Center for Economic Institutions Working Paper Series

CEI Working Paper Series, No. 2005-14

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Renegotiation, Learning and Relational Contracting.

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March 2006

Abstract

This paper empirically examines contract renegotiation and learning in the movie industry under long-term business relationships. The paper develops a theory of renegotiation and learning with incomplete contracts. This theory shows how renegotiation as an ex-post mechanism to adjust participation constraints, together with learning, allows agents to maximize the value of the contractual relationship in the presence of incomplete contracts and long term relationships. The theory defines clear testable implications that I test in the paper. For this purpose, I use a new dataset of revenue-sharing contracts and renegotiation outcomes in the Spanish movie industry. I find that movies that perform overall below expectations are renegotiated 20% more often. I find as well that movies are 6 to 8% more likely to be renegotiated in theaters where movie revenues are below the movie average revenues. Following this, I find evidence that economic agents learn across periods about the real movie audience appeal and use the new information to adjust their beliefs and make daily decisions. Finally, I conclude that contractual incompleteness is optimal in this case as long as learning allows firms to cut movie runs optimally.

[*]I thank Tom Hubbard, Ali Hortaçsu, Chad Syverson, Michael Greenstone, Michihiro Kandori, Akihiko Matsui, Hisashi Nakamura, Linda Cohen, Jun Ishii, Hugo Hopenhayn, Dan Ackerberg, Hongbin Cai, Raphael Thomadsen and seminar participants at Chicago, National University of Singapore, Santa Cruz, ARE Berkeley, IIOC, Davis, ESWC, Carlos III, Osaka, Hitotsubashi, Tokyo, Irvine and UCLA for their comments and useful suggestions. At the same time, this paper would have not been possible without the kind collaboration of industry managers Juan Antonio Gomez, Tomas Naranjo, Javier Ramirez, Pablo Nogueroles and Eva Rekketyei. The usual disclaimer applies.

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1 Introduction

Writing a complete contract is not an easy task. The cost of including all the possible contingencies or verifying all actions undertaken by the two parties may be prohibitive. This means that firms face a trade-off between contract cost and contract completeness. Under these circumstances, firms find solutions to incomplete contract scenarios with other firms, and solve likely agency problems using informal agreements, long-term contracts or vertical integration as possible solutions.

The complexity of this problem has motivated economists to study its solutions. In particular, Baker, Gibbons and Murphy (1994) and (2002) studied the use of informal agreements and relational contracts within and across firms, Joskow (1987) and (1988) studied the use of long-term contracts in the coal industry, and Klein, Crawford and Alchian (1978), among many others, studied the use of vertical integration as a way to prevent ex-post opportunistic behavior. Despite these and others not mentioned here, there is still much to understand about relational contracts and informal mechanisms that govern different industries, since each industry is driven by different institutional scenarios. Understanding further how relational contracts work constitutes the main goal of this paper.

This paper examines the renegotiation mechanism in movie exhibition contracts and argues that renegotiation allows agents to enhance efficiency in the presence of incomplete contracts. This analysis sheds light on how firms use relational contracts and reputation to enable simple contracts in complex business relationships. The approach here resembles that of the ex-post settling up literature (Goldberg (1977), Joskow and MacAvoy (1975)) where contracts are used as guidelines, and the parties adjust contractual terms ex-post.

However this mechanism of adjustment is not driven by incentive compatibility constraints, but participation constraints (same as in Oyer (2004) and Oyer and Schaefer (2004)). Therefore, this mechanism differs from the usual renegotiation studied in the literature where incentives are the main focus and raises the question of "what is the role of incentive contracts with no incentive effects" (Oyer (2004)).

This paper is motivated by anecdotal evidence, for which I develop a theory that supports it. I use the anecdotal evidence to reduce the set of possible explanations driving the renegotiation mechanism, and the empirical evidence to test the implications of the theory. This may be the main contribution of this paper since, to the best of my knowledge, this is among the first studies that empirically examines the renegotiation mechanism within an implicit and incomplete contracting scenario and provides an empirical test for the existence of contract renegotiation.[1]

[1] Recent studies that empirically examine renegotiation in contracts are Cai, Li and Zhou (2003) in the Chinese

For this purpose, I use a new and unique data set collected from a Spanish movie exhibitor. Exhibitors use revenue sharing contracts when they rent movies from distributors. In this data set, I observe the initial and final revenue sharing rate. Since the original contract establishes a rate for every week that the movie stays on screen, I do not only observe renegotiation outcomes across movies but also across theaters and weeks. I exploit this variation to study how changes in movie performance and its environment affect renegotiation outcomes. I observe contract renegotiation outcomes from January 2001 to June 2002. This constitutes an extensive data set of roughly 19,000 observations (55% renegotiated) that allows me to examine why firms renegotiate and test the implications from the model in the paper.

I find that exhibitors are more likely to renegotiate when the demand realization lies below average, and that larger deviations from the average result in larger differences between ex-ante and ex-post contract terms. These findings are robust across different specifications. I argue that the fact that renegotiation is always one-sided and more likely under negative revenue deviations from expectations is evidence that renegotiation is part of a mechanism used under incomplete contracts to adjust ex-post the participation constraint of exhibitors and maximize the gains from the contractual relationship at stake.

