The Impact of Import Quotas in The Chinese Movie Industry

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Abstract

How do local protectionism policies such as foreign movie quota affect the domestic consumers and producers in the Chinese movie market? We answer this question by estimating a nested logit demand system utilizing a unique theater-movie-week level movie performance data set. We find that when the import quota is loosened, there are a modest positive impact on the total revenue and admissions of the industry and a substitution between existing movies and new movies. However, since vertical integration is common between theaters and producers and the increase in revenue of domestic theaters and distributors outweigh the loss of domestic producers, integrated domestic producers may also benefit from less protectionism. Last, we find that inner-land China which are economically poorer and more minority dominant would substitute towards foreign movies more than other regions, indicating potential region-based policy concerns.

"We must not let our souls be asphyxiated, our eyes blinded, our businesses enslaved. We want to breathe freely – breathe the air that is ours, the air that has nourished the culture of the world, and that, tomorrow, is in danger of being lost to humanity.... Let us mobilise for this battle of survival."

–Jacques Toubon, the French Minister of Culture, 1993 [1]

1   Introduction

There is heated debate on whether to protect cultural goods in international trade. Some worry that when trade liberalization allows foreign cultural goods such as movies and pop

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[1]Quoted in McMahon, Darrin. 'Echoes of a Recent Past: Contemporary French Anti-Americanism in Historical and Cultural Perspective'. International Security Studies at Yale University, January 1995.

songs to invade, the domestic country may lose their own culture and tradition. Some economic literature directly ties it to welfare loss. For example, Francois and Ypersele (2002) show that when consumers are heterogeneous in their preferences towards domestic goods, and homogeneous towards global goods, it is possible that restrictions on trading the global goods can raise welfare on both the source and recipient countries when domestic producers cease to produce.

This paper studies the impact of U.S. movies on the Chinese movie industry. Hollywood movies as a cultural good often have a very large impact in foreign country's local motion picture industry. In China, between 2007-2013, foreign movies made up between 40-50% of the total market (Hou and Wu 2014). As China expands quickly in its own movie industry, becoming the second largest market in box office revenue (7.2 billion USD in box office in China VS 11.1 billion USD in box office in the U.S. in 2017), the case study how U.S. movies affect China local move players is an important example of how local protectionism may affect local producers.[2]

Chinese produced movies are protected from foreign competition through strict import controls. Most imported movies fall under a quota system. Historically, prior to 1999, only 10 movies a year were imported. The quota was increased to 20 in 1999 after China entered WTO. Since 2012, the quota further expanded to 34. It is likely that the policy makers will continue expand this quota in the future. We would like to calculate the effect of the 2012 expansion on the Chinese movie industry and explore how much consumers and various producers in the China movie market gain and lose from the relaxation in quota.

At a first glance, it seems consumers are likely to gain more surplus and domestic players will likely suffer. However, a unique feature of the China movie industry may actually gain revenue for the domestic suppliers. Unlike the U.S., China does not heavily regulate the domestic industrial structure. In particular, vertical integration among producers, distributors, and theaters is freely allowed. In contrast, the U.S. has banned integration of theaters and produces since the Paramount Decree of 1948. We argue that the combination of vertical integration and less protectionism actually benefits domestic players. When more foreign movies enter the Chinese market, theaters may gain more revenue as they have better and more movies to play. Distributors will also enjoy their distributor share from the foreign movies. In addition, since many theaters and distributors are integrated with upstream producers, the domestic players in total *including* the producers, who will suffer from substitution to imported movies, may benefit after all. To illustrate this consider demand for domestic movies as a function of the set of available domestic and foreign movies: $D_{m^d} = f(m^d, m^f)$. When foreign movies enter the market, demand for domestic movies

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[2]Box office revenue figures are quoted from Statista.

will shrink due to substitution, $\frac{\partial D_{m^d}}{\partial m^f} < 0$, and total demand for foreign movies will increase $\frac{\partial D_{m^f}}{\partial m^f} < 0$. If one domestic supplier provides all services - production, distribution, and exhibition - then that firm's total revenue is given by:

$$R = p_d D_{m^d} + p_f D_{m^f}.$$

Note that both $\frac{\partial R}{\partial m^f} > 0$ and $\frac{\partial R}{\partial m^f} < 0$ are possible. The goal of this project can be interpreted as measuring the sign and magnitude of this derivative.

To address this question, one may be tempted to compare the industry performance between 2011 and 2012, directly after the policy change. However, since the number and quality of domestic movies are growing over time, a simple comparison of industry revenue will likely underestimate the impact. To overcome such complexities, we use an unique data set for the Chinese movie market that contains box office and screen allocation information for each movie in each theater every week between 2011-2015. We use this rich panel to build a nested logit product space demand model that captures the changing movie quality over years in the Chinese market, similar in approach as Einav (2007). In this way, we control for the improving quality of domestic movies and avoid the problem of the direct comparisons. We next calculate what would happen if the quota had not been increased in 2012. In our basic counterfactual simulation, we rank the imported movies in each year by world box office (minus China) and keep only to top 20. We assume cinemas replace showings of the dropped movies with a generic low quality movie (we make various alternative assumptions for this replacement decision).

In our baseline counterfactual in which the quota is not raised after 2012, we find that total admissions decrease by between 3% and 6% each year. At the same time, we observe that admissions to domestic movies increase by between 2% and 4%, and admissions to imported movies decrease by about 1%. This suggests that the lifting of the quota from 20 to 34 resulted in substitution towards foreign movies relative to the counterfactual with the quota maintained at 20. However, after accounting for all the players, we find that in combination, the domestic producers, distributors and theaters have revenue between 4% and 5% lower under the 20-movie quota. This is because the increase in theater and distributor revenue from lifting the quota to 34 more than outweighs the decrease in producer revenue from substitution. Because of the vertical integration of producers and theaters, this suggests that some producers may actually benefit from the lifting of the quota. Other than the national impact, we also look at how the change of quota would impact on regions differently. A province level comparison shows inner-land China which are economically poorer and more racially diverse would substitute more towards foreign movies than other

regions if more foreign movies are allowed to enter.

There is a large literature on protectionism of cultural goods in international trade. Francois and Ypersele (2002) and Janeba (2007) are two theoretical work that show trade liberalization for cultural goods may lower equilibrium welfare. Olivier et al. (2008) showed in theory that trade can cause culture to diverge in a country, even resulting in disappearance of certain ones. Empirically, Chung and Song (2008) found substantial cultural preferences for domestic movies compared to the imported movies in the Korean market. Marvasti et al. (2005) examined the success of US movies in other countries in spite of existent barriers of trade. These works suggest the importance of protectionism. However, Ferreira (2013) found that globalization has not slowed down the performance of domestic music in many countries. Eswaran et al. (2007) proposed that the threat of entry of global cultural goods may improve the quality of the domestic ones. Our contribution is two-fold. We contribute to this literature by showing an example how vertical integration can help domestic players benefit from entry of global cultural goods using detailed micro-level data.

