distributors from 1920-1950. Source: Miskell (2009)

## Appendix B

*Inflation Adjustment*

**Table B1. Consumer Price Index (CPI) Adjustment by Year**

| | CPI | CPI Adjustment |
|---|---|---|
| 2014 | 1.00 | 1.00 |
| 2013 | 0.98 | 1.02 |
| 2012 | 0.97 | 1.03 |
| 2011 | 0.95 | 1.05 |
| 2010 | 0.92 | 1.09 |
| 2009 | 0.91 | 1.10 |
| 2008 | 0.91 | 1.10 |
| 2007 | 0.88 | 1.14 |
| 2006 | 0.85 | 1.17 |
| 2005 | 0.83 | 1.21 |
| 2004 | 0.80 | 1.25 |
| 2003 | 0.78 | 1.29 |
| 2002 | 0.76 | 1.32 |
| 2001 | 0.75 | 1.34 |
| 2000 | 0.73 | 1.37 |

NOTE – The CPI adjustment was computed as 1/CPI. The base year is 2014.

The adjustments were computed as the inverse of the actual inflation index. All box office revenues were adjusted according to the United States CPI inflation rate with 2014 as the base year. Revenue adjustments were based on the year that the film was released in the country of interest. For foreign countries, box office revenue, were already converted to US dollars based on the exchange rate at the time of release, hence only an inflation adjustment was required. Production budgets were adjusted using CPI inflation rates based on the production year of the film, which is usually 1-2 years before a film is released. CPI inflation rates were obtained from the U.S. Bureau of Labor Statistics.

*Film Count by Country and Year*

**Table B2. Number of Films Released by Country and Year**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| United States | 101 | 102 | 111 | 110 | 126 | 138 | 177 | 177 |
| Australia | 48 | 86 | 86 | 93 | 95 | 104 | 117 | 108 |
| China | 1 | 5 | 7 | 5 | 14 | 12 | 25 | 16 |
| France | 7 | 66 | 73 | 82 | 90 | 95 | 111 | 108 |
| Germany | 38 | 79 | 76 | 87 | 98 | 98 | 114 | 110 |
| India | 2 | 4 | 9 | 19 | 31 | 29 | 46 | 59 |
| Japan | 3 | 31 | 53 | 51 | 67 | 55 | 78 | 83 |
| Mexico | 4 | 59 | 78 | 90 | 91 | 100 | 120 | 108 |
| Russia | 2 | 1 | 30 | 74 | 80 | 84 | 104 | 89 |
| South Korea | 3 | 23 | 44 | 19 | 60 | 68 | 87 | 75 |
| United Kingdom | 35 | 73 | 74 | 91 | 99 | 109 | 135 | 122 |

**Table B2. (Continued)**

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|
| United States | 187 | 142 | 154 | 213 | 200 | 200 | 201 |
| Australia | 116 | 99 | 98 | 126 | 108 | 110 | 95 |
| China | 22 | 4 | 16 | 13 | 24 | 38 | 31 |
| France | 122 | 96 | 106 | 130 | 119 | 119 | 96 |
| Germany | 115 | 108 | 106 | 134 | 126 | 123 | 97 |
| India | 59 | 16 | 8 | 32 | 41 | 51 | 61 |
| Japan | 74 | 61 | 58 | 75 | 54 | 63 | 40 |
| Mexico | 118 | 108 | 108 | 130 | 123 | 126 | 93 |
| Russia | 111 | 99 | 104 | 127 | 120 | 111 | 91 |
| South Korea | 85 | 80 | 80 | 90 | 71 | 71 | 67 |
| United Kingdom | 137 | 115 | 118 | 154 | 151 | 139 | 120 |

Table B2 shows the film count by country and year. Most countries follow the same increasing trend of number of films released each year with the exception of China.

*Construction of Studio Indicator Variable*

**Table B3. Studios and Corresponding Subsidiaries**

| Studio | Subsidiary |
|---|---|
| Warner Bros. | Castle Rock Entertainment |
| | HBO Films |
| | New Line Cinema |
| Walt Disney Pictures | Walt Disney Animation Studios |
| | Marvel Studios |
| | Lucasfilm |
| | Disney-Pixar |
| | DisneyToon Studios |
| | Touchstone Pictures |
| Universal Pictures | Focus Features |
| | Working Title Films |
| | Illumination Entertainment |
| Sony Pictures | Columbia Pictures |
| | Sony Pictures Animation |
| | TriStar Pictures |
| | Screen Gems |
| | Affirm Films |
| | Stage 6 Films |
| | Sony Pictures Classics |
| 20th Century Fox | Fox Searchlight |
| | Blue Sky Studios |
| | 20th Century Fox Animation |
| | Fox 2000 Pictures |
| Paramount Pictures | MTV Films |
| | Nickelodeon Films |
| | Insurge Pictures |
| DreamWorks Pictures | DreamWorks Animation |
| Lionsgate | |
| The Weinstein Company | |
| Summit Entertainment | |

The top film studios, according to market share, and their respective subsidiaries were used to construct the dummy variables, *studio* and *subsidiary*.