This mechanism enhances efficiency because it allows firms to learn about the movie's audience appeal during its run. Exhibitors then terminate contracts optimally and exhaust the gains from each contractual relationship. Therefore, if exhibitors learn about the movie quality across periods and use the new information set to adjust the sharing term through renegotiation, they may use the same new information set to decide on whether to stop the movie run. I find that deviations below expectations that drive renegotiation also affect movie run termination decisions, and I interpret this as evidence of the existence of learning. Therefore, I conclude that agents find optimal using incomplete contracts in this scenario.

This paper relates as well to other lines of research. The vertical relations literature examines the effect of different contractual forms on the agents' incentives (Dana and Spier (2001), Mortimer (2002)). Secondly, the contracts literature, although large in theoretical grounds, it lacks the supporting empirical work, and studies the use of simple contractual forms (Holmstrom and Milgrom (1987)) and implicit contracts (Lee and Png (1990), Chakravarty and MacLeod (2004)). Finally, the renegotiation literature is also mainly limited to theory motivated by anecdotal evidence. This paper builds from the work of MacLeod and Malcomson (1993), and Hart and Moore (1988). Both papers analyze how incomplete contracts benefit from renegotiation, and agree that the specificity

banking industry, and Filson, Switzer and Besocke (2004) in the US movie industry.

of the investment is key for this matter[2]. Recent work by Wernerfelt (2004) shows that the threat of renegotiation optimally drives contractual incompleteness of non-price decisions, reversing then the direction of the causality found in the literature. This result resembles the conclusion in this paper. Due to renegotiation, and relational contracts, firms find optimal to leave contracts incomplete, and maximize the use of the new information every week.

The paper is structured as follows. In section 2 I describe the structure, institutions and contractual form that governs the motion picture industry. Section 3 presents a model of renegotiation and learning customized to the movie industry. There, I show how renegotiation allows the two agents to trade under incomplete contracts. I also describe how firms learn gradually about the actual quality of the movie and how this process affects their decisions in movie run length. In section 4, I describe the data. In the following section, I proceed with my empirical estimation to test the implications from the theory. Empirical results are robust across specifications and support the view that renegotiation serves to adjust participation constraints ex-post under incomplete contracts. Results also suggest that firms learn gradually about demand, and that they use the new flow of information to stop movie runs optimally. Section 6 concludes.

2 Institutional Details and Contracts in Movies

This section describes the institutional framework of the movie industry, drawing heavily from interviews with managers and previous work (Gil (2004)). The movie industry is divided mainly into three sectors: production, distribution and exhibition. The production sector includes all those agents who produce movies. Producers use distributors to introduce movies into the theater market. Finally, exhibitors run theaters and place movies on their screens to attract the audience that will generate box office revenue. Since this paper studies the contractual agreements between distributors and exhibitors, I concentrate my analysis on these two sectors.

Distributors maximize revenue across the movies they distribute into the theater and ancillary markets, and they are in charge of promoting these films through advertising and other activities. On the other hand, *exhibitors* maximize total box office revenue of the movies they show, in addition to revenue from other sources such as concessions. *Exhibitors* are in charge of screen space management and some promotional activities such as advertisements inside the theater, previews and site specific promotional activities.

[2] Other work in this literature comes from Fudenberg and Tirole (1990), Beaudry and Poitevin (1993), and Aghion, Dewatripont and Rey (1994).

Distributors' and exhibitors' incentives differ in that the distributors maximize box office revenues and revenues from ancillary markets, whereas the exhibitors maximize revenues from box office and concession sales. Notice then that their objective functions are different and that incentive alignment problems grow for movies with audience appeal more difficult to predict.

2.1 Contractual Environment

Distributors and exhibitors use revenue-sharing contracts. Each contract specifies the names of the distributor and exhibitor involved in the transaction, the movie and the theater at stake.[3] Each contract specifies a weekly share of movie box office revenues that the distributor keeps. By default, the exhibitor keeps the remaining amount of revenue. The revenue-sharing terms for the distributors usually decline from 60% to 40% and this decline varies across movies and theaters. Figure 1 presents a typical contract.

The contracts that distributors and exhibitors use do not specify the length of the movie run. The exhibitor decides when to stop showing the movie. In the interviews I learnt that the arrival of new information, such as the releases of theaters close by, affects the optimal movie run length. Therefore it is not optimal ex-ante to commit to a fixed termination date. The arrival of new information is not contractible and constitutes part of the contractual incompleteness.[4]

Although it may be possible to contract on output, it is not possible to contract on the exhibitor's opportunity cost of showing the movie an extra week since that value is not observable nor verifiable. Having a fully contingent contract in this case is very expensive, and probably unfeasible. This constitutes another major source of contractual incompleteness and a main reason why movie termination is not contractible.

Distributors use different sharing terms in their contracts to account for the existing heterogeneity in movies. For instance, contracts of movies expected to have a large share of their revenues early in their run will contain high distributor's shares at the beginning and experience a decline in later weeks. On the contrary, contracts of movies with larger shares of revenues in later weeks will have low distributor's shares at the beginning and experience moderate declines after that (if any at all). These downward sliding and flat term schemes are designed to provide the exhibitor with

[3] Each contract is screen specific. That means that if a movie is shown in more than one screen in a theater, the distributor and exhibitor must write down a contract per screen used.