The rest of the paper is organized as follows. In section 2, we will introduce the detailed setting of the Chinese movie industry and describe our data. In section 3, we will propose our empirical strategies and models for demand, supply, and counterfactuals. In section 4, we will present our estimation and counterfactual results. Lastly, in section 5 we will conclude and propose some extensions.

2 Industry Setting and Data

2.1 Industry Setting

We first explain the industry setting in more details. There are three types of players in this market. The first type is producers whsich are the movie makers. The second type is distributors which help producers advertise and bargain against theater chains and theaters on whether to show their movies. A distributor has incentives to negotiate with both theater chains and individual theaters to to promote their movies. There is a general revenue sharing rule for all domestic movies. The government will take 5% movie specific funds and 3.3% as taxes. After those fees, the regulation policy starting from 2009 is that the share of box office revenue between producers and distributors, and theater chains and cinemas should be no lower than 43% to 57%, corresponding to 40% and 52% before tax. In practice, the industry knowledge is that the 43%-57% rule is very common, but small variations exist (Hou and Wu 2014). In some cases, to encourage theaters to show their own movies, distributors may offer some small incentives to individual cinemas to play their movies through cash or

additional revenue share back. The detailed of such arrangements are unknown to us as econometricians. We also do not know the exact revenue sharing rule between producers and distributors for each movie. The third type is theaters which exhibit movies. They have to be a part of theater chains due to government regulations. Some theater chains decide supply strategies for all of their affiliated theaters and some only provide guidelines. Exhibition strategies including showing (number of screens to assign) and windowing (how long to play) are mostly controlled by the theater chains and theaters. Pricing for each movie is almost identical within a theater conditional on the same format.

Now we turn to the foreign movies in this industry. The entrance of foreign movies to the Chinese market is highly regulated. Two state-owned companies, China Filmgroup and HuaXia are the only designated distributors allowed to import foreign movies. Mainly, the two companies can directly import movies through a revenue-sharing model under a quota. Bigger name movies often enter through this channel and are usually released at the same time as the global market. Alternatively, a domestic firm can buy out the ownership rights of a foreign movie in the Chinese market from the foreign producer. Usually, movies from this channel are smaller and we ignore this channel in this paper. Similar to domestic movies, we know in general the revenue sharing rule between different players. Table 1 shows the industry practices of revenue sharing rule before and after 2012 from an industry report. The US-China Movie Pact in 2012 increased the number of imported movies in China from 20 to 34 and specified an increasing revenue share for foreign producers in the Pact. The policy specified the additional movies have to have 3D or IMAX format available. In the paper, however, we do not differentiate a regular movie from a 3D or IMAX one.

As mentioned in the introduction, vertical integration between producers, distributors, and theaters chains/theaters is allowed and common. China Film Group, for example, is a producer, a distributor, and a theater chain. It has 321 theaters, produced 31 movies and distributed 59 movies in 2015. We manually search for vertical relationship on the internet between each producer and theater pair, and distributor and theater pair, defined as sharing common investors. We find that at least 70% of theaters are integrated with some upstream producers and 60% of theaters are integrated with some distributors.

2.2 Data

The main data set of this paper is purchased from EntGroup China, which collects box office information from the tax-collecting agency, and is thus an administrative data set that covers all first-run movie theaters in China. From the database, we collect attendance,

Table 1: Revenue Sharing Rule for Imported RS Movies

Year	Prior to 2012	Since 2012
Foreign Producers	13.5-17.5%	25%
Distributors	21.9-25.9%	14.4%
Theater Chains+Theaters	52.3%	52.3%
# Imported RS Movies Allowed	20	34

The above table shows the revenue-sharing rule in industry practice and the quota for number of imported RS movies before and after 2012. The government gets the rest of share via tax and fees. This table is cited from Hou and Wu (2014), an industry report on the Chinese movie industry. The rule since 2012 is from the US-China Movie Pact in 2012.

box office, average price, and number of showings (show times) for every nationally yearly top-100 movies in gross box office for each theater between 2011 and 2014 throughout their life-time, defined in our paper as when a movie is showed in less than 10 theaters. From the same database, we also gather theater information including opening dates, seating capacity, numbers of screens available, and the theater chains they belong to. Demographics information for each city including total population are collected from the 2010 version of Chinese census. Movie information such as producers, distributors, directors, and cast information are downloaded from *www.cbooo.cn*. U.S. and global movie box office are downloaded from *www.boxofficemojo.com*. We believe our sample represents the Chinese movie industry well. Figure 1 plots the total weekly box office for the whole market over the years against with the total weekly box office for our data sample. Figure 2 plots the total number of weekly showings in the whole market against with our data sample. These information for the whole market are collected as additional variables from Entgroup. We see that our data sample covers the majority of the revenue share of the total market. More deviations are expected among total showings because in weeks when there were no or very few nationally top 100 movies, theaters still had incentives to provide many show times in a week, yet our data sample would not include those information. Therefore, our data sample shall represent well for the industry in terms of total revenue, but not necessarily show times.

Table 2 describes the numbers of movies and markets in our data. From 2011 to 2014, among the about 100 movies every year we collect, 15-29 were imported movies. We do not

Figure 1: Sample Vs Total Market ($ Box Office)
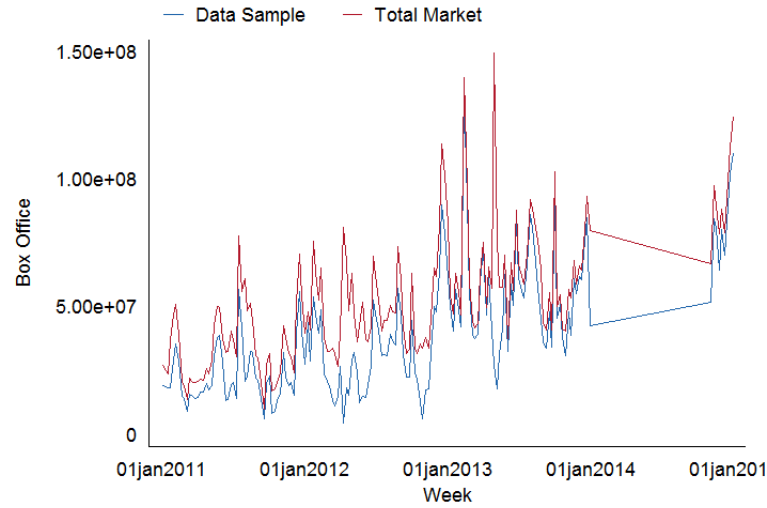
The above figure shows the total revenue in box office for our data sample along with the total market over each week between 2011 and 2014. Between January and October 2014, there was a bug in EntGroup's database, and the data for the whole market cannot be downloaded. We thus leave the period as blanks in the figure, though we do have individual theater data for our sample.