*Distribution of Select Dependent Variables*

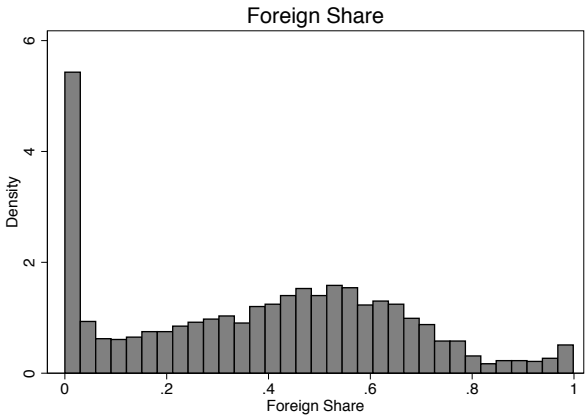


**Figure B1**. Distribution of foreign share

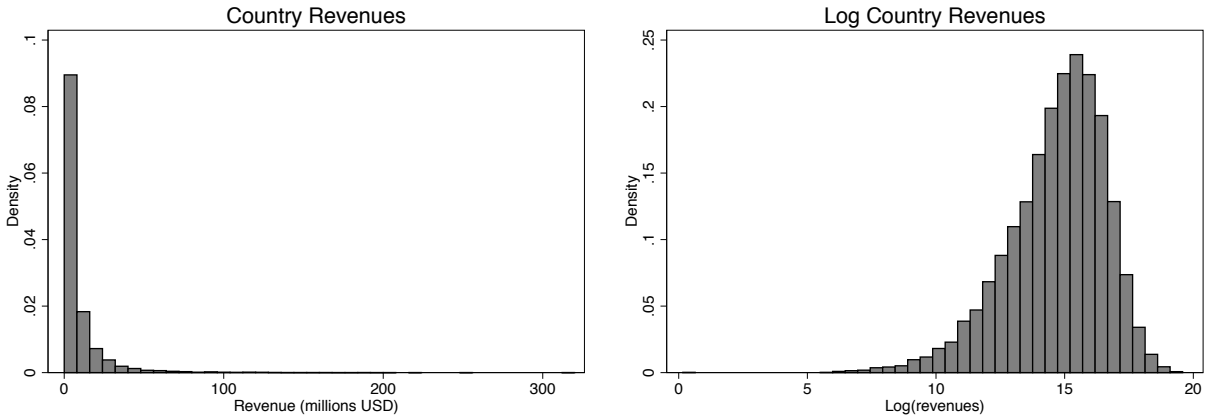


**Figure B2**. Distribution of revenues from ten foreign countries (left) and after transforming with the natural logarithm (right)