[4] If the movie performs below expectations, the exhibitor is clearly worse off. If, on the contrary, the movie performs above expectations, negotiation of the new contract could lead the distributor to act opportunistically. Therefore, it seems that leaving this part of the contract open solves the ex-post opportunistic behavior problems. Some of this new information could come in the form of weather change or externalities between movies and major sport events on TV.

the right incentives to continue the movie's run an extra week, and not open with a new movie release.

The simplicity of contracts and the contractual incompleteness surrounding the interactions between distribution and exhibition lead both parties to use other mechanisms not specified explicitly in the contract. In the next section I describe how firms use renegotiation to adjust sharing terms ex-post.

2.2 Renegotiation Mechanism

In this industry, firms adjust revenue sharing terms ex-post. Exhibition managers decide to keep movies on screen up to the point that their share of revenue equals the opportunity cost of holding the movie an extra week. When they decide to keep the movie an extra week, they have in mind already the probability of renegotiating such terms. Therefore, the moment that a movie is not profitable, even under renegotiation, the exhibition manager decides to stop its run.

During the interviews, I learnt that distribution managers never start the renegotiation process, exhibition managers do. Once managers cut the movie run, they go back to examine the outcomes of the initial contract and the relevant conditions in each one of the weeks. Managers do not have a specific rule for renegotiation, that is, renegotiate if sales go below certain threshold level. Managers claim that setting such a rule would be difficult since the same screen can be under many different effects and commitment to any rule is not credible.

Managers evaluate revenue quantities, and adjust these through renegotiation of the sharing terms specified in the contract. Even though renegotiation responds to unobservable causes, exhibition managers said during the interviews that they do not take advantage from it. Managers claim that the continuous contact between firms in the market softens perverse incentives since the same distribution firm brings more than one movie every year and no exhibition firm wants to lose the opportunity of opening any potential hit. Therefore, managers describe the process of renegotiation as one where they look at the amount that the initial contract term attributes to the exhibition firm, and judge whether that amount is "adequate" to the promoting effort exerted by the firm, and maintenance and opportunity costs of the screen.

Exhibitors claim that they are careful not to ask for renegotiation too much or in situations where they may be perceived as greedy. The interview with one of the managers provided insightful anecdotal evidence regarding this. According to this manager, a distribution firm denied renegotiation to one exhibition firm, and that responded to this by denying business during a certain amount of time. This retaliation period was not infinite though, and soon the distributor and exhibitor made business together again. These episodes are the exception of these vertical relations rather than the rule.

3 The Model

This section presents a model of renegotiation and learning under incomplete contracts that fits the institutional characteristics described above, and provides suitable testable implications. In this model, two individuals (distributor and exhibitor) write a contract to split revenues from a product (movie). I describe next the role and decisions that each one of these agents is responsible for within the contractual relationship. Figure 2 shows the timing of actions.

The distributor owns the movie. She does not obtain utility from the sole ownership of the movie, but from the revenue that the movie generates. Therefore the distributor needs the exhibitor to market the movie or the movie is worth nothing to her. I also assume that the distributor cannot do any action to enhance the productivity of the movie during its run.[5] I take as given the contractual form (revenue sharing) between the distributor and exhibitor. I do not discuss the suitability of the contractual form in this paper, since my main point of focus here is renegotiation and learning.

3.1 Incomplete Contracts

The distributor owns the rights of exploitation of a movie i, but needs of an exhibitor (or the screen that she runs) to undertake such exploitation. Assume that movie i brings revenue R_{ti} in every period t, and that distributors have a prior of movie success P_i^{t-1}, which can differ from the actual movie success P_i that firms can learn over time. There is also a marginal cost c_{tj} of exhibition and a marginal cost d_{ti} of distribution per period. The realization of both R_{ti} and c_{tj} are unknown to distributor and exhibitor previous to showing the movie, and therefore there is uncertainty about what the revenue and the opportunity cost of the exhibitor will be. I specify revenues R_{ti} and their expectation such that

$$R_{ti} = k_t P_i + \epsilon_{ti}$$

and

$$E_{t-1}[R_{ti}] = k_t P_i^{t-1},$$

[5] The distributor is in charge of movie advertising, but most of this advertising (and other promotional activities) take place before the movie release. This validates the assumption here.

where ϵ_{ti} is a disturbance *iid* and $N(0, \sigma^2)$, and k_t is a parameter specific to each period t, and constant across movies. In other words, distributor and exhibitor are uncertain about the level of revenues (P_i), but they know what the revenue change rate between periods ($\frac{k_t}{k_{t+1}}$) is.

Therefore in a world where it is costless to identify c_{tj} and P_i, contracts will include a number of clauses (one for each possible contingency) that cover all possible scenarios. In the model, I index contingencies by using w ($w = 1, 2, ..., n$). Therefore the exhibitor will accept to show movie i in period t as long as

$$(1 - s_{tw})R_{ti} > c_{tj}^{w} \tag{1}$$

where s_{tw} stands up for the share of revenue that the distributor keeps at each realization w of c_{tj} in period t, and R_{ti} is the amount of revenue that movie i yields in period t. Expression (1) says that exhibitors will show movie i up to period t when net revenues cover exhibition costs. Despite this, gains of this business relationship are maximized if exhibitors will continue a movie's run until the period T when

$$R_{Ti} < c_{Tj}^{w} + d_{Ti}. \tag{2}$$

Expression (2) says that the exhibitor should show movie i up to period T when there is no value of s_T ($0 < s_T < 1$) that covers both the exhibition and distribution costs at the same time. The distributor takes into account both rules in (1) and (2) when she designs a contract in period 0 that aligns the exhibitor's incentives with her own. This means that contracts could include n contingencies that specify s_{tw} and T_w (movie run length) for every possible w.