Figure 2: Sample Vs Total Market (Showings)
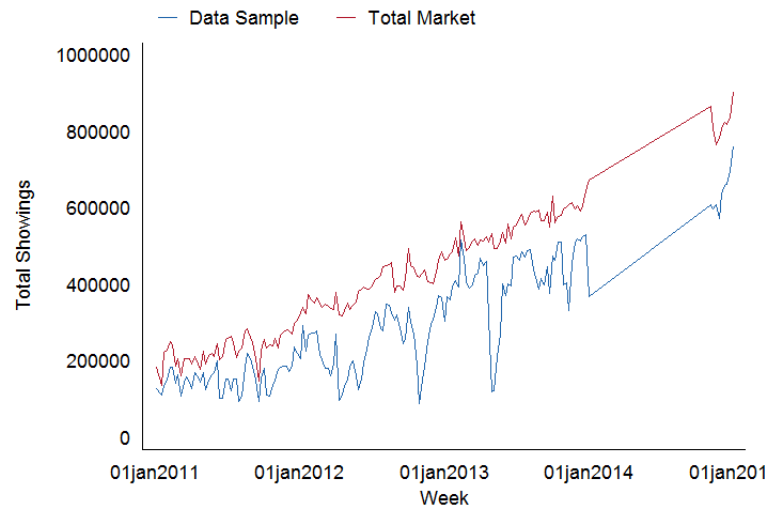
The above figure shows the total number of showings for our data sample along with the total market over each week between 2011 and 2014. Between January and October 2014, there was a bug in EntGroup's database, and the data for the whole market cannot be downloaded. We thus leave the period as blanks in the figure, though we do have individual theater data for our sample.

Table 2: Movies and Markets in the Data

Year	2011	2012	2013	2014
Number of Movies	99	106	104	111
Number of Imported Movies	15	25	29	26
Average Window (weeks)	5.9	5.1	4.5	4.4
Number of Theaters	1916	2577	3424	4338
Number of Theater Chains	45	45	45	46
Number of Cities	267	274	286	287

The above table describes number of movies and markets in our data. Average number of window is the number of weeks a movie is played at any theater in our data set since the opening week, taking average over all movies in our data set. The window period is capped at 10 weeks. More than 100 movies are displayed in each year as some movies are top-100 from the previous year.

Table 3: Summary Statistics At Movie-Theater-Week Level

| Year	2011	2012	2013	2014
Average Box Office (USD)	2952	2853	3269	3480
Average Admissions	533	512	580	605
Average Number of Showings	20	21	25	25
Average Ticket Price (USD)	4.9	5.0	5.0	5.1
Number of Observations	392,859	594,411	853,519	1,117,295

The above table shows the summary statistics at a movie-theater-week level. The average ticket price in a year is the average price for a movie in a theater in a week across all observations in that year.

capture all imported movies in the market because we only collect the top performing movies in a year. In terms of number of markets covered, our data is a rich and expanding cross sections covering a rapidly increasing number of theaters. During the 4 years, 1916 to 4338 theaters from 267 to 287 cities are included in our data. This rapid expansion is key to our identification in our empirical methodology. Table 3 provides some summary statistics at an observation unit in our main analysis – at a movie-theater-week level. For example, the average number of showings is 20 in 2011 at this level, which means that a movie is showed on average 20 times at a theater in a week in 2011. We observe an increasing number of admissions and number of showings for a movie in a theater in a week between 2011 to 2014, suggesting an expanding movie market, even within a theater in China. The prices for the 4 years have not changed much, suggesting that the expansion mainly came from volumes.

We also explore the regional variations in our data. Figure 3 plots the map of theater density (#theaters/#population) in each prefecture-level city. Most theaters are heavily concentrated in the east area, which is also more populous and richer. Figure 4 plots the map of the ratio of total imported movie box office divided by total domestic movie box office between 2011-2014. Two kinds of regions more heavily prefer foreign movies – the

Figure 3: Map of Theater Density by 2014
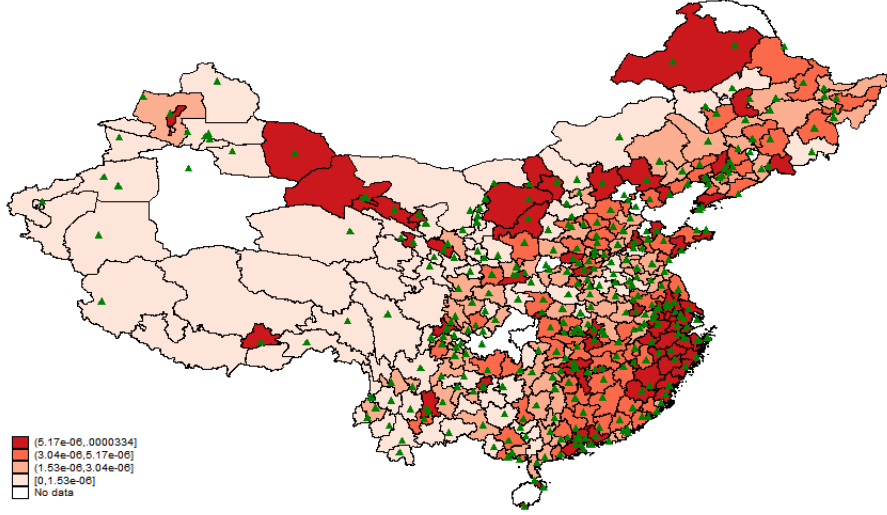
The above plots the total number of theater divided by 2014 per person in each prefecture-level city We do not have population information in every prefecture-level city and thus some regions have no data and are white on the map. Each green triangle represents an actual theater.

more global valued coastal regions like Beijing and Shanghai and the minority dominant regions in the west of China such as Tibet, Yunnan, Xinjiang, Qinghai, and Inner Mongol. One possible explanation is that the domestic movies are tailored more towards the urban Han people, the majority race in China that occupies mostly in the inner land. However, Hollywood movies are more global valued and thus are more appealing towards more global valued regions and minorities.