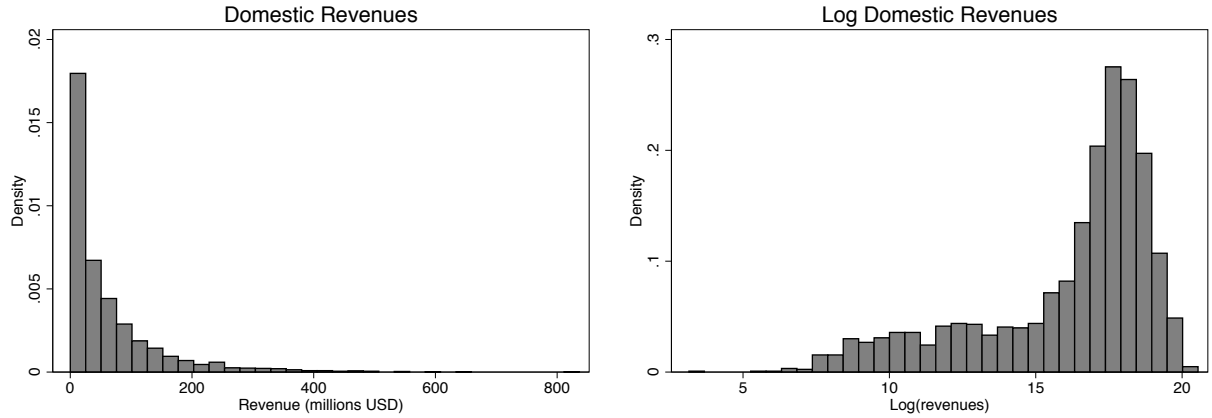


**Figure B3**. Distribution of domestic revenue (left) and after transforming with the natural logarithm (right)

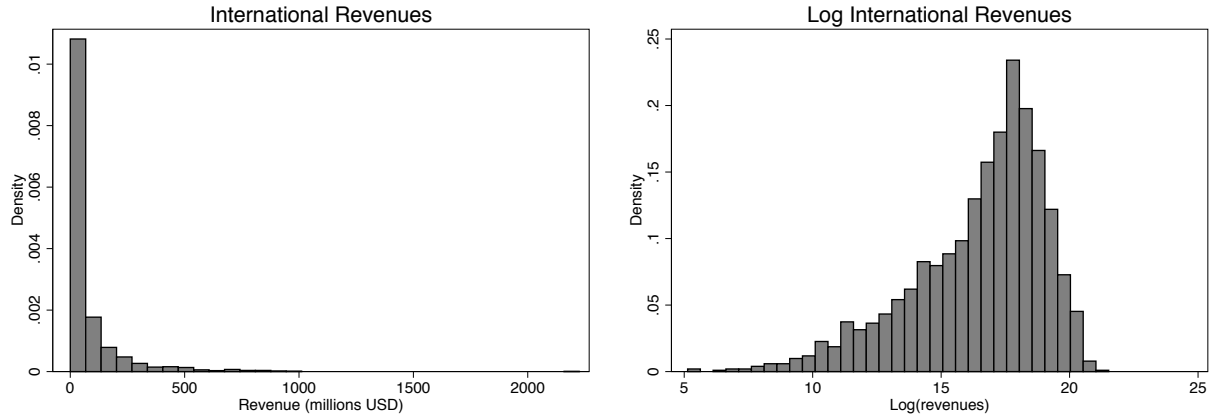


**Figure B4.** Distribution of gross international revenue (left) and after transforming with the natural logarithm (right)

*Effect of Missing Budget Values*

To observe the effect of dropping the log(budget) variable, the following regression was run with and without log(budget).

$Foreignshare_i = \beta_0 + \beta_1 FilmAttributes_i + \varepsilon_i$

**Table B4. Regression Results With and Without Log(budget)**

| | (1) With Log(budget) | | (2) Without Log(budget) | |
|---|---|---|---|---|
| | Coeff. | Std. Err. | Coeff. | Std. Err. |
| Log(budget) | -0.085*** | 0.007 | | |
| Screens | 0.002** | 0.001 | -0.008*** | 0.000 |
| Genre (Baseline = Action) | | | | |
| Comedy | 0.117*** | 0.014 | 0.134*** | 0.014 |
| Drama | 0.091*** | 0.018 | 0.104*** | 0.016 |
| Thriller | 0.021 | 0.018 | 0.055*** | 0.018 |
| Horror | -0.044* | 0.027 | 0.023 | 0.025 |
| Musical | 0.095** | 0.043 | 0.103** | 0.042 |
| Documentary | 0.112** | 0.046 | 0.187*** | 0.018 |
| Sequel | -0.05*** | 0.014 | -0.042*** | 0.015 |
| Critics | -0.001*** | 0.000 | -0.001*** | 0.000 |
| MPAA (Baseline = G) | | | | |
| PG | -0.040 | 0.030 | -0.002 | 0.024 |
| PG-13 | -0.044 | 0.030 | -0.039* | 0.023 |
| NC-17 | -0.382*** | 0.104 | -0.453** | 0.192 |
| R | -0.064** | 0.031 | -0.062*** | 0.023 |
| Not Rated | -0.045 | 0.063 | 0.059** | 0.024 |
| English | 0.072 | 0.058 | 0.013 | 0.033 |
| Constant | 1.952*** | 0.128 | 0.873*** | 0.049 |
| Observations | 1,546 | | 2,607 | |
| $R^2$ | 0.3329 | | 0.4313 | |

NOTE – The data used in these two regressions were obtained at the preliminary stage of the data collection process, hence the number of films and variables used was a subset of the final version used in the rest of the paper. It was intended only as an illustration.