Despite this, in the spirit of Segal (1999), including contingencies in a contract and identifying the realizations of the opportunity cost could be prohibitively costly. In that sense, if the cost of including z contingencies followed a function $G(z)$ and this was increasing in the number of clauses z in a contract ($G'(z) > 0$ and $G''(z) > 0$), there will be a value z^* ($z^* < n$) for which it is not profitable to include an extra clause in the contract. In this case, $z^* < n$, and the contracts will not include a clause for each possible contingency. Therefore it will be optimal to write not complete contracts.

Taking as given that these contracts are not complete, I continue my analysis assuming that distribution firms choose only one term s_t per period t. In that case, distributors set s_t for every t such that

$$(1 - s_t)E_0[R_{ti}] = E_0[c_{tj}], \tag{3}$$

as long as

$$E_0[R_{ti}] \geqslant E_0[c_{tj}] + d_{ti}. \tag{4}$$

See d_{ti} has not appeared in expressions (1) and (3). I am implicitly assuming that d_{ti} is always smaller than $s_t R_{ti}$. Another assumption here is that the distributor has all the bargaining power when designing the contract.[6]

3.2 Renegotiation and Learning

As distribution firms use their expectations in period 0 to write down the initial s_t, the participation constraint will bind in a number of occasions. This circumstance would determine the immediate termination of the movie run (expression (1)), and a major source of inefficiency in this contractual relationship.

Therefore, there exist gains of allowing ex-post adjustments to s_t once uncertainty resolves (by following expression (2)). Then if the participation constraint above binds in period t such that

$$(1 - s_t)R_{ti} < c_{tj}, \tag{5}$$

there will be gains of allowing the revenue sharing term adjust ex-post such that

$$(1 - s_t^*)R_{ti} = c_{tj} \tag{6}$$

and continue the movie run. Therefore, if we define $R_{ti} = E_{t-1}[R_{ti}] + \epsilon_{ti}^r$ and $c_{tj} = E_{t-1}[c_{tj}] + \epsilon_{tj}^c$, there will exist renegotiation if

$$(1 - s_t)(E_{t-1}[R_{ti}] + \epsilon_{ti}^r) < E_{t-1}[c_{tj}] + \epsilon_{tj}^c \tag{7}$$

and

$$(1 - s_t)\epsilon_{ti}^r - \epsilon_{tj}^c < E_{t-1}[c_{tj}] - (1 - s_t)E_{t-1}[R_{ti}] \tag{8}$$

Now take period 1 for example. The distributor sets s_1 such that

$$(1 - s_1)E_0[R_{1i}] = E_0[c_{1j}] \tag{9}$$

[6] This assumption is not far from reality, since the number of movie copies is always smaller than the number of screens available.

See that the expectation in period 1 is proportional to the prior available of movie i such that

$$E_0[R_{1i}] = E_0[k_1 P_i] = k_1 E_0[P_i] = k_1 P_i^0.$$

Assume then that when exhibitor observes R_{1i}, she knows that R_{1i} consists of two different components

$$R_{1i} = k_1 P_i + \epsilon_{1i}$$

where the first component ϵ_{1i} is a disturbance normally, identically and independently distributed ($N(0, \sigma^2)$) and the second component is the revenue amount due to the actual movie audience appeal P_i. The exhibitor cannot distinguish between these two components.

Therefore, the exhibitor learns some information from the revenue realization R_{1i} that she uses in period t to decide whether to cut the movie's run. Then, exhibitors Bayesian update their prior of the movie audience appeal P_i every period incorporating the new information in R_{1i}. Conjugate distribution theory (Degroot (1970)) shows that Bayesian updating a normal prior distribution of W of mean μ and precision τ, using random draws X_i (i = 1, ..., n) from a normal distribution for unknown mean and precision r, results in a normal posterior distribution of W with mean μ' and precision nr, where

$$\mu' = \frac{nr\overline{x} + \tau\mu}{nr + \tau},$$

n is the number of draws and $\overline{x} = \sum_{i=1}^{n} x_i$. This result shows that the posterior mean is a weighted average between the prior mean μ and the mean of the random draws ($\overline{x}$). An implication of this result is how much the prior mean changes everytime we observe a new random draw. Applying the result above to the notation in this paper, the new prior P_i^t is a linear combination of the previous prior P_i^{t-1} and the new information contained in R_{ti} such that

$$P_i^t = \frac{rP_i^{\dagger}(R_{ti}) + \tau P_i^{t-1}}{r + \tau}, \tag{10}$$

where r and τ are weights and precisions for the random draw and the prior distribution respectively.[7] Assume then for simplicity that $P_i^{\dagger}(R_{ti}) = \frac{R_{ti}}{k_t}$ (since $E(\epsilon_{ti}) = 0$). Therefore, if the exhibitor decides whether to continue the movie's run into the following period, expression (11) must be true

$$E_t[R_{t+1,i}] \geqslant E_t[c_{t+1,j}] + d_{ti}. \tag{11}$$

[7] This relates to recent work from Ackerberg (2003) and Hubbard (1997).