3 Empirical Strategy

3.1 Demand Estimation

We assume that a consumer may choose to watch one movie in any theater in his city every week, or not watching any. We specify a nested logit demand model. A market is defined at a city-week level. A product is a theater-movie combination, ie. a movie watched at a particular theater. The nest includes watching any movie in any theater in this city. We define the market size as the population of the city in 2010. Our baseline model for a consumer i's utility from consuming movie j at theater k at time t in city c is specified as below.

$$u_{ikjt}^{ct} = \theta_k + \gamma_j + \lambda(t - r_j) + \xi_{kjt} + (1 - \sigma)\epsilon_{ikjt}, \tag{1}$$

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Figure 4: Map of Ratio of Imported Against Domestic Movies
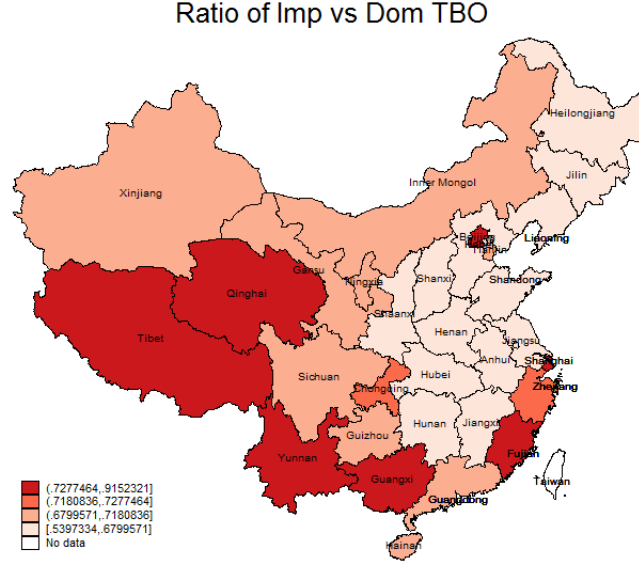
The above map plots for each province, the ratio of total imported movie box office of all years divided by total domestic movie box office of all years between 2011-2014.

and the utility of consuming no movies (outside option) as

$$u_{i00t}^{ct} = -T(t) - H(t) + \xi'_{kjt} + (1-\sigma)\epsilon_{i00t}. \tag{2}$$

In the specification, θ and γ capture theater and movie fixed effects. $(t - r_j)$ denotes the number of weeks since releasing day. Thus, λ captures the movie quality decay rate. $T(t)$ and $H(t)$ captures seasonality. T denotes week-of-the-year fixed effects and H denotes holiday fixed effects. They are not completely collinear since many holidays in China including the Chinese new year are celebrated using a lunar calendar. As usual, we assume that both ϵ_{ikjt} and $\xi_{kjt} + (1-\sigma)\epsilon_{ikjt}$ are distributed i.i.d extreme value. The decay pattern and seasonality are important in capturing a movie's attractiveness on the consumers. Figure 5 plots the average gross revenue per movie for each weeks-since-released. It can readily been seen that movies attractiveness almost fell exponentially over time. Figure 6 plots the total box office for all movies collapsed at each week of a year between 2011-2014. The seasonality variation was very salient and there are peaks around week 6, week 26, and week 51, roughly corresponding to the Chinese New Year, international labor day, and new year's day.

In the demand system, we do not include supply strategies such as prices. However, we do not believe it is a big concern. In the industry practices, movies at the same time of a day are priced almost identically controlling for the format (regular vs 3D, for example). Another supply variable we omit is self-promotion and advertising. It is possible that a theater would

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Figure 5: Movie Decay Pattern
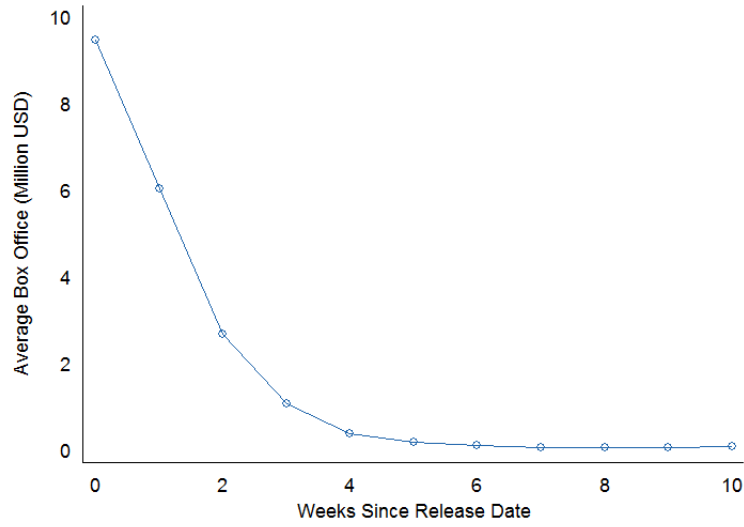
The above figure plots for every week-since-released, the total box office across all theaters per movie.

Figure 6: Total Box Office Seasonality
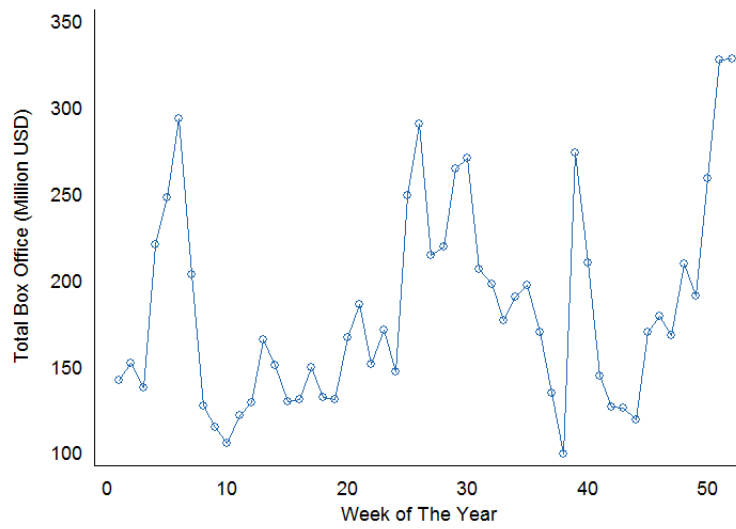
The above figure plots the total box office in our data sample across 2011-2014 for each week of the year.

try to promote certain movies, especially when a movie is integrated to the theater. We have a specification not showed in the paper that includes a dummy variable whether movie j is integrated with theater k to capture such promotional effects. The results do not change much and are available upon request. Another important thing to notice is that we do not include year fixed effects in the outside option. So the interpretation of movie fixed effects γ_j is worth attentions. We interpret them as a movie's "quality" to an average consumer, incorporating the changes of appealingness of outside options over time.

Using the usual Berry transformation (1994), we can derive the following formula at market share level.

$$
log(s_{kjt}^{ct}) - log(s_{00t}^{ct}) = \theta_k + \gamma_j + \lambda(t - r_j) + T(t) + H(t) + \sigma log(\frac{s_{kjt}^c}{1 - s_{00t}^c}) + \xi_{kjt}, \quad (3)
$$

where s_{kjt} is the share of consumption of movie j at theater k at week t, calculated as the attendance of movie j at theater k at time t divided by the population of the city; $log(\frac{s_{kjt}}{1-s_{00t}})$ captures the within group share and thus σ captures the correlation within the nest and the market expansion effect.