***,**,* $p < 0.01$, 0.05 and 0.10 respectively

# Appendix C

*Residual Plots*

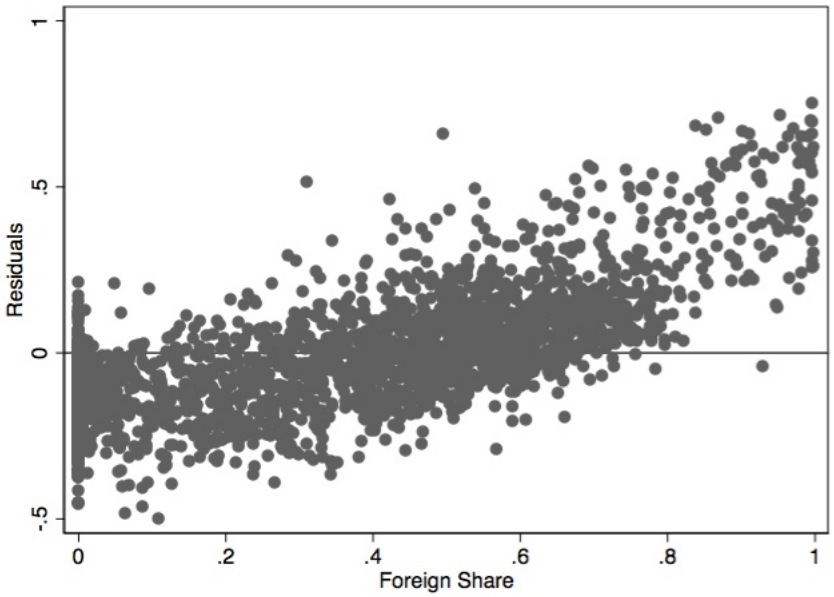


**Figure C1.** Residual plot from regression (1) indicates heteroskedasticity.

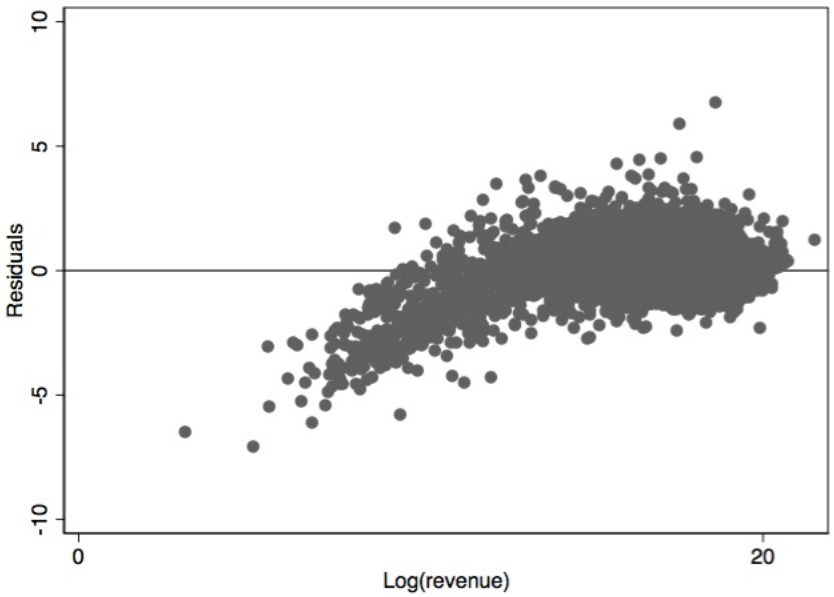


**Figure C2.** Residual plot from regression (1a) indicates heteroskedasticity.

*Analysis of Film Attributes Over Time*

$$Foreign\ Share_i = \beta_0 + \beta_1\ Film\ Attributes_i + \beta_2 FilmAttributes*Year_i + \mu_k + \varepsilon_i \qquad (2)$$

**Table C1. Results for Regression (2) with Year Interaction Terms**

| | Main Effect | | *FilmAttribute*Year* Interaction Term | |
|---|---|---|---|---|
| | Coeff. | Std. Err | Coeff. | Std. Err |
| Log(budget) | -0.829 | 2.524 | 0.0004 | 0.001 |
| Screens | 1.992*** | 0.331 | -0.001*** | 0.0002 |
| Star Director | 11.773* | 6.732 | -0.006* | 0.003 |
| Critics | 0.313 | 0.08 | -0.0002*** | 0.00003 |
| Star Actor | 5.215 | 4.36 | -0.003 | 0.002 |
| Genre (Baseline = Action) | | | | |
| Comedy | -0.346 | 5.529 | 0.0001 | 0.003 |
| Drama | 15.412** | 6.369 | -0.008** | 0.003 |
| Thriller | -5.141 | 7.178 | 0.003 | 0.004 |
| Horror | -4.151 | 11.864 | 0.002 | 0.006 |
| Musical | -1.984 | 16.781 | 0.001 | 0.008 |
| Documentary | 8.204 | 12.111 | -0.004 | 0.006 |
| Sequel | -12.726** | 5.095 | 0.006** | 0.003 |
| Studio (Baseline = Independent production) | | | | |
| Subsidiary | 9.072* | 4.758 | -0.005* | 0.002 |
| Major Studio | 7.472* | 4.184 | -0.004* | 0.002 |
| Adaptation | 6.377 | 3.891 | -0.003 | 0.002 |
| MPAA (Baseline = G) | | | | |
| PG | -10.874 | 12.439 | 0.005 | 0.006 |
| PG-13 | -5.305 | 12.343 | 0.003 | 0.006 |
| NC-17 | -35.396 | 37.098 | 0.018 | 0.018 |
| R | -2.093 | 12.721 | 0.001 | 0.006 |
| Not Rated | 15.472 | 15.987 | -0.008 | 0.008 |
| English | 22.578 | 27.129 | -0.011 | 0.014 |
| Top10markets | -7.158*** | 1.102 | 0.004*** | 0.001 |

NOTE – Nominal variables are in 2014 US dollars.
***,**,* $p < 0.01$, 0.05 and 0.10 respectively

**Table C1. Results for Regression (2) with Year Interaction Terms (Continued)**

| | Main Effect | | *FilmAttribute*Year* Interaction Term | |
|---|---|---|---|---|
| | Coeff. | Std. Err | Coeff. | Std. Err |
| Year Fixed Effects (Baseline = 2000) | | | | |
| 2001 | -0.059 | 0.039 | | |
| 2002 | -0.064 | 0.062 | | |
| 2003 | -0.01 | 0.084 | | |
| 2004 | -0.004 | 0.107 | | |
| 2005 | 0.019 | 0.131 | | |
| 2006 | 0.051 | 0.154 | | |
| 2007 | 0.083 | 0.178 | | |
| 2008 | 0.108 | 0.202 | | |
| 2009 | 0.139 | 0.226 | | |
| 2010 | 0.186 | 0.249 | | |
| 2011 | 0.233 | 0.272 | | |
| 2012 | 0.233 | 0.297 | | |
| 2013 | 0.23 | 0.319 | | |
| 2014 | 0.248 | 0.344 | | |
| Constant | -0.269 | 0.210 | | |
| Observations | 2,337 | | | |
| $R^2$ | 0.523 | | | |