If we decompose the left-hand side of the equation we find

$$E_t[k_{t+1}P_i] = k_{t+1}P_i^t \geqslant E_t[c_{t+1,j}] + d_{ti}. \tag{12}$$

Substituting in expression (10) by P_i^t, we find

$$k_{t+1}[\frac{rP_i^\dagger(R_{ti}) + \tau P_i^{t-1}}{r+\tau}] \geqslant E_t[c_{t+1,j}] + d_{ti}.$$

Use expressions above $R_{ti} = E_{t-1}[R_{ti}] + \epsilon_{ti}^r$ and $R_{ti} = k_t P_i^\dagger(R_{ti})$ to arrange expression (13) and we find that

$$\delta\epsilon_{ti}^r \geqslant \frac{k_t}{k_{t+1}}(E_t[c_{t+1,j}] + d_{ti}) - k_t P_i^{t-1}, \tag{13}$$

where $\delta = \frac{r}{r+\tau}$. If this condition is reverse, the exhibitor will decide to stop the movie's run. That means that for very low values of ϵ_{ti}^r the exhibitor will adjust downward her beliefs and decide that there does not exist an allocation of revenue between distributor and exhibitor that makes them both better off by continuing the business relationship.

We can summarize the results so far with the following two propositions:

Proposition 1 *Firms will renegotiate contracts ex-post when the participation constraint of the exhibitor is not satisfied. The contract will be renegotiated when*

$$(1-s_t)\epsilon_{ti}^r - \epsilon_{tj}^c < (1-s_t)E_{t-1}[R_{ti}] + E_{t-1}[c_{tj}].$$

This means that distributors will adjust down their share of revenue to equal exhibitor's revenue to their opportunity cost if large negative deviations from revenue expectations or large positive deviations from cost expectations occur.

Proposition 2 *The exhibitor will use the newly released information in the current period to decide whether to continue the movie's run into the following period. In particular, the exhibitor will decide to cut the movie run if*

$$\delta\epsilon_{ti}^r < \frac{k_t}{k_{t+1}}(E_t[c_{t+1,j}] + d_{ti}) - k_t P_i^{t-1}.$$

This means that the exhibitor will cut the movie's run if the negative deviation from revenue expectations exceeds the difference between the sum of exhibitor and distributor's cost and the expected revenue of the following period with today's information.

The fact that distributors and exhibitors do not know P_i (they know at most a prior P_i^0) makes it difficult to contract on movie run length, and therefore letting the exhibitor decide in this margin by using the information that comes in every period through ϵ_{ti}^{r} is efficient since it exhausts the gains of the business relationship by extending the movie run.

On the other hand, each contract has its own last period where the incentives to deviate from this informal agreement and not allow renegotiation are the highest. In a world, where these two agents are likely to meet over and over, the market will come up with a default strategy that will deter agents from deviating from the initial agreement. In this case, if we call Π^{ND}, Π^{D} and Π^{Def} the profit from no deviating, the profit from deviating and the profit during the default strategy respectively, we need to set the gains from no deviating as big as the gain from deviating, and the default outcome. The following expression must be fulfilled

$$\frac{\Pi^{ND}}{1-\beta} \geq \Pi^{D} + \frac{\beta\Pi^{Def}}{1-\beta}. \tag{14}$$

In this industry, both distributors and exhibitors have incentives to act opportunistically: the former by not allowing renegotiation, and the latter by asking renegotiation when they should not. This takes us to Proposition 3.

Proposition 3 *Renegotiation becomes a sustainable mechanism to adjust participation constraints ex-post if agents meet often in the market and there exists a market mechanism (default strategy) that punishes opportunistic agents.*

The propositions here specify first a mechanism through which distributors prevent exhibitors from dropping movies too early (ex-post adjustment of their participation constraints), and second, the mechanism that makes this informal agreement sustainable in equilibrium.

3.3 Testable Implications

Under the assumptions above, renegotiation provides ex-ante incentives for contractual parties and therefore it becomes an efficiency-enhancing mechanism. Under this premise, we have four main testable implications:

• Firms will renegotiate when participation constraint is not satisfied. It is not possible to observe changes in the right hand side of the participation constraint, but we can observe unexpected changes in box office revenue with respect to previous expectations. Therefore, *negative deviations will increase the probability of renegotiation, whereas positive deviations will not have any effect.* Note that positive deviations should have an effect under practically any other theory.

• Similarly, *larger negative deviations will cause larger term renegotiations, whereas larger positive deviations should not have any effect.*

• New information arrives in every period. Firms use this new information to update their decisions on when to terminate the movie run. Therefore, realizations of demand today bring information about the realization of demand tomorrow. We should observe that *a negative deviation from demand expectation today increases the probability of cutting the movie run tomorrow*, and that *the same negative deviation has a weaker effect on movie run stopping decisions than it does on renegotiation* (since $0 < \delta < 1$).

• Finally, different movies will have different δ. As $\delta = \frac{r}{r+\tau}$, this means that *movies with less precise prior distributions will be more sensitive to larger negative deviations.*

The last two implications have to do with the decision of continuing the movie's run into the following period, and the learning process involved. Since exhibitors make this decision every period, the timing is consistent with the arrival of new information and the corresponding update in movie audience appeal P_i. The existence of learning drives the decentralization of decisions and its efficiency. Following this, I present the data and I test the implications of this model.