Next, we discuss our identification for our baseline specification. The movie fixed effects γ_j are vital for our analysis as the levels of them determine the competitiveness of those movies in the whole movie market. The fundamental assumption is that a movie's decay rate is constant across all movies at all time, and seasonality does not change over years. The decay rates and seasonality can then be captured by the week-of-the year dummies and holiday dummies. Then a movie's fixed effect can be identified because a movie is showed in multiple weeks, and across many cross-sections (theaters). Along those dimensions, the different combinations of competitor movies showed in different theaters help identify a movie's average quality separate from other movies. The within group share $log(\frac{s_{kjt}}{1-s_{00t}})$ is endogenous by construction. Thus, we need an instrument to capture the market expansion effect σ. One choice is log of the total number of theaters in the city at time t. Since between 2011 to 2014, the number of theaters more than doubled, we have a lot of variations in the total number of theaters available in the city. Regarding the inclusion restriction, the number of theaters should be positively correlated with the total share of watching any movies in a city, the denominator of the within group share. Figure 7 plots over time, the average attendance across all theaters per city and average number of theaters per city. The high positive correlation provides evidence that the inclusion restriction is likely satisfied. On the other hand, the timing of theater construction helps the exclusion restriction. Since there is a long lag between when a theater is planned to build and when it is open, we assume

Figure 7: Market Expansion By Number of Theaters
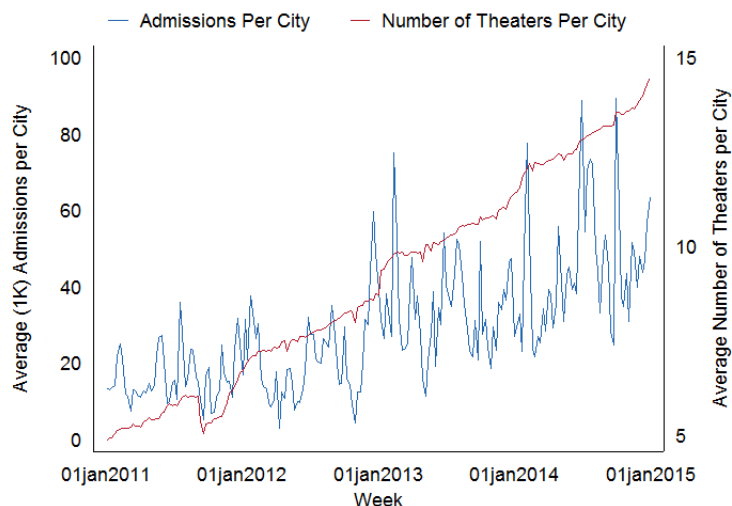
The above figure plots two lines. The blue line shows the average total admissions per city across all theaters and all movies over time. The red line plots the average number of theaters per city over time.

that a consumer's preference has not changed in the week before and after a theater is open. Therefore, we can think of number of theaters in a city as an exogenous shock at a weekly level.

3.2 Counterfactual Exercise

The counterfactual exercise asks what would happen had the quota for the imported movies been kept to 20 instead of 34 between 2012-2014. We define our counterfactual exercises using the following steps. First, in each year, rank the 34 imported movies by their global box office excluding Chinese box office[3]. Keep only the movies in our data sample that ranked between 1-20 (relative to the total 34 movies) in the global box office list. Since not all such top 20 movies made to our top-100 data sample, we may end up having fewer than 20 movies in our counterfactual data set. In Figure 8, we plot the log of Chinese box office for each imported movie in our sample against the log of global box office (excluding the Chinese box office) between 2011-2014. The global box office clearly predicted the Chinese box office to some extent, suggesting that it may be reasonable to assume that in the counterfactuals, decision makers may import the top 20 movies ranked by the global box office.

Second, We need to make a decision what movies a theater would replace the trimmed imported movies with. We experiment using two specifications. In specification 1, we assume

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[3]Gathered from www.boxofficemojo.com

Figure 8: Log Chinese Box Office Against Log Global Box Office Among Imported Movies
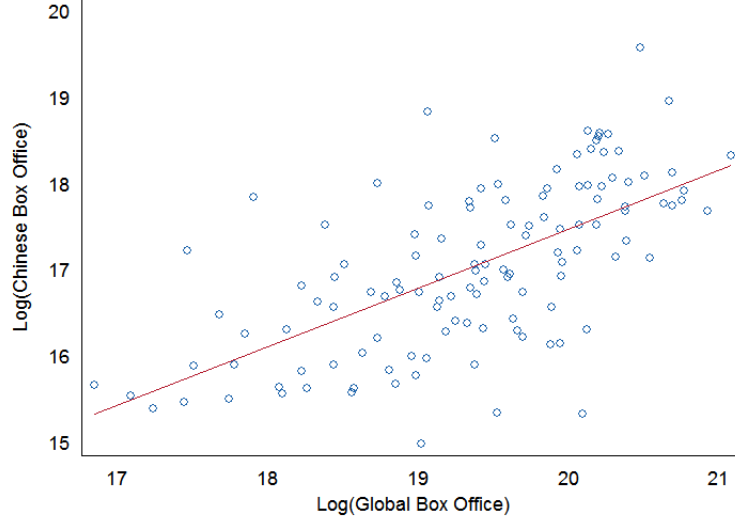
Each circle in the above figure stands for an observed imported movie in our data sample between 2011-2014. The x axis is the log of global box office (USD), excluding the Chinese box office. The y axis is the log of the Chinese box office (USD). The red line is the fitted regression line.

each cinema would replace it with the worst movie in terms of movie FE in our data sample in all time when showing a removed foreign move in any theater any week. Mathematically, if a theater shows a trimmed movie γ_f at time t, we counterfactually let it show movie $min_j\{\gamma_j\}$ at time t. In specification 2, we replace a trimmed foreign movie at a week with the worst movie FE in the week before. That is, if actually theater k shows movie γ_f at time t, we counterfactually let k show movie $min_j\{\gamma_j\}\_st\_j \in J(t-1)$ at time t. $J(t-1)$ denotes the set of movie available at time $t-1$. Therefore, specification 2 is a more conservative approach in estimating the effect of the quota than spec 1.

Last, we can plug into our estimated demand system and calculate what would happen to each movie in each theater every week.

3.3   Regional Heterogeneity

Consumers in different provinces may have differential demand response to foreign movies, which will have policy implications if the policy makers aims to strengthen the Chinese culture in particular areas. Some hypotheses include, for example, regions that are poorer, and minority dominated rural regions may also have stronger responses to global movies as domestic movies may targeted towards urban Han people audience.