NOTE – Nominal variables are in 2014 US dollars. Year fixed effects were jointly significant when tested with a F-test ($p < 0.01$)

***,**,* $p < 0.01$, 0.05 and 0.10 respectively

$$Film\ Attribute_i = \gamma_0 + \gamma_1 Year_i + \gamma_2 Basefilms_i + \varepsilon_i \quad (3)$$

**Table C2. Time Trend Regressions for Film Variables With (3)**

| | Log(budget) | Screens | Star Director | Critics | Star Actor | Sequel | Adaptation |
|---|---|---|---|---|---|---|---|
| Year | -0.001 | 0.360** | -0.002 | 0.330 | 0.022*** | 0.006* | 0.007 |
| | (0.018) | (0.148) | (0.003) | (0.28) | (0.005) | (0.003) | (0.005) |
| Basefilms | -0.008*** | -0.063*** | -0.0001 | -0.016 | -0.001 | -0.0003 | -0.0009 |
| | (0.002) | (0.016) | (0.0003) | (0.031) | (0.001) | (0.0004) | (0.001) |
| Constant | 19.382 | -692.132** | 5.031 | -609.178 | -43.097*** | -11.547* | -13.737 |
| | (36.728) | (294.233) | (5.477) | (558.559) | (10.351) | (6.419) | (9.475) |
| $R^2$ | 0.025 | 0.008 | 0.003 | 0.001 | 0.018 | 0.002 | 0.001 |
| Observations | 2,337 | 2,337 | 2,337 | 2,337 | 2,337 | 2,337 | 2,337 |

***,**,* p < 0.01, 0.05 and 0.10 respectively

**Table C2. (Continued)**

| | Genre Variables | | | | | | |
|---|---|---|---|---|---|---|---|
| | Comedy | Drama | Thriller | Horror | Musical | Documentary | English |
| Year | -0.009* | 0.003 | 0.002 | -0.0004 | -0.001 | -0.001 | 0.002*** |
| | (0.005) | (0.005) | (0.003) | (0.003) | (0.001) | (0.002) | (0.001) |
| Basefilms | 0.0001 | 0.0002 | 0.0001 | 0.0003 | 0.0002 | 0.0002 | -0.0003*** |
| | (0.001) | (0.001) | (0.0004) | (0.0003) | (0.0001) | (0.0002) | (0.0001) |
| Constant | 18.544* | -6.362 | -3.789 | 0.748 | 1.853 | 1.108 | -3.918** |
| | (9.580) | (9.359) | (6.601) | (5.315) | (2.542) | (3.639) | (1.778) |
| $R^2$ | 0.006 | 0.002 | 0.002 | 0.002 | 0.001 | 0.0004 | 0.003 |
| Observations | 2,337 | 2,337 | 2,337 | 2,337 | 2,337 | 2,337 | 2,337 |

***,**,* p < 0.01, 0.05 and 0.10 respectively

**Table C2. (Continued)**

| | Studio Variables | | MPAA Variables | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Subsidiary | Major Studio | PG | PG-13 | NC-17 | R | Not Rated | Top10 markets |
| Year | -0.003 | -0.019*** | 0.007* | -0.003 | 0.0001 | -0.002 | 0.003 | 0.063* |
| | (0.003) | (0.004) | (0.004) | (0.005) | (0.0004) | (0.005) | (0.002) | (0.036) |
| Basefilms | -0.0001 | 0.0008 | -0.0009** | -0.00002 | -0.00004 | 0.0006 | 0.0001 | -0.003 |
| | (0.0004) | (0.001) | (0.0004) | (0.001) | (0.00004) | (0.001) | (0.0002) | (0.004) |
| Constant | 5.794 | 38.922 | -12.909* | 7.240 | -0.373 | 3.967 | -5.640 | -122.048* |
| | (6.920) | (8.881) | (7.648) | (10.045) | (0.879) | (10.321) | (4.591) | (70.979) |
| $R^2$ | 0.002 | 0.016 | 0.002 | 0.001 | 0.0003 | 0.001 | 0.005 | 0.003 |
| Observations | 2,337 | 2,337 | 2,337 | 2,337 | 2,337 | 2,337 | 2,337 | 2,337 |

***,**,* p < 0.01, 0.05 and 0.10 respectively

## Appendix D

*Regression (4) Without Heckman Correction*

$$Log(revenue)_{i,j} = \alpha_0 + \alpha_1 Film\ Attributes_i + \alpha_2 Country\ Attributes_{i,j} + \mu_j + \mu_k + \varepsilon_{i,j} \quad (4)$$

