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The Changing Role of Hollywood in the Global Movie Market

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Does Hollywood dominate world cinema markets with American taste, culture, and values through the exportation of films produced mainly for its domestic (US and Canada) market? Or does Hollywood supply the films that world audiences demand and, because of the logistics of distribution, screen these films first in the domestic market prior to exhibition in foreign markets? In this article, the authors empirically analyzed the global market for motion pictures to provide statistical evidence that can speak to these questions. They examined data on nearly 2,000 films exhibited from 1997–2007, inclusive, in the United States and Canada, Australia, France, Germany, Mexico, Spain, and the United Kingdom—markets that today collectively account for over 75% of worldwide cinema box-office revenue. The empirical evidence provides support for the hypothesis that the supply of Hollywood films has accommodated global demand as the relative size of the U.S. domestic market has decreased. There is no evidence that box-office success in the United States creates a contagion that spreads to other film exhibition markets; however, box-office success in international markets appears to be less uncertain for films that have been successful in their U.S. releases.

INTRODUCTION

The business of motion pictures has become a global industry. International revenues—once thought of as something "extra" in terms of a film's financial performance—have come to

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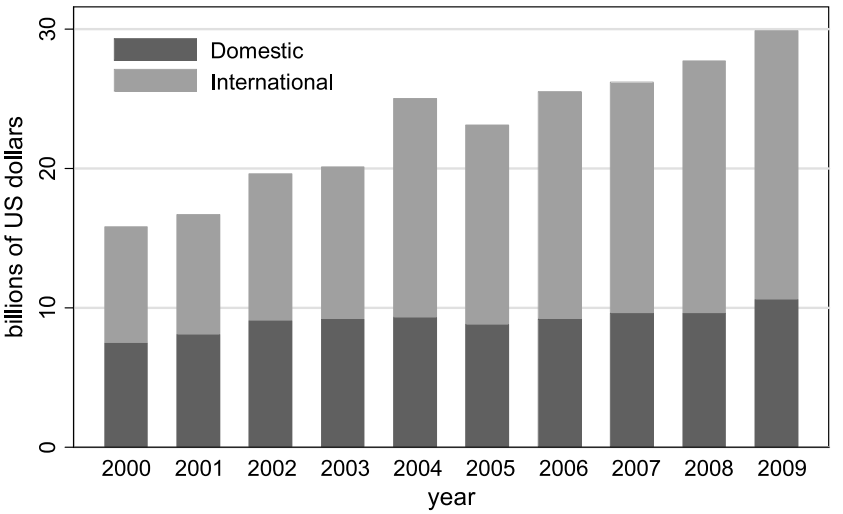

FIGURE 1 Domestic and international theatrical revenues. Data source: *MPAA Theatrical Market Statistics*, 2005, 2006, 2007, 2008, 2009.

dominate global box-office revenue.[1] Figure 1 shows that international revenues have grown from roughly equal to domestic in year 2000 to double the level of domestic revenue in 2009. It is clear that international markets, taken in aggregate, are very important in the revenue streams of Hollywood films. However, most empirical studies have focused either on domestic North American revenues or on the revenues of a particular country or market.[2]

In this article we provide an analysis of the worldwide theatrical market for motion pictures. Our sample of data has a wide geographical coverage that includes over 75% of total box-office revenues over the past decade. The descriptive analysis of our data set provides an update to the work of De Vany and Walls (1999), and it also extends their analysis to the global movie market rather than focusing solely on the domestic North American market. We provide a thorough empirical characterization of the global movie market as well as investigating several alternative ideas associated with the dominance of global box-office revenue by the U.S. commercial film industry—an industry that we shall simply term *Hollywood* in reference to the industry and not the place. Although our analysis does not demonstrate causality, we make an effort to distinguish between alternative characterizations of the global movie market. One view is that Hollywood dominates global movie markets as a supply-driven phenomenon where Hollywood films displace films that would otherwise be more successful in international markets. An alternative view is that Hollywood is demand-driven and produces films that appeal

[1] Most motion-picture data providers aggregate revenues for the United States and Canada and label this as *domestic*. We follow the same convention, so all domestic or U.S. revenues reported in this research aggregate revenues from the United States and Canada. Markets outside the United States and Canada are "international" or "foreign."

[2] Notable exceptions include the studies of Ravid (1999) and Elberse and Eliashberg (2003). Other studies have examined secondary-market revenues, such as residual earnings studied in Rusco and Walls (2004) and DVD revenues examined for Australia by McKenzie (2010) and for the North American market by Walls (2010).

to international audiences, but usually releases these films in the domestic market first because of the logistics of distribution.[3] In other words, our empirical examination is geared toward distinguishing whether the observed dominance of worldwide theatrical revenue by Hollywood films is more consistent with being a supply-driven or a demand-driven phenomenon.

The article will continue as follows. In the following section we briefly review the relevant conceptual and empirical literature on how cultural and economic factors impact market dominance in media industries. In the Data Set and Preliminary Analysis section we describe the construction of our data set and provide a detailed descriptive statistical analysis. Specific hypotheses are tested in the Economic Analysis section, which develops and presents an econometric model of film revenues. Final remarks are made in the Conclusion.

CULTURE AND ECONOMICS IN MARKET DOMINANCE

A well-articulated and sensible explanation of global media market dominance is that the combination of scale economies in production and cultural discount in consumption results in an equilibrium where media markets are dominated by firms located in countries with relatively large domestic markets. The cultural discount refers to the lower demand for foreign products that are less familiar to consumers in terms of social values, historical perspective and context, and language. The cultural discount disproportionately affects producers from small countries, because a larger proportion of the global market culturally discounts their products. In contrast, producers from larger countries serve their larger domestic market without any cultural discount in addition to a certain amount of effective demand from culturally distant markets. The larger effective markets for the larger countries permits firms in these countries to benefit from scale economies in the production of media products. Hoskins and Mirus (1988), Hoskins and McFayden (1991), Marvasti (1994, 2000), Marvasti and Canterbery (2005), Waterman (1988), Wildman and Swiek (1988), among others, provided thorough explorations of this type of model in relation to both film and television markets. In the context of the motion picture market, this model appears to be an accurate depiction in the pre-1990s period when non-U.S. theatrical revenues were smaller than domestic revenues. One could think of U.S. demand as driving Hollywood production, and the Hollywood supply of films to the rest-of-world market as a residual rather than as a driving force.

A substantial body of work that tests the cultural discount hypothesis in the context of the motion-picture industry has evolved over the past decade. Many studies, in particular the earlier studies in this literature, rely on aggregate or macro-level data to test the cultural discount model. For example, Fu and Sim (2010) and Oh (2001) examined international trade in films and find support for the cultural discount hypothesis. Jayakar and Waterman (2000) examined U.S. film exports, and S. W. Lee (2002) examined competitive balance of film trade between the United States and Japan, both studies finding support for the cultural discount hypothesis of media market dominance. Most of the recent studies leverage highly disaggregated film-level data through the application of modern econometric analysis. Fu and Lee (2008) examined

[3]In many cases, films may be planned to be distributed worldwide from the inception of a project. However, the actual distribution pattern will have the films released first in the domestic market before being released in subsequent markets.

the market for films in Singapore, F. L. F. Lee (2006) examined the market for films in Hong Kong, and F. L. F. Lee (2008, 2009) examined the cultural discount hypothesis in a number of East Asian countries. The film-level research uniformly finds evidence of cultural discount in the particular East Asian motion-picture markets under study.