We therefore specify a provincial flexible consumer i's utility from consuming movie j at

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theater k in province p at time t is as below:

$$u_{ikjpt}^{ct} = \theta_k + \gamma_{pj} + \lambda(t - r_j) + \xi_{kjpt} + (1 - \sigma_p)\epsilon_{ikjpt}, \tag{4}$$

and the utility for outside good is

$$u_{i00t}^{ct} = -T_t - H_t + \xi'_{kjt} + (1 - \sigma_p)\epsilon_{i00t}. \tag{5}$$

Therefore the market share equation can be written as

$$log(s_{kjpt}^{ct}) - log(s_{000t}^{ct}) = \theta_k + \gamma_{pj} + \lambda(t - r_j) + T_t + H_t + \sigma_p log(\frac{s_{kjpt}^c}{1 - s_{000t}^c}) + \xi_{kjpt}. \tag{6}$$

In essence, we allow movie's average quality γ_{pj} and market expansion effect σ_p to be different across provinces. The identification for the provincial level regression is almost identical. The difference is to identify market expansion effect σ_p for different provinces, we interact our instrument log of theaters in a city with a province dummy.

For the counterfactual exercise, we do the same exercise as in 3.2. Foreign movies are trimmed in the counterfactual at a national level. The difference is that we define a new counterfactual specification 3, in which we replace a trimmed foreign movie with the worst movie in the same province of the theater. If actually theater k in province p shows movie γ_f at time t, we counterfactually let k show movie $min_j\{\gamma_{jp}\}$ at time t.

4 Results

4.1 Demand Estimation Results

We show our baseline demand estimation results from equation (3) in Table 4. The third column is the first stage result. We observe a strongly explained first stage. The total number of theaters in the city is strongly negatively correlated with the within group share as anticipated. The second column shows the main nested logit estimation using IV regression. We estimate a weekly decay rate around -0.57, and a within-group correlation coefficient σ around 0.20. Figure 9 plots the estimated movie qualities γ_j for both domestic and foreign movies over the time of their releasing date. One salient observation is that the foreign movie FE did not change much over time, while domestic ones were increasing in quality sharply.

Table 4: Results for Demand Estimation

VARIABLES	(1) $log(s_{kjt}) - log(s_{00t})$	(2) $log(\frac{s_{kjt}}{1-s_{00t}})$
$log(\frac{s_{kjt}}{1-s_{00t}})$	0.200***	
	(0.00400)	
$t - r_j$	-0.569***	-0.692***
	(0.00443)	(0.00558)
Inst_log(theater_city_count)		-0.849***
		(0.00432)
Observations	2,951,648	2,951,648
R^2	0.820	0.762
Theater FE	YES	YES
Movie FE	YES	YES
WofY and Holiday FE	YES	YES

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The above tables show the results of the first stages and the main regression of the demand estimation from equation (3). The second column is the main estimation and uses $log(s_{kjt}) - log(s_{00t})$ as the LHS variable. The third column is the first stage estimation and uses $log(\frac{s_{kjt}}{1-s_{00t}})$ as LHS variable. Inst_log(theater_city_count) is the excluded instruments we use, which is the log of number of total theaters in the city at time t.

Figure 9: Estimated Movie FE γ_j Against Opening Dates
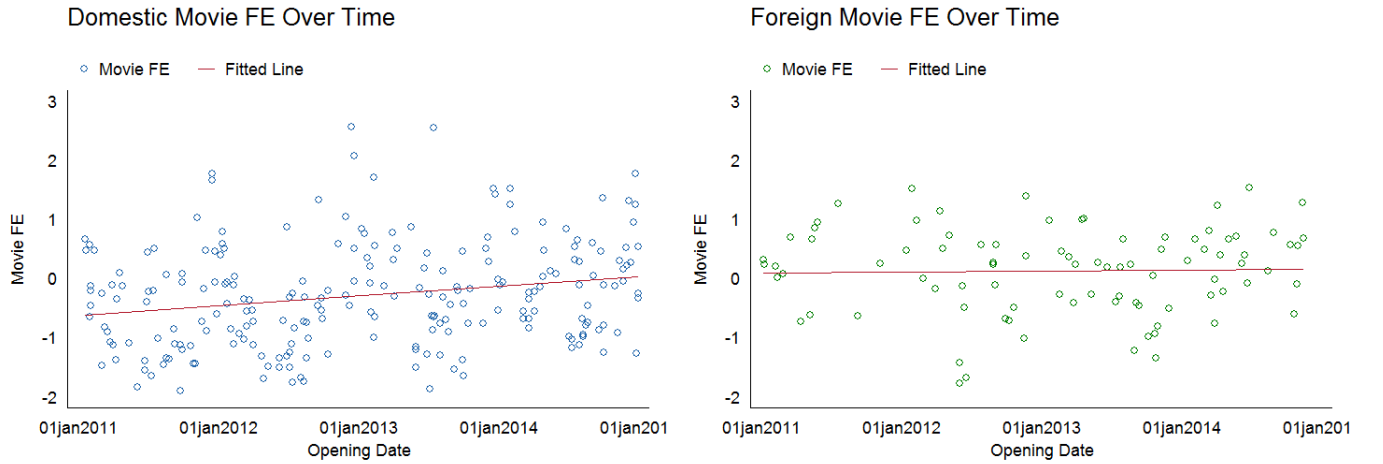
The above figure plots the movie fixed effects γ_j estimated from the demand stage, normalized the mean at 0 and bounded between 1th and 99th percentile. Then we plotted them by types (domestic vs foreign) in the above two figures. The red lines are linear regression fit.

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Table 5: Comparing Key Results for Counterfactuals of Spec 1

Year	2012	2013	2014
# Actual Imported Movies in sample	25	29	26
# Cf Imported Movies in sample	18	16	17
Actual Admissions	304	495	676
Cf Admissions	295 (-3%)	465 (-6%)	651 (-4%)
Actual Domestic Admissions	172	298	383
Cf Domestic Admissions	175 (+2%)	309 (+4%)	393 (+3%)
In-Sample Actual Admissions	291	452	638
In-Sample Cf Admissions	293 (+1%)	458 (+1%)	647 (+1%)
Out-of-sample Actual Admissions	14	43	38
Out-of-sample Cf Admissions	2	7	3

This above table uses counterfactual spec 1. When a theater shows a trimmed movie γ_f at time t, we counterfactually let them show movie $min_j\{\gamma_j\}$ at time t. The counterfactual results (Cf) compared to the actual values for each year are showed in units of millions. We only keep the best 20 movies among the 34 movies ranked by global box office excluding Chinese box office in the counterfactuals. Since not all top 20 movies ranked by global box office made to the top 100 movies in the Chinese market, our sample has fewer than 20 every year in the counterfactuals. In-sample represents the common movies between actual and counterfactuals. Out-of-sample actual means the removed foreign movies in our dataset. Out-of-sample Cf means the replaced movies using worst movie FE. We treat those movies as domestic.