**Table D1. Results for Regression (4) Without the Heckman Correction**

| | Coeff. | Std. Err. | | Coeff. | Std. Err. |
|---|---|---|---|---|---|
| Log(domestic) | 0.531*** | 0.024 | Log(GDP) | 1.189*** | 0.066 |
| | | | Cultural Distance (Baseline = | | |
| Log(budget) | 0.340*** | 0.019 | culture_1) | 0.024*** | 0.007 |
| Screens | 0.0001 | 0.003 | Culture_2 | -0.012 | 0.023 |
| Star Director | 0.140*** | 0.034 | Culture_3 | -0.045 | 0.043 |
| Critics | 0.005*** | 0.001 | Language Match | 0.650** | 0.319 |
| Star Actor | 0.082*** | 0.024 | Year Fixed Effects (Baseline = 2000) | | |
| Genre (Baseline = Action) | | | 2001 | -0.023 | 0.120 |
| Comedy | -0.393*** | 0.035 | 2002 | -0.365*** | 0.113 |
| Drama | -0.388*** | 0.041 | 2003 | -0.326*** | 0.112 |
| Thriller | -0.129*** | 0.037 | 2004 | -0.425*** | 0.112 |
| Horror | 0.054 | 0.057 | 2005 | -0.571*** | 0.115 |
| Musical | -0.655*** | 0.121 | 2006 | -0.713*** | 0.117 |
| Documentary | -0.479*** | 0.149 | 2007 | -0.778*** | 0.122 |
| Sequel | 0.335*** | 0.028 | 2008 | -0.660*** | 0.124 |
| Studio (Baseline = Independent production) | | | 2009 | -0.660*** | 0.121 |
| Subsidiary | -0.094*** | 0.033 | 2010 | -0.633*** | 0.125 |
| Major Studio | -0.069*** | 0.026 | 2011 | -0.801*** | 0.129 |
| Adaptation | -0.007 | 0.024 | 2012 | -0.769*** | 0.131 |
| MPAA (Baseline = G) | | | 2013 | -0.796*** | 0.133 |
| PG | -0.059 | 0.072 | 2014 | -0.801*** | 0.135 |
| PG-13 | -0.074 | 0.071 | Country Fixed Effects (Baseline = U.K.) | | |
| NC-17 | 0.860*** | 0.314 | Australia | -1.113** | 0.471 |
| R | -0.067 | 0.074 | China | 1.205 | 8.847 |
| Not Rated | 0.791** | 0.349 | France | 0.231 | 0.320 |
| English | -0.382* | 0.22 | Germany | 0.405 | 0.346 |
| Country Lag | -0.004*** | 0.000 | India | 0.993 | 9.858 |
| Holiday | 0.370*** | 0.053 | Japan | 0.800* | 0.457 |
| Summer | 0.060** | 0.026 | Mexico | 2.129*** | 0.681 |
| Log(popn) (Baseline = | | | | | |
| popn_1) | -0.638 | 0.441 | Russia | 2.132*** | 0.506 |
| Popn_2 | 0.571 | 1.233 | South Korea | 0.070 | 0.659 |
| Constant | -1.441 | 1.885 | | | |
| $R^2$ | 0.627 | | | | |
| Observations | 11,242 | | | | |

***,**,* p < 0.01, 0.05 and 0.10 respectively

*Probit Coefficients for Regression (4) With Heckman Correction*

**Table D2. Probit Coefficients for the Heckman Selection Model for Regression (4)**

| | Coefficient | Std Err. |
|---|---|---|
| log(opening) | -0.125*** | 0.011 |
| log(domestic) | 0.230*** | 0.011 |
| Screens | 0.036*** | 0.002 |
| Star Director | 0.015 | 0.037 |
| Critics | 0.003*** | 0.000 |
| Star Actor | 0.151*** | 0.02 |
| Genre (Baseline = Action) | | |
| Comedy | -0.420*** | 0.028 |
| Drama | -0.277*** | 0.033 |
| Thriller | -0.083** | 0.037 |
| Horror | -0.176*** | 0.045 |
| Musical | -0.204*** | 0.078 |
| Documentary | -0.382*** | 0.072 |
| Sequel | 0.140*** | 0.033 |
| Studio (Baseline = Independent production) | | |
| Subsidiary | 0.069** | 0.029 |
| Major Studio | 0.084*** | 0.023 |
| Adaptation | 0.084*** | 0.022 |
| MPAA (Baseline = G) | | |
| PG | 0.301*** | 0.064 |
| PG-13 | 0.470*** | 0.063 |
| NC-17 | 0.681*** | 0.196 |
| R | 0.509*** | 0.064 |
| Not Rated | 0.069 | 0.104 |
| English | -0.284** | 0.111 |
| Constant | -2.929*** | 0.171 |

NOTE – All nominal variables are in 2014 U.S. dollars.
***,**,* $p < 0.01$, 0.05 and 0.10 respectively

The coefficients in Table D2 are interpreted as the effect of a variable on the likelihood that a film will be imported in any of the ten foreign countries. Higher domestic revenue, screens, critics' reviews, the presence of a star actor, sequels and adaptations increased the likelihood of a film being imported in a foreign country. In general, attributes that increased the popularity of a film with a country's local audience increased the likelihood that it was imported.

Films by a studio or subsidiary were also more likely to be imported as compared to independent films, likely due to the distribution network that these companies have.

All genres were less likely to be imported relative to action films, with the harshest penalty imposed on comedies. English films were also less likely to be imported than non-English films. The patterns in genre and language support the Cultural Discount Theory discussed in Section VII of the paper. In addition, all the MPAA ratings, except Not Rated, were significant and positively predicted entry into a country relative to the baseline, G-rated films. This is surprising since most MPAA ratings were not significant when predicting foreign share, domestic or international revenues in the study. It is not certain why G-rated films would be the least likely to be imported into a foreign market. Nonetheless, it is interesting to note that MPAA ratings significantly predict whether films are imported or not and would be of interest in future research.