In this article we would like to contrast the cultural discount/scale economies model of media markets with an alternative conceptual view that conforms to the rapidly growing importance of non-U.S. revenues in the world movie market (see Figure 1 discussed above). Scale economies and capacity are characterized by inertia, and the institutions surrounding the production of creative content and the channels through which it is distributed are fairly rigid. However, the relative sizes of domestic and foreign markets has been transposed in the span of just over a decade. In this context, it is reasonable to consider a framework where the country with the largest production and corresponding advantage of scale economies would adjust its production to maximize global profits, and in doing so it would create films that explicitly internalized the trade-off between domestic revenues and international revenues. In other words, we consider a conceptual model where Hollywood production is driven by worldwide demand. Production of films is flexible, though the distribution system is one where films are screened domestically first before moving into international exhibition. Though films are screened to domestic consumers first, domestic consumption is the residual of worldwide demand and not the sole driving force behind production.

The empirical analysis of the next section aims to distinguish between a more supply-driven explanation of Hollywood film exports and a more global demand-driven explanation. We will examine whether or not the types of films made have changed in addition to quantifying how film attributes are related to success at the box office. The analysis will also explicitly account for some statistical complications related to the fact that a non-random sample of Hollywood films is chosen by distributors for exhibition in international markets. Finally, the analysis will consider whether or not success in the domestic market creates a cascade or contagion of demand in international markets.

DATA SET AND PRELIMINARY ANALYSIS

Data Set Construction

The primary data used in this study were derived from Nielsen EDI's FilmSource. EDI's film data covers all seven countries in our study over the years 1997–2007. Film-specific data on box-office revenue, budget, cast, genre, rating, and so on is also included. In this study we restrict our attention to films which (at some point) played in U.S./Canadian theatres giving us a total of 5,470 films—although in estimation this sample is reduced to 1,910 because of incomplete budget data. Budget data are proprietary, and the budget data that we use are those included in the EDI database.

It is possible that missing observations on budget data are not random, but we have no feasible way to independently model the missing budget data. However, we can provide a cross-tabulation showing how the availability of budget data are related to observable film attributes. Table 1 displays cross-tabulations of budget availability and film genre, star presence, and whether or not a film is a sequel, respectively. In each cross-tabulation the composition of films

TABLE 1
Tabulation of Films by Budget Data Availability

	Budget Data		
	No	*Yes*	*Total*
Genre[†]			
Action	106	203	309
Adventure	26	29	55
Animated	59	94	153
Black comedy	52	21	73
Comedy	609	469	1,078
Documentary	647	39	686
Drama	1,638	556	2,194
Fantasy	19	27	46
Horror	55	103	158
Musical	35	18	53
Romantic comedy	164	123	287
Science fiction	15	74	89
Suspense	128	142	270
Western	7	12	19
Star[‡]			
No	3,131	923	4,054
Yes	417	987	1,404
Sequel[*]			
No	3,510	1,746	5,256
Yes	50	164	214
Total	3,560	1,910	5,470

[†] $\chi^2(13) = 784.55$ with marginal significance level of approximately 0.
[‡] $\chi^2(1) = 1{,}000$ with marginal significance level of approximately 0.
[*] $\chi^2(1) = 170.56$ with marginal significance level of approximately 0.

differs for the groups with and without budget data. The differing genre composition if difficult to interpret, but one could argue that the sorts of films that are overrepresented in the group with reported budget data are the types films that are consistent with major studio releases. Films without budget data have feature fewer marquee stars and are less often sequels, also consistent with the idea that budget data are more likely to be observed for major studio films. If missing budget data are related to low budgets and low numbers of theater screens, then our sample is similar to most other studies of the mainstream Hollywood movie industry, which generally do not include films with low budgets or small releases as these may be considered "arts" films and not Hollywood films. The empirical results will clearly be more directly applicable to major studio releases than to independent films with lower budgets and limited releases.

For each country we observe cumulative revenue, budget, genre, rating, and sequel information as well as the various bilateral exchange rate conversions used to transform local currencies to U.S. dollars at the average of the annual bilateral exchange rate.[4] One country, France, reported admissions rather than revenues, and this required transforming admissions to

[4] Although imperfect, using an average exchange rate is unlikely to alter our results in any systematic way.

TABLE 2
Summary Statistics on Revenue and Budget

				Percentiles		
Variable	*Observations*	*Mean*	*SD*	*25*	*50*	*75*
Revenue						
Australia	1,560	3,712,664	5,267,429	455,823	1,766,945	4,813,764
France	1,482	5,596,116	10,143,365	446,505	2,051,230	6,255,851
Germany	1,459	6,148,782	11,295,155	457,236	2,139,390	7,118,863
Mexico	1,404	3,158,969	4,456,700	457,330	1,570,118	4,070,740
Spain	1,569	3,917,246	5,632,669	420,997	1,875,572	5,173,711
United Kingdom	1,588	8,892,449	15,646,676	649,442	3,171,597	10,010,155
United States	1,910	51,281,793	69,158,873	7,700,581	28,027,917	66,148,084
Worldwide	1,910	76,286,419	110,488,258	12,211,408	38,401,944	92,931,464
Budget	1,910	41,240,324	40,596,221	12,234,777	27,740,757	58,075,890

(Euro) revenues at the average annual French ticket price (computed by dividing annual total box office by annual total admissions) and then to U.S. dollars.[5] This approximation is not perfect, but it is unlikely to create systematic errors of any consequence. Finally, all revenue data were then converted to constant U.S. dollars using the U.S. Bureau of Labour Statistics Consumer Price Index (CPI) with a base of December 2007.

In addition to the EDI film variables, we augmented the data set with a *star variable*, which is a binary variable taking the value one if either of the two lead actors appeared on James Ulmer's "Hot List" as an A+, A, B+, or B talent in the relevant edition for the year of the film's release in the U.S., and a value of zero otherwise. The Ulmer Scale is a popular industry source for classifying talent based on a 100-point scale; it is based on the survey of dozens of industry deal-makers.[6] There are now eight editions of the Hot List available and each edition covers more actors than previous editions—the current edition featuring 1,400 actors. As well, rankings change throughout time in movement with industry perception about the particular actor's bankability. As a guide, the cumulative distribution of rankings in the 6th edition were 0.5% (A+), 2.6% (A), 8.4% (B+), and 17.1% (B). Given the relatively long time dimension of our study—and the fact that stars are ephemeral—we use various volumes of Ulmer's Hot List to classify a star. In particular, we used Volume 1 for the years 1997–1999, Volume 3 for the years 2000–2002, Volume 5 for the years 2003–2005, and Volume 6 for 2006–2007. In the final sample of 1,910 films, a star was featured in 987 films.[7] We also observe 164 sequels in our data set as reported by EDI.