4 The Data

In this paper, I use a new data set on contract renegotiation outcomes from a movie theater company in Spain. I collected this data set in the summer of 2002 while visiting and interviewing six different managers, each of them from different Film Booking departments. Two of these firms are located in Barcelona and the rest in Madrid, where I travelled to get a closer impression of the business and of the answers of the managers. The confidentiality of the contract data that my project required, and sometimes the informality of the business, only made possible the total collaboration of one of the film bookers.[8] According to most of the interviewed managers, the firm disclosing the data used in this paper is representative of the renegotiation process in this industry.

This data set consists of the shares specified in the contracts and the renegotiation outcomes for one major exhibition firm in Spain from January 2001 to June 2002. I observe weekly initial and final revenue share per movie and theater where that movie is playing. The data consists of approximately 19,000 observations of which 55% are renegotiated. I show summary statistics of contract terms in Table 1. The exhibition firm providing the data runs 25 theaters that are spread around 16 cities located in 11 different provinces. Its theaters vary in size from 1 to 16 screens and their total seat capacity goes from 400 to roughly 4,000 seats. On top of this, the towns where the theaters are located vary greatly in market size and income: the smallest town has 8,000

[8] Two other film bookers agreed to disclose initial contract terms. I do not use this data here since I do not observe renegotiation of those initial terms.

inhabitants whereas the largest has almost 3 millions.

This exhibition firm showed 371 movies during this period. Some characteristics of these movies also appear in Table 1. These movies are distributed by 21 different distribution firms of different sizes and business background. The movies come from 16 different countries from which USA, Spain, UK and France are the most represented. Sixty percent of the movies were released in the United States previous to their release in Spain. I also collected for each movie the total box office revenues in Spain, and US box office revenue when available.

4.1 Constructing Demand Shocks

I construct two measures of demand shocks: a measure of the deviation from the overall expected performance, and a measure of deviation over the average revenues of the movie in a given period.

I call the first type of deviation "Aggregate Deviation". This is a variable that measures whether a movie performed over or below its expectation given the information that we have on that movie previous to its release in Spain. To construct this variable, I ran OLS of Spanish Box Office on US Box Office for those movies with US release in a larger sample of movies released during the same period. These two revenue numbers show a strong positive correlation, and therefore I use the US Box Office as a signal to the performance in the Spanish market.[9] I use the residuals of that regression as deviations from movie expectation. I also generate a dummy variable "Negative Aggregate Deviation" that takes value 1 if "Aggregate Deviation" takes a negative value and 0 otherwise.

In order to construct the second type of deviation, I must first overcome a problem of data availability. I do not observe the revenue of each movie every week in every theater, but I do observe the revenue generated in every theater every week. Since I observe which movies are playing in each theater in every period, I use variation in movie composition and theater size to disentangle movie revenues from theater revenues.

In order to do this, I use the results from the two-step estimation in Gil (2004). There, I use a much larger data set with larger number of theaters and exhibition firms. I assign a starting box office revenue (A_i) and decrease (or increase) rates (γ_i and β_i) after the opening week that are movie specific such that $BOR_{it} = A_i e^{\gamma_i t + \beta_i t^2}$. My dependent variable is $\ln(BOR_{jt})$ which stands for the logarithm of the box office revenue for theater j in period t. In the first step, I fit equation

[9] Industry managers agreed with the assumption here that observed success in the US leads to higher expectations of performance in the local market.

(16),

$$\ln(BOR_{jt}) = \sum_{i\in j,t}[\ln(A_i) + \gamma_i l_{it} + \beta_i {l_{it}}^2] + \alpha_j + \delta_t + \epsilon_{jt} \tag{15}$$

where l_{it} stands for run length of movie i in period t since the movie was released, α_j are theater fixed effects that capture both the effect of physical characteristics and relative success of each theater in particular, and δ_t are period fixed effects. Therefore, $\ln(BOR_{jt})$ equals the sum of logarithms of revenue of all movies playing in theater j in period t, being each one of them at different run lengths since each movie has its particular release. The parameters A_i, γ_i and β_i are the parameters of interest in this equation.

With these parameters for all movies playing, I compute an estimate of box office revenue amount to any movie i in any period t during its lth week $\widehat{BOR}_{it}$. I interpret this estimated movie box office revenue as a measure of how popular that movie is across theaters and weeks. I then use this measure of popularity to attribute proportional shares of the revenue (that I observe) at the theater level according to their share of popularity. In particular, I attribute a share of the observed revenue to each movie i in each theater j and period t equal to the share of popularity of that movie i in that theater j and that period t by applying the implied revenue common to all theaters and the estimated coefficients $\widehat{A}_i$, $\widehat{\gamma}_i$ and $\widehat{\beta}_i$, such that $s_{ijt} = \frac{\widehat{BOR}_{it}}{\sum_{i\in j,t}\widehat{BOR}_{it}}$.

Once I attribute the revenue across movies according to these shares, I can create my second measure of demand deviation from expectations. I compute averages of revenue per movie and week, and call "Local Deviation" the difference between BOR_{ijt} and the corresponding average $\overline{BOR}_{it}$. Again, I generate a dummy variable "Negative Local Deviation" that equals 1 if "Local Deviation" takes negative value and 0 otherwise.

Table 1 shows summary statistics of these two measures of demand shocks, and their respective dummy variables. Notice that the number of observations for the "Local Deviation" fell down to roughly 10,000 observations. This is so because we only observe box office revenue at the theater level for 56 weeks, instead of the 78 weeks that we have renegotiation observations for.