Another possible reason for the censored observations in the dataset is that the film was actually released in the country, but records of it were not maintained. To minimize this possible bias, data from 2000 onwards were used in this study.

*Analysis of Country Attributes Over Time*

$$Log(revenue)_i = \beta_0 + \beta_1 \, Country\ Attributes_i + \beta_2 \, CountryAttributes*Year_i + \beta_3 \, Film\ Attributes_i + \mu_j + \mu_k + \varepsilon_i \quad (5)$$

**Table D3. Regression Results for (5) With Heckman Correction**

| | Main Effect | | *CountryAttribute*Year* Interaction Term | |
|---|---|---|---|---|
| | Coeff. | Std. Err. | Coeff. | Std. Err |
| Release Lag | -0.151** | 0.067 | 0.00007** | 0.00003 |
| Holiday | -14.127 | 29.265 | 0.007 | 0.015 |
| Summer | -17.399 | 13.758 | 0.009 | 0.007 |
| Log(popn) (Baseline = Popn_1) | 38.942 | 29.912 | -0.02 | 0.015 |
| Popn_2 | -82.199 | 55.846 | 0.012 | 0.018 |
| Log(GDP) | 99.076*** | 28.651 | -0.049*** | 0.014 |
| Cultural Distance (Baseline = Culture_1) | -2.276 | 3.206 | 0.001 | 0.002 |
| Culture_2 | 3.387 | 2.329 | -0.001 | 0.001 |
| Culture_3 | 4.725 | 8.52 | -0.001 | 0.004 |
| Language Match | -14.361 | 23.311 | 0.007 | 0.012 |
| Log(domestic) | 0.593*** | 0.022 | | |
| Log(budget) | 0.386*** | 0.021 | | |
| Screens | 0.004 | 0.003 | | |
| Star Director | 0.116*** | 0.04 | | |
| Critics | 0.006*** | 0.001 | | |
| Star Actor | 0.121*** | 0.026 | | |
| Genre (Baseline = Action) | | | | |
| Comedy | -0.471*** | 0.04 | | |
| Drama | -0.416*** | 0.04 | | |
| Thriller | -0.118*** | 0.041 | | |
| Horror | 0.062 | 0.057 | | |
| Musical | -0.664*** | 0.1 | | |
| Documentary | -0.524*** | 0.123 | | |
| Sequel | 0.350*** | 0.035 | | |
| Studio (Baseline = Independent production) | | | | |
| Subsidiary | -0.082** | 0.034 | | |
| Major Studio | -0.065** | 0.027 | | |
| Adaptation | 0.008 | 0.025 | | |
| MPAA (Baseline = G) | | | | |
| PG | 0.028 | 0.081 | | |
| PG-13 | 0.043 | 0.082 | | |
| NC-17 | 1.124*** | 0.297 | | |
| R | 0.076 | 0.087 | | |
| Not Rated | 0.753*** | 0.202 | | |
| English | -0.495*** | 0.153 | | |

NOTE – All nominal variables are in 2014 US dollars.
***,**,* $p < 0.01$, 0.05 and 0.10 respectively

**Table D3. Regression Results for (5) With Heckman Correction (Continued)**

| | Main Effect | | *CountryAttribute*Year* Interaction Term | |
|---|---|---|---|---|
| | Coeff. | Std. Err. | Coeff. | Std. Err |
| Year Fixed Effects (Baseline = 2000) | | | | |
| 2001 | 0.201 | 0.192 | | |
| 2002 | 0.113 | 0.256 | | |
| 2003 | 0.389 | 0.345 | | |
| 2004 | 0.534 | 0.446 | | |
| 2005 | 0.647 | 0.552 | | |
| 2006 | 0.746 | 0.658 | | |
| 2007 | 0.955 | 0.774 | | |
| 2008 | 1.346 | 0.889 | | |
| 2009 | 1.522 | 0.981 | | |
| 2010 | 1.836* | 1.102 | | |
| 2011 | 1.980 | 1.228 | | |
| 2012 | 2.248* | 1.338 | | |
| 2013 | 2.466* | 1.453 | | |
| 2014 | 2.724* | 1.564 | | |
| Country Fixed Effects (Baseline = United Kingdom) | | | | |
| Australia | -1.828* | 1.016 | | |
| China | 132.591 | 156.56 | | |
| France | 0.280 | 0.217 | | |
| Germany | 0.651* | 0.348 | | |
| India | 131.515 | 154.304 | | |
| Japan | 1.393* | 0.739 | | |
| Mexico | 1.526 | 1.041 | | |
| Russia | 2.132*** | 0.808 | | |
| South Korea | -0.764 | 0.73 | | |
| Constant | -1.036 | 3.813 | | |
| Censored Observations | 11,895 | | | |
| Uncensored Observations | 11,238 | | | |
| Prob > $chi^2$ | 0.000 | | | |
| Lambda | 0.541 | | | |
| Rho | 0.442 | | | |
| Sigma | 1.224 | | | |