Summary statistics on film budgets and revenues by country are reported in Table 2. Worldwide average revenue was about $76 million over our sample of 1,910 films, with a standard deviation of about $110 million. The median revenue was about $38 million, an

[5]Data on ticket prices for France were obtained from http://www.cnc.fr.

[6]Complete details of the Ulmer Scale are available at http://www.ulmerscale.com.

[7]We experimented with less crude variables for star presence, including expanding the indicator variable to a set that would capture the number of stars in a particular film. None of the alternatives had explanatory power beyond the simple binary variable used to indicate star presence.

TABLE 3
Time Profile of Budget, Star Presence, and Sequels

		Budget (US millions)				
Year	*Observations*	*Mean*	*Mdn.*	*SD*	*Star M*	*Sequel M*
1997	174	37.4	23.3	40.7	0.422	0.057
1998	170	39.4	24.5	37.4	0.400	0.047
1999	183	39.0	28.1	35.0	0.445	0.038
2000	170	43.4	30.0	39.0	0.586	0.065
2001	155	44.6	33.2	35.7	0.578	0.071
2002	171	44.1	33.7	38.6	0.526	0.105
2003	169	44.6	29.7	43.2	0.651	0.136
2004	178	44.6	30.5	45.3	0.556	0.118
2005	173	41.1	29.8	42.6	0.520	0.098
2006	192	36.7	21.2	40.3	0.508	0.099
2007	175	39.7	21.9	46.6	0.520	0.109
Total	1,910	41.2	27.7	40.6	0.518	0.086

indication of the strong upward skew in the distribution of box-office revenue. Country-specific box-office revenue averages ranged from $3.7 million for Australia to $51.3 million for the United States.[8] For each individual country, we also observe that mean revenue is substantially higher than the median revenue, so skewness in revenue appears to be a common feature of theatrical exhibition. The average budget of films in our sample was about $41 million with a standard deviation of nearly $41 million; film budgets are also observed to be skewed toward more costly films.

We also note some interesting trends in our data set over the sample period 1997–2007. As reported in Table 3 we observe that the median film budget increased to a maximum of $33.7 million until 2003 before it decreased dramatically toward the end of the sample period coinciding with the onset of the global financial crisis. The prevalence of star talent similarly shows some evidence of increasing and subsequently declining over the sample period—which could in part be linked to both production budget cutbacks and the industry's move away from star driven projects—however, the pattern is certainly not as dramatic as that of budget. Finally, we note some evidence that sequels have become more commonplace in Hollywood's choice of projects as the number of such films in a given year nearly doubled over the sample period.

Quantifying Revenue Inequality

A standard way to quantify income inequality is to calculate the Gini coefficient, which can range from 0 to 100, with 0 indicating complete equality and larger magnitudes indicating a greater degree of inequality. For worldwide revenue the Gini coefficient G is calculated to be about 0.54. We further calculated the Gini coefficient separately for each country market, and these values are reported in Table 4 under the column heading G_k: The calculated country-

[8]In the EDI data, the United States and Canada are aggregated in a total box-office figure. As is common in the industry, we will simply refer to this as U.S. revenue.

TABLE 4
Decomposition of Revenue Inequality Across World Markets

Country	S_k	G_k	R_k	*Share*	Δ *Gini*	*95% Confidence Interval*†	
Australia	0.0417	0.5890	0.9342	0.0425	0.0008	−0.0000379	0.0017330
France	0.0634	0.6531	0.7815	0.0600	−0.0034	−0.0066581	−0.0005452
Germany	0.0667	0.6621	0.8900	0.0729	0.0062	0.0035763	0.0080714
Mexico	0.0326	0.6087	0.8553	0.0315	−0.0011	−0.0023398	−0.0000873
Spain	0.0452	0.5728	0.8482	0.0407	−0.0045	−0.0060845	−0.0032226
United Kingdom	0.1012	0.6576	0.9178	0.1133	0.0121	0.0093146	0.0146087
United States	0.6493	0.5408	0.9815	0.6392	−0.0101	−0.0159331	−0.0030111
Total		0.5392					

$$G = \sum_{k=1}^{K} S_k G_k R_k$$

where S_k is share of country k, G_k is Gini of country k, and R_k is Gini correlation of country k revenue with distribution of total revenue.

†Nonparametric bootstrap confidence intervals calculated with 500 replications.

specific Gini coefficients vary from a low of about 0.54 for the United States to as high as 0.66. We further investigated how the worldwide Gini coefficient is related to its country-specific components using the decomposition suggested by Lerman and Yitzhaki (1985), $G = \sum_{k=1}^{K} S_k G_k R_k$, where S_k is share of country k, G_k is Gini of country k, and R_k is Gini correlation of country k revenue with distribution of total revenue.[9] The decomposition reveals how individual country markets affect the overall worldwide Gini coefficient and this is displayed in the △Gini column of the table. Several countries, including the United States, Spain, Mexico, and France, contribute to a more uniform distribution of revenues across films, while Germany and the United Kingdom contribute unambiguously to a more unequal distribution of revenues; the impact of Australia is statistically no different from zero.

Genres, Stars, and Sequels

In Table 5 we tabulate the sample of films exhibited by country of exhibition, genre of film, presence of a star, and whether or not the film was a sequel. Although the number of individual films chosen for exhibition differs across countries, we find that the genre pattern of films is very similar across the countries. In fact, using a standard χ^2 goodness-of-fit test, we cannot reject the null hypothesis that the pattern of films by genre is the same across all countries in our data set. However, when viewing the pattern of star presence in exhibited films across countries we find a different pattern; using a χ^2 goodness-of-fit test we can reject at the 1% marginal significance level the null hypothesis that the pattern of star presence in films is equal across countries. In some ways the pattern of exhibited across countries is similar, whereas in other ways the pattern is dissimilar.

[9]The decomposition and associated standard errors were estimated using the Stata code written by Lopez-Feldman (2006).

TABLE 5
Tabulation of Exhibited Films by Genre, Star, and Country

	United States	*Australia*	*France*	*Germany*	*Mexico*	*Spain*	*United Kingdom*
Genre[†]							
Action	203	175	184	175	178	186	174
Adventure	29	26	24	24	25	24	26
Animated	94	85	86	81	81	85	90
Black comedy	21	17	14	14	9	17	15
Comedy	469	381	322	340	304	377	365
Documentary	39	28	20	19	14	12	25
Drama	556	411	407	382	383	427	447
Fantasy	27	25	25	25	23	22	25
Horror	103	92	91	88	91	94	98
Musical	18	13	15	13	12	12	16
Romantic comedy	123	105	93	103	90	103	104
Science fiction	74	68	66	65	66	71	70
Suspense	142	125	125	121	120	128	123
Western	12	9	10	9	8	11	10
Star[‡]							
No	923	670	615	600	547	663	685
Yes	987	890	867	859	857	906	903
Sequel[*]							
No	1,746	1,401	1,328	1,305	1,258	1,417	1,433
Yes	164	159	154	154	146	152	155
Total	1,910	1,560	1,482	1,459	1,404	1,569	1,588

[†]Pearson $\chi^2(72) = 35.396$ with a corresponding marginal significance level of approximately 1.
[‡]Pearson $\chi^2(6) = 35.214$ with marginal significance level of approximately 0.
[*]Pearson $\chi^2(6) = 5.458$ with marginal significance level of 0.487.