4.2 Counterfactual Results

Specification 1 assumes that we replace removed foreign movies with the worst movie we observe in the data set. Table 5 shows the yearly total actual values together with the counterfactual results for each year for spec 1. We would keep 18, 16, and 17 movies respectively from 2012 to 2014 using our top-20 movie selection criteria ranked by global box office. Had the quota stayed at 20 between 2012 and 2014, our exercise indicates that the total admissions would drop between -3% to -6%. When fewer good movies (foreign movies compared to the worst movies we use for substitution) were available, fewer consumers would watch any movies. This suggests a dominant market expansion effect and increased welfare for consumers when more foreign movies actually entered the market. To compare consumption between movies, we define in-sample as the common set of movies between actual and counterfactual settings. Our exercise shows that among in-sample movies, counterfactual admissions would increase by 1% compared to actual admissions, suggesting a modest substitution effect – when more movies were available, the "new" movies enjoyed more revenue, substituted from the existing movies. The same story applies to the domestic movie admissions. More people would go to domestic movies counterfactually when fewer foreign movies were available. The sizes of all these effects though are not too big. This indicates that foreign movies ranked 21-34 may not have too big impacts in the Chinese movie market.

Table 6 presents the detailed breakdown of revenue changes for different domestic players in the Chinese market using the actual and counterfactual values for spec 1. We assume that theaters, distributors, and producers would get 52.3%, 13.1%, and 26.2% respectively for domestic movies before tax. For foreign movies, we assume domestic theaters would get 52.3% and the domestic distributors would get 14.4%. These rules are taken from Table 1. We observe that, in the counterfactuals when fewer foreign movies were available, theaters would lose -5% to -7% in revenue. This is expected from the shrinking total demand discussed in Table 5 and the fact that theaters gain revenue from playing either domestic or foreign movies. For distributors, their counterfactual result is *ex-ante* ambiguous. If there were fewer foreign movies, they may gain more revenue from their domestic movies. However, they would receive less revenue from distributing foreign movies. In our empirical exercise, we observe that they would lose -6% to -9% in revenue when fewer foreign movies were available, suggesting that their loss from foreign distribution revenue would be bigger than their gains in domestic revenue. For producers, their revenue would increase by +2% to +5% if there was less competition with foreign movies. What is more important, however, is to look at the three domestic players as a whole. We observe a small decrease in revenue under the counterfactuals, ranging from -4% to -5%. Since many theaters and upstream producers and distributors are vertically integrated like China Film Group, the domestic production players combined may indeed benefit after more foreign movies enter the market because of internalization of revenue through vertical integration. Unfortunately, we cannot determine how to internalize such gains for each individual player because we do not observe their shares in any integrated entities.

We also run other specifications assuming different counterfactual supply strategies. In specification 2, we replace removed foreign movies with the worst movie FE of in the week before showing the trimmed foreign movies. As we can see in Tables 7 and 8, the qualitative results are similar as before. The effects are generally smaller since we replace the trimmed movies with less worse ones in the counterfactuals. The exception is actual and counterfactual domestic admission comparison. Since we consider those replaced movies as domestic in the counterfactual, we expect a bigger domestic revenue change in specification 2 than in specification 1.

4.3 Regional Heterogeneity

The counterfactual results are showed in Tables 9 and 10. Qualitatively, we observe similar stories.

What is more interesting under this exercise is to see which region prefers foreign movies

Table 6: Counterfactual and Actual Domestic Revenue For Spec 1

Year	2012	2013	2014
Actual Theater	887	1459	2033
Cf Theater	843 (-5%)	1356 (-7%)	1901 (-6%)
Actual Producer	245	428	557
Cf Producer	249 (+2%)	448 (+5%)	571 (+2%)
Actual Distributor	224	358	505
Cf Distributor	211 (-6%)	327 (-9%)	466 (-8%)
Actual Total	1356	2245	3095
Cf Total	1303 (-4%)	2131 (-5%)	2938 (-4%)

This above table uses counterfactual spec 1. When a theater shows a trimmed movie γ_f at time t, we counterfactually let them show movie $min_j\{\gamma_j\}$ at time t. The counterfactual results (Cf) compared to the actual values for each year are showed in units of millions. dollars for different domestic players. We assume that theaters, distributors, and producers would get 52.3%, 13.1%, and 26.2% respectively for domestic movies before tax. For foreign movies, we assume domestic theaters would get 52.3% and the domestic distributors would get 14.4%. Prices for out-of-sample counterfactuals are calculated using theater-year level average prices.

Table 7: Comparing Key Results for Counterfactuals For Spec 2

Year	2012	2013	2014
# Actual Imported Movies in sample	25	29	26
# Cf Imported Movies in sample	18	16	17
Actual Admissions	304	495	674
Cf Admissions	297 (-2%)	473 (-4%)	660 (-2%)
Actual Domestic Admissions	172	298	383
Cf Domestic Admissions	177 (+3%)	318 (+7%)	403 (+5%)
In-Sample Actual Admissions	291	452	638
In-Sample Cf Admissions	292 (+1%)	456 (+1%)	645 (+1%)
Out-of-sample Actual Admissions	14	43	37
Out-of-sample Cf Admissions	5	17	15

This above table uses counterfactual spec 2. If theater k shows a trimmed movie γ_f at time t, we counterfactually let k show movie $min_j\{\gamma_j\}\_st\_j \in J(t-1)$ at time t. $J(t-1)$ denotes the set of movie available at time $t-1$. The counterfactual results (Cf) compared to the actual values for each year are showed in units of millions. We only keep the best 20 movies among the 34 movies ranked by global box office excluding Chinese box office in the counterfactuals. Since not all top 20 movies ranked by global box office made to the top 100 movies in the Chinese market, our sample has fewer than 20 every year in the counterfactuals. In-sample represents the common movies between actual and counterfactuals. Out-of-sample actual means the removed foreign movies in our dataset. Out-of-sample Cf means the replaced movies using worst movie FE. We treat those movies as domestic.

Table 8: Counterfactual and Actual Domestic Revenue For Spec 2

Year	2012	2013	2014
Actual Theater	887	1459	2028
Cf Theater	848 (-4%)	1380 (-5%)	1929 (-5%)
Actual Producer	245	428	557
Cf Producer	252 (+3%)	462 (+8%)	586 (+5%)
Actual Distributor	224	358	503
Cf Distributor	213 (-5%)	333 (-7%)	473 (-6%)
Actual Total	1356	2245	3088
Cf Total	1312 (-3%)	2175 (-3%)	2989 (-3%)

This above table uses counterfactual spec 2. If theater k shows a trimmed movie γ_f at time t, we counterfactually let k show movie $min_j\{\gamma_j\}\_st\_j \in J(t-1)$ at time t. $J(t-1)$ denotes the set of movie available at time $t-1$. The counterfactual results (Cf) compared to the actual values for each year are showed in units of millions dollars for different domestic players. We assume that theaters, distributors, and producers would get 52.3%, 13.1%, and 26.2% respectively for domestic movies before tax. For foreign movies, we assume domestic theaters would get 52.3% and the domestic distributors would get 14.4%. Prices for out-of-sample counterfactuals are calculated using theater-year level average prices.