NOTE – All nominal variables are in 2014 US dollars. Year fixed effects were jointly significant when tested with a F-test ($p < 0.01$)

***,**,* $p < 0.01$, 0.05 and 0.10 respectively

**Table D3. (Continued) Probit Coefficients for Selection Model for (5)**

| | Coeff. | Std. Err. |
|---|---|---|
| Log(opening) | -0.132*** | 0.01 |
| Log(domestic) | 0.210*** | 0.011 |
| Log(budget) | 0.162*** | 0.011 |
| Screens | 0.030*** | 0.002 |
| Star Director | -0.059 | 0.036 |
| Critics | 0.004*** | 0 |
| Star Actor | 0.120*** | 0.02 |
| Genre (Baseline = Action) | | |
| Comedy | -0.320*** | 0.029 |
| Drama | -0.207*** | 0.033 |
| Thriller | -0.013 | 0.037 |
| Horror | -0.003 | 0.047 |
| Musical | -0.135* | 0.08 |
| Documentary | -0.144* | 0.076 |
| Sequel | 0.153*** | 0.034 |
| Studio (Baseline = Independent production) | | |
| Subsidiary | 0.062** | 0.029 |
| Major Studio | 0.040* | 0.023 |
| Adaptation | 0.057*** | 0.022 |
| MPAA (Baseline = G) | | |
| PG | 0.302*** | 0.065 |
| PG-13 | 0.465*** | 0.064 |
| NC-17 | 0.777*** | 0.204 |
| R | 0.524*** | 0.065 |
| Not Rated | 0.209** | 0.105 |
| English | -0.282*** | 0.107 |
| Constant | -5.176*** | 0.24 |

***,**,* $p < 0.01$, 0.05 and 0.10 respectively

Calculating Coefficients for Different Years

Coefficient = $\beta_1 + \beta_2 * Year$

Coefficient for *release lag* = -0.151 + Year*0.00007

In 2000: Coefficient = -0.151 + 2000*0.00007 = -0.11

In 2014: Coefficient = -0.151 + 2014*0.00007 = -0.01002

Coefficient for *log(GDP)* = 99.076 + Year*-0.049

In 2000: Coefficient = 99.076 + 2000*-0.049 = 1.076

In 2014: Coefficient = 99.076 + 2014*-0.049 = 0.390

Hence for both variables, the coefficient retained its sign during the 2000 – 2014 period.

$$CountryAttribute_i = \gamma_0 + \gamma_1 Year_i + \gamma_2 Basefilms_i + \varepsilon_i + \mu_j \quad (6)$$

**Table D4. Time Trend Regression Results for Country Attributes with (6)**

| | Country Lag | Holiday | Summer | Log(popn_1) | Log(popn_2) | Log(GDP) |
|---|---|---|---|---|---|---|
| Year | -9.127*** | 0.0001 | 0.001 | 0.006*** | 0.010*** | 0.030*** |
| | (0.500) | (0.001) | (0.002) | (0.003) | (0.001) | (0.004) |
| Basefilms | 0.611*** | -0.0002** | -0.00004 | -0.001 | -0.0001 | 0.001** |
| | (0.056) | (0.0001) | (0.0002) | (0.0004) | (0.0001) | (0.0004) |
| Constant | $1.929x10^4$*** | -0.123 | -1.046 | -28.498*** | -16.380*** | -51.753*** |
| | (996.646) | (1.600) | (3.471) | (6.482) | (1.537) | (7.549) |
| $R^2$ | 0.056 | 0.001 | 0.000 | 0.004 | 0.451 | 0.022 |
| Observations | 13,597 | 13,579 | 13,579 | 12,892 | 705 | 13,597 |

***,**,* p < 0.01, 0.05 and 0.10 respectively

**Table D4. (Continued)**

| | Culture_1 | Culture_2 | Culture_3 | Language Match |
|---|---|---|---|---|
| Year | 0.018*** | 0.001 | -0.114*** | 0.001** |
| | (0.006) | (0.009) | (0.024) | (0.0002) |
| Basefilms | -0.013*** | 0.015*** | -0.007*** | -0.0001** |
| | (0.002) | (0.0008) | (0.002) | (0.0002) |
| Constant | -35.397*** | 22.776 | 278.081*** | -0.082 |
| | (12.517) | (17.111) | (48.484) | (0.489) |
| $R^2$ | 0.862 | 0.196 | 0.223 | 0.984 |
| Observations | 10,500 | 2,612 | 467 | 13,597 |

***,**,* p < 0.01, 0.05 and 0.10 respectively

*GDP Per Capita Growth Rate by Country*

**Table D5. Average GDP Per Capita Growth Rate**

| Country | Average Growth Rate (%) |
|---|---|
| China | 9.100 |
| India | 5.422 |
| Russian Federation | 4.662 |
| Korea, Rep. | 3.814 |
| Australia | 1.550 |
| Germany | 1.319 |
| United Kingdom | 1.244 |
| **United States** | **1.046** |
| Mexico | 0.897 |
| Japan | 0.842 |
| France | 0.673 |