Mean box-office revenue tabulated by country, genre, star presence, and sequels is displayed in Table 6. Certain regularities are visible across countries, such as action films earning box-office revenues substantially above the mean of all films exhibited. However, differences are also apparent, such as the revenues earned by romantic comedy films being substantially above the mean in Australia and Germany, although they are well below the mean in France. We also observe differences in average revenues for films with and without stars across countries. For example, star films in the United States earned about 35% above the average of all films, whereas in Mexico star films earned about 16% above the average of all films exhibited. Our statistical model will account for all of these variations in revenues across films that are associated with the observable attributes of films.

The changing composition of US films by genre for 1985–1996 and 1997–2007 is displayed in Table 7. This table displays an enumeration of the composition of exhibited films categorized by genre for our sample of data and a very similar sample of data drawn from the same EDI database for the years 1985–1996 that has been previously analyzed by De Vany and Walls (1999). The total number of films in each sample, 1985–1996 and 1997–2007, is similar, though there are noticeable differences in the pattern of genres, with adventure, animated, documentary,

TABLE 6
Box-Office Revenue of Exhibited Films by Genre and Country

	United States	*Australia*	*France*	*Germany*	*Mexico*	*Spain*	*United Kingdom*
Genre							
Action	84,636,327	5,979,405	8,249,124	9,706,838	4,835,892	6,060,998	13,903,722
Adventure	68,845,899	4,921,950	9,096,163	7,050,105	4,555,699	6,606,614	12,376,396
Animated	95,655,842	6,941,492	14,875,726	11,386,481	7,812,339	7,505,431	19,347,482
Black comedy	21,807,477	1,056,046	2,021,290	1,318,755	981,577	1,118,064	5,165,601
Comedy	45,882,983	3,262,127	3,194,480	4,259,598	2,317,874	2,441,015	7,358,653
Documentary	16,272,520	1,322,480	2,818,804	1,829,817	487,817	865,976	1,437,062
Drama	32,164,413	2,426,802	3,904,495	4,068,567	1,717,294	2,706,094	4,578,354
Fantasy	157,150,926	13,018,743	22,785,526	28,124,001	10,568,766	14,759,645	45,562,691
Horror	43,562,040	1,761,201	3,347,177	3,549,101	2,735,731	3,176,137	5,621,319
Musical	41,871,550	4,850,550	2,216,576	2,255,717	1,221,273	2,831,246	8,712,900
Romantic comedy	52,176,765	4,580,512	4,198,252	7,208,633	2,602,930	3,888,470	10,068,350
Science fiction	89,833,597	5,594,324	11,069,843	11,740,097	5,130,662	6,300,304	16,901,920
Suspense	44,243,531	2,436,163	4,107,232	4,481,374	2,979,309	4,613,532	5,725,538
Western	37,674,175	1,738,783	3,362,818	3,621,843	1,574,828	1,956,295	2,921,229
Star							
No	32,312,647	2,428,536	3,635,559	3,961,718	2,379,268	2,395,203	5,880,865
Yes	69,020,924	4,679,366	6,986,824	7,676,417	3,656,631	5,031,059	11,176,985
Sequel							
No	44,897,851	3,223,338	4,742,739	5,193,928	2,760,646	3,466,950	7,293,339
Yes	119,247,419	8,024,265	12,955,112	14,240,238	6,591,100	8,115,072	23,676,485
Total	51,281,793	3,712,664	5,596,116	6,148,782	3,158,969	3,917,246	8,892,449

TABLE 7
The Changing Composition of Films in the U.S. Market

Genre	*1985–1996*	*1997–2007*	*Total*
Action	232	203	435
Adventure	57	29	86
Animated	41	94	135
Black comedy	26	21	47
Comedy	419	469	888
Documentary	8	39	47
Drama	592	556	1,148
Fantasy	34	27	61
Horror	71	103	174
Musical	32	18	50
Romantic comedy	133	123	256
Science fiction	42	74	116
Suspense	142	142	284
Western	16	12	28
Total	1,845	1,910	3,755

Note. Data for 1985–1996 from Table 1 of De Vany and Walls (2005). Pearson $\chi^2(13) = 76.06$ with marginal significance level of approx. 0.000.

horror, musical, science fiction, and westerns showing what appear to be significant differences across samples. We tested the null hypothesis that the pattern of films across genres was the same across the earlier and more recent samples of EDI data and found that we could reject this hypothesis at the 1% marginal significance level. The formal statistical test confirms that the structure of film production has changed substantively since the late 1990s. The detailed descriptive statistics presented in this section complement the detailed descriptive statistics presented by De Vany and Walls (1999) for their EDI data spanning the years 1985–1996.

Correlations of Revenue

Correlations of box-office revenues across countries are shown in Table 8. The table lists the pairwise Pearson correlations (of the magnitude of revenues), and Spearman correlations (of the rankings of revenues), as well as the number of films shown in each pair of countries. Clearly not all films are shown in all countries, so the number of observations on which the correlations are based varies across country pairs. The Pearson correlations across countries vary from a low of about 0.70 (for the United States and Mexico) to a high of about 0.91 (for the United Kingdom and Australia). However, correlations with worldwide box-office revenue vary from about 0.81 for France to a high of 0.98 for the United States. The Spearman correlations provide results that are broadly similar, with the only striking difference being that the Pearson correlation for France's revenues with other countries (United States, Mexico, United Kingdom) is much larger than the corresponding Spearman correlations, indicating the rank ordering of films by revenue are less similar across these countries than are the magnitudes.

ECONOMETRIC ANALYSIS

A Hedonic Model of Revenue

We begin our disaggregate statistical analysis by setting out a model relating a film's revenue in a particular market to that film's attributes. The basic regression equation is

$$\ln \text{Revenue}_i = \beta_0 + \beta_1 \ln \text{Negative Cost}_i + \beta_2 \text{Sequel}_i + \beta_3 \text{Star}_i + \Gamma[\text{Genre, Rating}]_i' + \mu_i \quad (1)$$

where i indexes individual movies, *Negative Cost* is the estimated cost of producing the film (i.e., the budget), *Star* and *Sequel* are dummy variables equal to unity when a movie contains a star or is a sequel, respectively, and zero otherwise, and Γ is a vector of coefficients conformable with the sets of explanatory variables indicating particular genres and ratings, and μ is a random disturbance with mean zero and finite variance. This log-linear regression equation, or one similar to it, has been used by many previous researchers including Prag and Cassavant (1994), Litman and Ahn (1998), Ravid (1999), Ravid and Basuroy (2004), De Vany and Walls (2005), Walls (2005, 2009), and others.[10] There are two compelling reasons to use this log-linear specification: First, because others have used a similar equation, our using it makes our

[10]For a more complete listing and discussion of empirical studies on the economics of the film industry, see McKenzie (2012) and the references therein.