5 Empirical Evidence

Next, I test the empirical implications of the model. In the first subsection, I investigate the forces driving renegotiation and test the two theoretical implications from the model regarding the probability and magnitude of renegotiation. In the second subsection, I investigate the existence of learning and test the theoretical implications above that relate the information driving the renegotiation decisions to the information driving the continuation decision of movies' runs.

5.1 Renegotiation

I divide this section in two parts that aim to answer two different questions. The first one is when firms renegotiate. In my data, firms renegotiate roughly 55% of the time. Therefore I explore what causes exhibitors to renegotiate so often. The second question is what drives the magnitude of renegotiation. In the data I observe renegotiation outcomes that differ from their initial terms to a maximum of 31%. Figure 3 shows the average initial and final sharing terms per week since release.[10] The theory above has clear testable implications with respect to these two questions which I test using my data.

5.1.1 Extensive Margin: When to Renegotiate?

First implication of the data establishes that if the exhibitor participation constraint is binding, we should observe renegotiation of terms. This could happen because the revenue (left-hand side of participation constraint) dropped or because the opportunity cost (right-hand side) rose. I test this implication both using “Aggregate Deviation” and “Local Deviation”. These deviations from expectations represent changes in the left-hand side of the participation constraint whereas I try to control for changes in the right-hand side of the constraint by using theater and week characteristics. In Table 2, I order the two types of deviation in the paper (Aggregate and Local) and divide them into a different number of quantiles (4, 6 and 8). Just by looking at average renegotiation within quantile, we observe an inversely proportional relationship between the number of quantile and the average renegotiation: higher quantile numbers are associated with lower renegotiation of averages.

Figure 4 scatters “Aggregate Deviation” and the average renegotiation per movie in the data. Although not clear at first sight, the figure shows a negative relationship between the two variables: positive deviations are associated with lower average renegotiation per movie, and vice versa. This is confirmed by evidence in Table 3. Table 3 shows results from OLS regressions of average movie renegotiation on US Release dummy variable, and the interaction of this variable with the total box office revenue of that movie in the US, its “Aggregate Deviation” and a “Negative Aggregate Deviation” dummy variable respectively such that

$$AvgReneg_i = \alpha_0 + \alpha_1 US\text{Release} + \alpha_2 USBoxOffice + \alpha_3 AggDeviation + \epsilon_i.$$

I find that movies released in the states are less likely to be renegotiated, that movies that collected higher amounts of revenue in their US run are less likely to be renegotiated, and that movies

[10] Have in mind when looking at figures 5 to 8 that most of the observations are concentrated between the first five weeks of run (see Figure 9).

performing below expectations in the Spanish market are more likely to be renegotiated. An interesting result is that US Release importance vanishes when we add detailed information about performance in the US run. This suggests that there is no difference between those movies that were not released in the US and those released in the US collecting low amounts of box office. Results are robust across specifications. Estimates suggest that movies released in the US are 13% to 25% less likely to be renegotiated, an increase of one hundred million dollars of box office revenue collected in the US decreases renegotiation probability in 13% to 16%, a deviation of 10 million euros below expectation increases renegotiation probability by 40%, and that a negative deviation from expectation increases renegotiation probability on average by roughly 20%.

Despite this, a testable implication from the model states that positive deviations should not have an effect on renegotiation. Results in columns (1) and (2) of Table 8 show that movies with larger positive deviations are renegotiated less frequently than movies with smaller but still positive deviations. Even though this result is intuitive, it fails one of the testable implications of the model.

Evidence at the theater level does not yield different results. Figure 5 plots renegotiation average for movies with US Release and movies without US Release per week since release. The figure shows that average renegotiation is higher for movies with no US release during the first weeks and then equalizes with that of movies with US Release. On the other hand, Figure 6 plots the renegotiation probability for movies made in the US grouped by different amounts of US box office revenue. Renegotiation probability is inversely proportional to US movie performance during the first weeks of the run. After a few weeks, all of them converge to the same renegotiation probability. Findings in both figures suggest that movies with more uncertain ex-ante audience appeal are renegotiated more often during the first weeks of their run, and that endogenous movie attrition make these differences vanish in the long run.

Table 4 examines renegotiation outcomes at the movie/theater/week level. I estimate the Probit equation

$$\text{Reneg}_{ijt} = 1\{\alpha_0 + \alpha_1 \overline{BoxOffice}_{it} + \alpha_2 LocalDev_{ijt} + \alpha_3 X_{jt} + \epsilon_{ijt}\},$$

where Reneg_{ijt} takes value 1 if renegotiated and 0 otherwise, $\overline{BoxOffice}_{it}$ is the average revenues of movie i in week t, $LocalDev_{ijt}$ is the difference between the actual revenue of movie i in theater j in week t and the average revenue, and X_{jt} are other controls at the theater, market and week level. Again results are robust across specifications. Results indicate that a decrease of 1,000 euros in movie revenue expectation increases renegotiation probability by a magnitude of 3% to

5%, a deviation below expectations of 1,000 euros increases renegotiation probability by 3%, and a negative local deviation from expectations increases on average the probability of renegotiation by a range of 6 to 8%. Contrary to common intuition, theaters in more competitive markets seem to have more bargaining power. This result goes away and reverses as we include more fixed effects that deal with unobserved heterogeneity: theaters in more competitive markets are less likely to renegotiate their contracts.