Table 9: Comparing Key Results for Counterfactuals for Spec 3

Year	2012	2013	2014
# Actual Imported Movies in sample	25	29	26
# Cf Imported Movies in sample	18	16	17
Actual Admissions	304	495	676
Cf Admissions	294 (-3%)	463(-6%)	650(-4%)
Actual Domestic Admissions	172	298	383
Cf Domestic Admissions	173 (+1%)	303 (+2%)	390(+2%)
In-Sample Actual Admissions	291	452	638
In-Sample Cf Admissions	293 (+1%)	459 (+2%)	648 (+2%)
Out-of-sample Actual Admissions	14	43	38
Out-of-sample Cf Admissions	1	3	2

This above table uses provincial level demand system in equation (6) and counterfactual spec 3. If theater k in province p shows a trimmed movie γ_f at time t, we counterfactually let k show movie $min_j\{\gamma_{jp}\}$ at time t. The counterfactual results (Cf) compared to the actual values for each year are showed in units of millions. We only keep the best 20 movies among the 34 movies ranked by global box office excluding Chinese box office in the counterfactuals. Since not all top 20 movies ranked by global box office made to the top 100 movies in the Chinese market, our sample has fewer than 20 every year in the counterfactuals. In-sample represents the common movies between actual and counterfactuals. Out-of-sample actual means the removed foreign movies in our dataset. Out-of-sample Cf means the replaced movies using worst movie FE. We treat those movies as domestic.

Table 10: Counterfactual and Actual Domestic Revenue for Spec 3

| Year	2012	2013	2014
Actual Theater	887	1459	2033
Cf Theater	840 (-5%)	1349 (-8%)	1899 (-7%)
Actual Producer	245	428	557
Cf Producer	246 (+0%)	439 (+3%)	567 (+2%)
Actual Distributor	224	358	505
Cf Distributor	210 (-6%)	323 (-10%)	464 (-8%)
Actual Total	1356	2245	3095
Cf Total	1295 (-4%)	2111 (-6%)	2929 (-5%)

This above table uses level demand system in equation (6) and counterfactual spec 3. If theater k in province p shows a trimmed movie γ_f at time t, we counterfactually let k show movie $min_j\{\gamma_{jp}\}$ at time t. The counterfactual results (Cf) compared with the actual values for the total revenue are showed in million dollars for different domestic players. We assume using common industry practices, theaters, distributors, and producers will get 52.3%, 13.1%, and 26.2% respectively for domestic movies before tax. For foreign movies, we would assume domestic theaters still get 52.3% and the domestic distributors would get 14.4%. Prices for out-of-sample counterfactuals are calculated using theater-year level average prices.

more when the foreign movie quota is relaxed. We calculate the following statistic for each province p:

$$\Delta F^p = (F_a^p - F_c^p)/(F_c^p + D_c^p), \tag{7}$$

where F_a^p is the actual provincial level admission for foreign movies when the quota was relaxed, F_c^p is the counterfactual admission for foreign movies had the quota not being relaxed, and D_c^p is the counterfactual admissions for domestic movies. Thus, ΔF^p captures how much each province watches foreign movies additionally as a percentage of total movie admissions when the quota is relaxed. If this statistic is big, it implies when there are more foreign movies available, consumers in that province would prefer foreign movies more than other consumers. Figure 10 plots these statistics for all the provinces in China. We observe that regions mainly in the inner land such as Tibet, Inner Mongolia that are economically poorer and have more minority would substitute towards more foreign movies than other provinces. Global cities such as Beijing and Shanghai would also watch more foreign movies. This suggests province-level heterogeneity and may be informative if the policymakers have regional preferences on foreign movie penetration.

Figure 10: Map of ΔF^p for Equation (7)
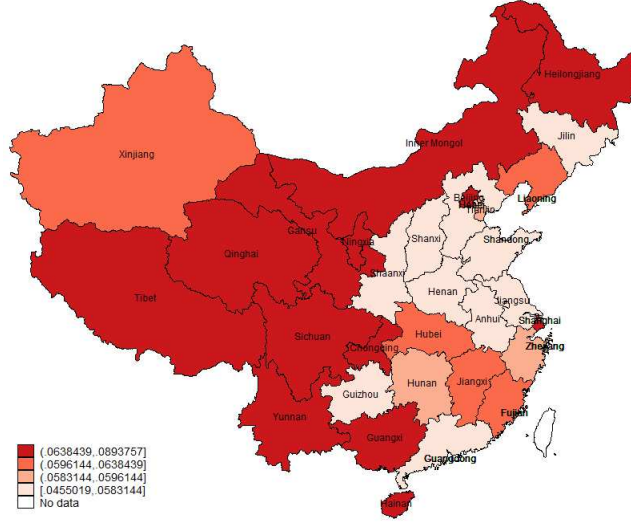
This above figure uses the demand system in equation (6) and counterfactual spec 3. If theater k in province p shows a trimmed movie γ_f at time t, we counterfactually let k show movie $min_j\{\gamma_{jp}\}$ at time t. The above map plots for each province the statistic of ΔF^p, as defined in equation (7).

5   Conclusion

Our paper uses a rich panel data set in the Chinese movie market and estimates a product-space demand of the movie industry in China. Economically, we illustrate that when an industry allows some domestic players to get rents from foreign goods sales and vertical integration between domestic players is possible, all domestic players may benefit as a result of more foreign goods in the market. Empirically, in the Chinese movie market, we show that when only 20 foreign movies were allowed to import, consumers would go to fewer movies in total (-3% to -5% in spec 1) and watch more domestic movies (+2% to +4%). However, domestic supply players as whole would lose revenue (-4% to -5%). This indicates a stricter protectionism policy may hurt both consumers and domestic production players. When we allow a provincial level demand system, we also show that inner-land China would watch more foreign movies when more foreign movies are imported, which indicates special regional concerns when designing policies.

There are several limitations of this paper. For example, since we do not know the exact share between players in any integrated entity, we cannot calculate how exactly a domestic producer may benefit from downstream revenue. We also cannot show causally, whether increase in total revenue of all domestic players may translate to higher productivity in domestic movie quality and quantity. In addition, one important factor of the debate about cultural goods is whether invasion from foreign countries may result in decline in domestic

culture. Even if we can show increases in domestic revenue resulting from playing foreign movies result in increase in domestic movie quality and quantity, we may worry that whether these domestic movies are still "domestic" culturally. Are these movies culturally becoming more foreign? We cannot answer this question in this paper. Indeed, any attempts to answer this question involve a much more difficult yet important question – "what is domestic culture?"

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