TABLE 8
Correlation of Film Revenues Across Country-Specific Markets

	1	*2*	*3*	*4*	*5*	*6*	*7*	*Total*
1. Australia	1.0000							
	1.0000							
	2,486							
2. France	0.7384	1.0000						
	0.6482	1.0000						
	1,930	2,627						
3. Germany	0.8320	0.8116	1.0000					
	0.7850	0.7504	1.0000					
	1,833	1,893	2,238					
4. Mexico	0.7741	0.7019	0.7095	1.0000				
	0.7320	0.6114	0.7051	1.0000				
	1,712	1,747	1,641	2,024				
5. Spain	0.8343	0.7954	0.8228	0.8187	1.0000			
	0.7371	0.7494	0.7930	0.7841	1.0000			
	1,945	2,069	1,894	1,775	2,525			
6. United Kingdom	0.9107	0.7658	0.8365	0.7437	0.8160	1.0000		
	0.8551	0.6848	0.7885	0.7352	0.7464	1.0000		
	2,138	2,145	1,944	1,745	2,077	2,881		
7. United States	0.8950	0.7176	0.7916	0.8180	0.8099	0.8359	1.0000	
	0.8189	0.5972	0.7299	0.8010	0.7108	0.8115	1.0000	
	2,486	2,627	2,238	2,024	2,525	2,881	5,470	
8. Total	0.9358	0.8066	0.8713	0.8499	0.8728	0.9052	0.9834	1.0000
	0.8672	0.7153	0.8171	0.8299	0.7927	0.8634	0.9498	1.0000
	2,486	2,627	2,238	2,024	2,525	2,881	5,470	5,470

Note. Pearson correlation, Spearman correlation, and number of pairwise observations used in calculation.

results comparable to the results obtained by previous researchers, and second, De Vany and Walls (2005) estimated the optimal exponent in a Box-Cox (Box & Cox, 1964) transformation of box-office revenue and find statistical evidence in support of modeling the logarithm of box-office revenue as opposed to other possible transformations.

We first estimated the Regression Equation 1 using as the dependent variable the box-office revenue corresponding to the U.S. market, the foreign market, as well as the worldwide total box-office revenue. It is worth noting that because we are modeling the logarithm of revenue, and the logarithm is a transcendental function, it does not follow that $\sum_j b_j = b$; however, we can still examine how production values are mapped onto box-office revenue by individual country and in aggregate. The regression results for the United States, international markets in aggregate, and global revenues are shown in Table 9. Comparing the estimated coefficients across columns, one can see differences in how film attributes are transformed into revenues in the U.S. market, the aggregate foreign market, and in the worldwide market. The coefficients on Stars and Sequels, for example, differ substantially between the U.S. market and the aggregate Foreign market. Differences are also observed for many of the individual

TABLE 9
Revenue Regression Analysis: U.S., Foreign, and Worldwide Revenue

	Worldwide		*United States*		*Foreign*	
Variable	*Coeff.*	*S.E.*	*Coeff.*	*S.E.*	*Coeff.*	*S.E.*
Budget	0.819	(0.048)	0.805	(0.050)	0.743	(0.053)
Star	0.349	(0.077)	0.365	(0.085)	0.553	(0.093)
Sequel	0.594	(0.074)	0.563	(0.081)	0.762	(0.108)
Adventure	−0.204	(0.238)	−0.241	(0.224)	0.044	(0.283)
Animated	0.260	(0.170)	0.045	(0.195)	0.650	(0.208)
Black comedy	0.296	(0.369)	0.189	(0.398)	−0.515	(0.607)
Comedy	0.060	(0.111)	0.084	(0.120)	−0.468	(0.138)
Documentary	0.594	(0.364)	0.956	(0.394)	−0.018	(0.428)
Drama	−0.266	(0.111)	−0.379	(0.122)	−0.425	(0.128)
Fantasy	0.110	(0.206)	−0.053	(0.201)	0.416	(0.274)
Horror	0.827	(0.151)	0.874	(0.169)	0.594	(0.177)
Musical	0.014	(0.326)	−0.002	(0.322)	−0.364	(0.512)
Romantic comedy	0.267	(0.139)	0.048	(0.169)	0.064	(0.192)
Science fiction	0.116	(0.142)	−0.018	(0.152)	0.298	(0.167)
Suspense	−0.015	(0.155)	−0.060	(0.160)	0.061	(0.149)
Western	−1.249	(0.497)	−1.220	(0.525)	−1.653	(0.514)
NC–17	−0.583	(1.001)	−0.847	(1.252)	−0.456	(0.467)
Not rated	−2.066	(0.346)	−3.206	(0.387)	−0.440	(0.363)
PG	−0.150	(0.148)	−0.049	(0.184)	−0.184	(0.213)
PG–13	−0.261	(0.161)	−0.162	(0.200)	−0.181	(0.225)
R	−0.625	(0.167)	−0.713	(0.209)	−0.279	(0.233)
Intercept	3.379	(0.854)	3.222	(0.911)	3.113	(0.977)
Observations	1,910		1,910		1,787	
R^2	0.541		0.530		0.398	

Note. Coeff. = coefficient; S.E. = standard error.

TABLE 10
Changing US Box-Office Responses to Film Attributes

Metric	*1984–1996*†	*1997–2007*
Revenue elasticity with respect to budget	0.545	0.805
Sequel multiplier	2.142	1.756
Star multiplier	2.337	1.441

†Calculated from results reported in De Vany and Walls (2005). Standard errors are reported in Table 9.

genres. These empirical findings are consistent with differences in taste and audience appeal of films across markets.

In addition to quantifying how film attributes are mapped into revenues, we can compare our U.S. estimates for 1997–2007 with U.S. estimates for 1984–1996 reported by De Vany and Walls (2005). This comparison is made in Table 10. In the table we report the elasticity of box-office revenue with respect to budget and the (exponentiated) revenue multipliers corresponding to star presence and whether or not a film is a sequel. These metrics are without units, making valid our comparison across time periods. We observe that the elasticity of revenue with respect to production budget has increased substantially between 1984–1996 and 1997–2007. However, the sequel and star multipliers have decreased substantially. These findings are consistent with U.S. film production focusing on larger budget films in the more recent sample, whereas concomitantly choosing projects that, in terms of sequels and stars, are not as highly valued in the U.S. market. This trade-off—sacrificing some U.S. box-office appeal—is what one would expect if films were being made with more emphasis placed on the non-U.S. box-office revenue potential.

Correcting for Selection Bias

We now run regressions similar to those reported above, though we extend the analysis in two important ways. First, we estimate the regressions for individual countries instead of aggregating all non-U.S. markets, and second, we now consider selection bias in our analysis. Here we take the sample of U.S. films that subsequent to their U.S. release are distributed in a particular foreign market. We estimate revenue regressions and then we consider that only some U.S. films are distributed in each foreign market. In other words, the sample of U.S. films exhibited in any particular foreign market is the result of a decision by the distributor of whether or not to exhibit that particular film in that particular country. The basic econometric model, as set out by Heckman (1976, 1979), is that $y_{ij} = b_i' x_j + \mu_{1ij}$ but the film is only exhibited in country i if $z_{ij}\gamma_i + \mu_{2ij} > 0$, where y represents box-office revenue, x represents film-specific variables, and z is related to the decision of whether or not to distribute a film in a particular country.[11]

[11]As a practical point, the vector z must contain at least one variable which is not in the vector x. We include opening week U.S. revenue as the additional variable in the selection equation. This variable is not in—and does not belong in—the revenue equation, because that equation represents a hedonic model.

We estimate the Heckman self-selection model by maximum likelihood.[12] The estimates of ordinary least-squares regressions as well as the Heckman estimates that correct for selectivity bias are displayed in Tables 11 and 12. We find that, conditional on selection, the production values differ from what one would conclude if selection bias were uncorrected.[13] Thus, it appears that controlling for selection bias is very important in valuing the attributes of films in individual markets.[14]

In Table 13 we have summarized the selection-corrected box-office responses to film attributes for each foreign market as well as the results for the United States. There is substantial variation in market-specific box-office responses. Budget elasticities vary from a low of 0.356 in France to a high of 0.805 in the United States, but it is not at all the case that the U.S. market places higher values on specific film attributes than foreign markets. For example, sequels are more highly valued in Spain, with a multiplier of 2.057, than they are in the United States, which has a multiplier of 1.756. We also observe that stars are most highly valued in the Spanish market and that dramas are most highly valued in the French market, though comedies are most highly valued in the domestic U.S. market. The results point toward the erosion of the phenomenon of cultural discount, where films would be produced primarily for the domestic market and then distributed to foreign markets to earn incremental revenues. Perhaps the growing relative size of the foreign market may be providing an incentive for the production of films that maximize worldwide profitability, which necessarily leads to a trade-off between what appeals to the domestic market and what appeals to foreign markets.

Is There an International Contagion Effect?

Thus far the econometric analysis has been concerned with properly quantifying the valuing of film attributes across markets and in quantifying changes over time in how the U.S. market values film attributes. Another aspect of sequential releases is the extent to which U.S. revenues might influence foreign revenues.[15] It is possible, though it need not be the case, that box-office success in the U.S. market creates a demand contagion or herding phenomenon that spreads to other film exhibition markets. De Vany and Walls (2005) propose and use quantile regressions to test for the presence of demand contagion. The intuition is that if a particular explanatory variable is responsible for creating blockbuster revenues, it should be observed that the upper quantiles of the revenue distribution increase more than the mid- and lower quantiles.

The substantive portion of the quantile regression estimations is shown by plotting the revenue elasticities by quantile in Figures 2 and 3. Here we observe that the foreign market revenue elasticities (with respect to U.S. revenue) for lower quantiles are affected much more than are the upper revenue quantiles. This could be interpreted—as is done by De Vany and

[12]Johnston and DiNardo (1997) and Greene (1997) provide thorough yet accessible treatments of Heckman's self-selection model.

[13]More directly, we can reject the null hypothesis that $\rho = 0$. Our finding that $\rho \neq 0$ confirms that selection is important in the statistical model.

[14]We note that F. L. F. Lee (2009) found that selection bias was not important in his study of cultural discount and the performance of Hollywood films in East Asia.

[15]In contrast to our previous models, we now include U.S. revenue as an additional explanatory variable in each country's revenue model. This exercise is undertaken with the goal of exploring possible contagion effects rather than quantifying how film attributes contribute to revenue as was the goal of the previous section.

TABLE 11
Least-Squares and Heckman Revenue Regressions: Australia, France, Germany

	Australia				*France*				*Germany*			
	Least-squares		*Heckman*		*Least-squares*		*Heckman*		*Least-squares*		*Heckman*	
Variable	*Coeff.*	*S.E.*	*Coeff.*	*S.E.*	*Coeff.*	*S.E.*	*Coeff.*	*S.E.*	*Coeff.*	*S.E.*	*Coeff.*	*S.E.*
Budget	0.657	(0.059)	0.418	(0.049)	0.645	(0.060)	0.356	(0.053)	0.764	(0.063)	0.393	(0.054)
Star	0.367	(0.102)	0.279	(0.103)	0.628	(0.120)	0.339	(0.126)	0.415	(0.116)	0.239	(0.118)
Sequel	0.742	(0.116)	0.603	(0.121)	0.831	(0.145)	0.651	(0.159)	0.693	(0.131)	0.545	(0.146)
Adventure	−0.175	(0.258)	−0.202	(0.290)	0.309	(0.342)	0.430	(0.365)	0.151	(0.269)	0.173	(0.358)
Animated	0.066	(0.250)	−0.063	(0.245)	1.268	(0.286)	1.126	(0.282)	0.523	(0.279)	0.552	(0.289)
Black comedy	−0.640	(0.463)	−0.852	(0.496)	−0.940	(0.745)	−0.550	(0.763)	0.002	(0.442)	0.136	(0.506)
Comedy	−0.233	(0.146)	−0.367	(0.150)	−1.008	(0.182)	−0.623	(0.187)	−0.280	(0.170)	−0.280	(0.178)
Documentary	0.486	(0.462)	−0.296	(0.417)	0.416	(0.629)	0.327	(0.598)	0.646	(0.616)	0.148	(0.595)
Drama	−0.326	(0.136)	−0.387	(0.141)	−0.376	(0.146)	−0.292	(0.160)	−0.402	(0.159)	−0.399	(0.171)
Fantasy	0.094	(0.344)	0.078	(0.384)	0.568	(0.413)	0.555	(0.439)	−0.108	(0.365)	−0.032	(0.420)
Horror	−0.241	(0.215)	−0.561	(0.214)	0.271	(0.195)	−0.105	(0.212)	0.333	(0.223)	−0.136	(0.229)
Musical	0.327	(0.481)	0.434	(0.464)	−0.930	(0.567)	−0.977	(0.588)	−1.570	(0.673)	−1.188	(0.693)
Romantic comedy	0.245	(0.206)	0.050	(0.213)	−0.397	(0.239)	−0.203	(0.254)	0.168	(0.251)	−0.074	(0.262)
Science fiction	−0.150	(0.192)	−0.185	(0.208)	0.481	(0.238)	0.438	(0.250)	0.350	(0.217)	0.305	(0.237)
Suspense	−0.360	(0.169)	−0.642	(0.177)	−0.179	(0.169)	−0.413	(0.188)	−0.253	(0.176)	−0.625	(0.191)
Western	−1.049	(0.429)	−0.882	(0.497)	−1.554	(0.685)	−1.451	(0.757)	−0.818	(0.423)	−0.861	(0.510)
NC–17	−1.476	(0.402)	−1.465	(0.339)	−1.485	(0.534)	−1.173	(0.483)	−1.340	(0.403)	−0.847	(0.427)
Not rated	−0.415	(0.597)	0.237	(0.424)	0.617	(0.644)	1.160	(0.470)	−0.215	(0.756)	0.741	(0.569)
PG	−0.110	(0.243)	−0.076	(0.187)	−0.224	(0.288)	−0.084	(0.255)	−0.397	(0.254)	−0.523	(0.333)
PG–13	−0.276	(0.257)	−0.283	(0.202)	0.165	(0.313)	0.154	(0.277)	−0.264	(0.276)	−0.239	(0.339)
R	−0.383	(0.267)	−0.317	(0.209)	0.511	(0.318)	0.575	(0.283)	−0.164	(0.280)	−0.126	(0.342)
Intercept	2.878	(1.093)	7.477	(0.898)	2.485	(1.097)	8.101	(0.985)	1.080	(1.154)	8.170	(1.048)
Rho			−0.917	(0.009)			−0.869	(0.016)			−0.853	(0.012)
Sigma			1.712	(0.044)			2.026	(0.053)			1.917	(0.051)

Note. Coeff. = coefficient; S.E. = standard error.

TABLE 12
Least-Squares and Heckman Revenue Regressions: Mexico, Spain, and United Kingdom

	Mexico				*Spain*				*United Kingdom*			
	Least-squares		*Heckman*		*Least-squares*		*Heckman*		*Least-squares*		*Heckman*	
Variable	*Coeff.*	*S.E.*	*Coeff.*	*S.E.*	*Coeff.*	*S.E.*	*Coeff.*	*S.E.*	*Coeff.*	*S.E.*	*Coeff.*	*S.E.*
Budget	0.677	(0.045)	0.517	(0.040)	0.679	(0.061)	0.396	(0.053)	0.712	(0.060)	0.568	(0.053)
Star	0.174	(0.077)	0.057	(0.080)	0.800	(0.110)	0.574	(0.112)	0.174	(0.111)	−0.064	(0.115)
Sequel	0.377	(0.087)	0.394	(0.093)	0.659	(0.115)	0.721	(0.126)	0.839	(0.129)	0.770	(0.138)
Adventure	−0.038	(0.236)	−0.021	(0.243)	0.063	(0.372)	0.371	(0.390)	−0.217	(0.374)	−0.263	(0.387)
Animated	0.510	(0.183)	0.513	(0.185)	0.513	(0.250)	0.614	(0.245)	0.440	(0.241)	0.275	(0.244)
Black comedy	−0.365	(0.428)	−0.091	(0.441)	−1.188	(0.598)	−1.225	(0.616)	0.090	(0.574)	0.332	(0.605)
Comedy	−0.345	(0.109)	−0.226	(0.113)	−0.603	(0.160)	−0.567	(0.162)	−0.265	(0.156)	−0.204	(0.163)
Documentary	−0.487	(0.473)	−0.708	(0.455)	0.260	(0.761)	1.020	(0.693)	−0.196	(0.420)	−0.484	(0.427)
Drama	−0.504	(0.104)	−0.484	(0.109)	−0.412	(0.142)	−0.334	(0.149)	−0.559	(0.149)	−0.624	(0.157)
Fantasy	0.163	(0.258)	0.306	(0.279)	0.232	(0.323)	0.721	(0.358)	0.595	(0.321)	0.606	(0.359)
Horror	0.702	(0.144)	0.456	(0.147)	0.901	(0.171)	0.456	(0.181)	0.074	(0.225)	−0.428	(0.233)
Musical	−1.113	(0.348)	−0.903	(0.368)	−0.126	(0.692)	0.356	(0.642)	−1.265	(0.849)	−1.005	(0.921)
Romantic comedy	−0.068	(0.147)	0.007	(0.154)	−0.124	(0.222)	−0.082	(0.233)	−0.047	(0.234)	−0.117	(0.241)
Science fiction	−0.160	(0.169)	−0.155	(0.174)	0.269	(0.201)	0.169	(0.208)	0.235	(0.216)	0.071	(0.228)
Suspense	0.310	(0.117)	0.194	(0.121)	0.269	(0.167)	0.050	(0.176)	−0.263	(0.190)	−0.482	(0.202)
Western	−0.789	(0.208)	−0.671	(0.247)	−1.497	(0.574)	−1.609	(0.592)	−1.460	(0.578)	−1.604	(0.558)
NC–17	—	—	—	—	−0.350	(0.933)	−0.751	(0.454)	−1.092	(0.684)	−1.162	(0.371)
Not rated	−0.292	(0.409)	0.527	(0.432)	0.637	(0.390)	1.508	(0.352)	−0.991	(0.514)	−0.006	(0.315)
PG	0.022	(0.176)	0.041	(0.159)	−0.271	(0.219)	−0.134	(0.190)	−0.212	(0.248)	−0.163	(0.211)
PG–13	−0.149	(0.194)	−0.141	(0.175)	−0.076	(0.249)	0.155	(0.215)	−0.506	(0.272)	−0.400	(0.224)
R	−0.407	(0.200)	−0.326	(0.182)	0.002	(0.257)	0.306	(0.219)	−0.566	(0.281)	−0.318	(0.235)
Intercept	2.539	(0.816)	5.587	(0.729)	1.993	(1.110)	7.142	(0.966)	2.846	(1.101)	5.765	(0.969)
Rho			−0.736	(0.043)			−0.912	(0.015)			−0.898	(0.014)
Sigma			1.203	(0.030)			1.821	(0.048)			1.851	(0.0465)

TABLE 13
Box-Office Responses to Film Attributes by Country

Metric	*United States*	*Australia*	*France*	*Germany*	*Mexico*	*Spain*	*United Kingdom*
Budget elasticity	0.805	0.418	0.356	0.393	0.517	0.396	0.568
Sequel multiplier†	1.756	1.828	1.918	1.725	1.483	2.057	2.160
Star multiplier†	1.441	1.322	1.404	1.270	1.059	1.775	0.938
Drama multiplier†	0.685	0.679	0.747	0.671	0.616	0.716	0.536
Comedy multiplier†	1.088	0.693	0.536	0.756	0.798	0.567	0.816

†Calculated as the exponential of the respective coefficient in the Heckman sample-selection-corrected estimates reported in Tables 11 and 12. Estimated standard errors may be obtained from the values reported in Tables 11 and 12.

Walls (2005) in a different context—that high U.S. box-office earnings place a floor under foreign earnings, but that high U.S. earnings cannot be expected to result in high foreign earnings. We report formal test statistics for equality of U.S. revenue and budget elasticity of lower and upper quartiles in Table 14. Our results show that U.S. revenues are very important in moving the entire distribution of international box-office earnings, but that lower quantiles increase significantly more than upper quantiles. Thus, high U.S. revenues reduce the risk of a film earning low foreign revenues, while not greatly increasing the probability that a film earns extremely high revenues.

In contrast to the foreign revenue elasticity results with respect to U.S. revenue, we find for all countries except Australia that foreign revenue elasticity with respect to production budget is equal across lower and upper revenue quantiles. Thus, the effect of budget is essentially uniform across the revenue distribution, increasing lower and upper quantiles by a similar amount. For Australia we do find statistical evidence of budgets being related to blockbusters, because the upper quantiles increase far more than the lower quantiles.

CONCLUSION

International film revenues—those generated outside the United States and Canada—have become increasingly important in the global film industry, now accounting for more than two-thirds of worldwide box-office revenue. This change in the relative importance of domestic and international markets is associated with a substantial change in the attributes of films produced by the Hollywood industry. In our empirical analysis of the global market for motion pictures, we examined nearly 2,000 films exhibited from 1997–2007, inclusive, in the United States and Canada, Australia, France, Germany, Mexico, Spain, and the United Kingdom—markets that today collectively account for over 75% of worldwide cinema box-office revenue. We found support for the hypothesis that the supply of Hollywood films has accommodated global demand as the relative size of the U.S. domestic market has decreased. We found no evidence that box-office success in the U.S. domestic market creates a contagion that spreads to other film exhibition markets. However, box-office success in international markets appears to be

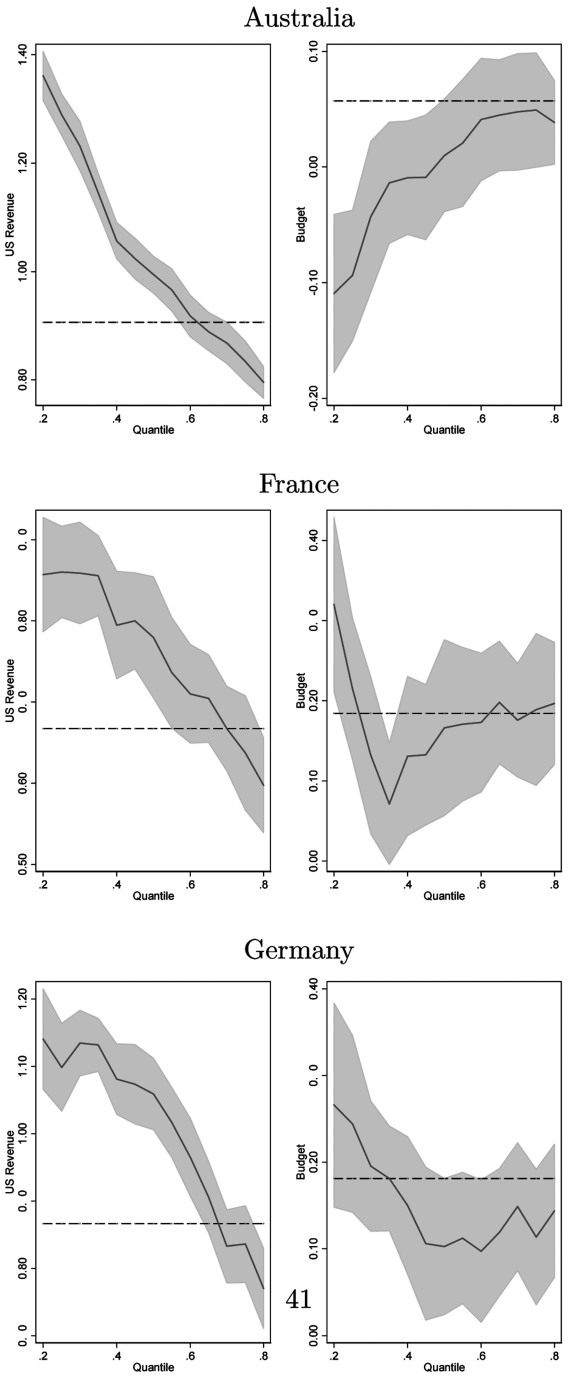

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FIGURE 2 Elasticity estimates by quantile: Australia, France, and Germany.

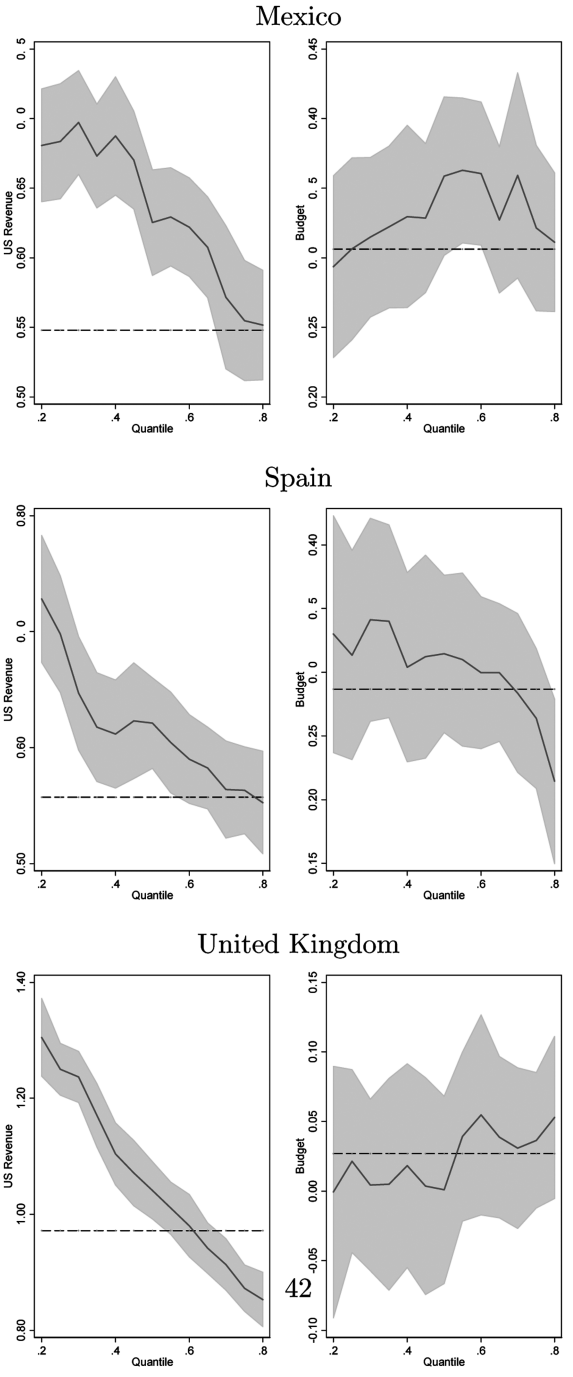

FIGURE 3 Elasticity estimates by quantile: Mexico, Spain, and United Kingdom.

TABLE 14
Testing Equality of Revenue Elasticities Across Quantiles

	H_o: *Equality of Revenue Elasticity with Respect to*	
Country	*US Box-Office Revenue*	*Film Budget*
Australia	0.0000	0.0283
France	0.0073	0.6422
Germany	0.0000	0.1841
Mexico	0.0041	0.7501
Spain	0.0386	0.6349
United Kingdom	0.0000	0.9176

Note. Marginal significance levels (p values) for the null hypothesis of equality of country-specific revenue elasticities at the 25th and 75th percentiles with respect to U.S. box-office revenue and film budget. Graphically, the hypothesis test amounts to testing for equality across quantiles of the elasticity estimates plotted in Figures 2 and 3.

less uncertain (in that there is a smaller variance for revenue outcomes) for films that have been successful in their U.S. releases.

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