Table 8 again tests whether positive deviations matter for renegotiation. Columns (3) to (6) in that table show that contracts of movies with larger positive deviations at the theater level are less likely to experience renegotiation than contracts of movies with smaller (but still positive) deviations. This again fails one of the testable implications in the model.

Evidence in this section shows that renegotiation is more likely to occur when movies experience negative deviations from expectations. This finding is robust both at the aggregate and local level, and across specifications in Tables 3 and 4. These results validate the first of the theoretical implications of the model in this paper. Despite this, evidence shows that decreases in positive deviations also increase the probability of renegotiation. This goes against the refined version of the implications of the theory. This could be due to the fact that our definition of expectation (average) is biased down, or to the fact that there are still a lot of changes in the right-hand side of the participation constraint that we are not controlling for.

5.1.2 Intensive Margin: How Much to Renegotiate?

The second testable implication from the theory is that bigger decreases of revenue (left-hand side of the exhibitor participation constraint) or bigger increases of opportunity cost (right-hand side of the exhibitor participation constraint) should be associated with bigger adjustments in the sharing term. I test this implication by examining patterns in the magnitude of the "Local Deviation" and the magnitude of renegotiation observed in the data. If it is true that renegotiation under incomplete contracts works as a mechanism to adjust ex-post participation constraints, then the change in sharing terms will be equivalent to a transference of money from the distributor to the exhibitor. Following this, I call the difference between the initial and final shares the renegotiation spread paid to exhibitors.

Figures 7 and 8 show the evolution of the average renegotiation spread for different subsets of movies across weeks since their release week. Figure 7 shows the average renegotiation spread for those movies without U.S. release versus the average spread for those movies with U.S. release. The spread of the former is higher than that of the latter during the first four weeks of the run, and they equate after that. On the other hand, Figure 8 shows the average spread of movies with a

US release divided in four groups (those that collected less than 1 million dollars, those between 1 and 50 million dollars, those between 50 and 100 million dollars and those over 100 million dollars). The spread size in the first three weeks is inversely proportional to the amount of revenue collected during their US run. After the fourth week, differences vanish. These findings resemble those described in Figures 5 and 6.

In Table 5 I run OLS regressions with the spread as a dependent variable using all observations by estimating the equation

$$\text{Reneg}Spread_{ijt} = \alpha_0 + \alpha_1 \overline{BoxOffice}_{it} + \alpha_2 LocalDev_{ijt} + \alpha_3 X_{jt} + \epsilon_{ijt},$$

where $\text{Reneg}Spread_{ijt}$ is the difference between initial share and final share in movie i, theater j and week t, and all the controls are the same as those in the section above. Results indicate that exhibitors showing movies with lower revenue expectations (lower US revenues) are likely to obtain higher spreads, and that larger deviations from revenue expectations are associated to larger spreads. It is interesting to observe how the spread increases with the number of movies released in every week. This suggests that more movies released in a week increases the opportunity cost of showing the current movie in that same week, and therefore increases the renegotiation spread as the theory predicts. Table 6 repeats the exercise in Table 5 using only those observations that were renegotiated (10,470 to 5,875 observations). Results do not vary from those in Table 5 and are robust across specifications.

Unfortunately (and consistently with results above), columns (7) to (10) in Table 8 show that contracts of movies with larger positive deviation have smaller renegotiation spread than contracts of movies with smaller (but still positive) deviation. This result is robust to different specifications and again can only mean two things: our definition of expectation (movie average revenues across theaters) may be biased down, or we cannot control adequately for changes in the opportunity cost of the theater, and therefore we tend to underestimate its level.

Finally, Table 7 provides evidence on the effect of the magnitude of deviation on the magnitude of renegotiation (spread) by estimating a TOBIT. In this framework, I use all 10,470 observations and I take those observations not renegotiated as left-censored at 0. Results do not change from those obtained in Tables 5 and 6 and are robust across specifications. Not surprisingly, run length affects spread negatively holding everything else constant because information is revealed during the first weeks of the movie's run.

Evidence in this section and the anecdotal evidence provided in the institutional section suggest that renegotiation in this industry is part of a mechanism to adjust ex-post participation constraints.

This mechanism is sustained in equilibrium by the long term span of relationships that characterize the movie exhibition industry.

5.2 Learning

The third and fourth testable implications have to do with the use of new information in the current period on decisions concerning the run of movies. Exhibition contracts do not specify movie run length. This suggests that during the run of the movie there is new information revealed that helps parties maximize the value of their relationship. Therefore, the same new information that drives the renegotiation decision could be used to decide when to stop the movie run optimally. This implies that renegotiation decisions and the termination decisions are not independent. To analyze this feature of the model and test the hypothesis that agents use the same source of information (deviations from revenue expectations) to decide on both margins, I estimate a bivariate probit model with a likelihood function such that

$$L = \prod_{ijt} [\text{Reneg}_{ijt} * CUT_{ijt}]$$

where the two dependent variables are Renegotiation (1 if renegotiated and 0 otherwise) and Cut (1 if exhibitor terminates the movie's run in the following period and 0 if she does not). See in Table 9 the results of this estimation.

The model suggests that if there is learning going on, the deviation variable must have explanatory value for the movie run stopping decision, but its effect must be smaller than it is for the renegotiation decision. The results of Table 9 confirm that negative deviations matter for movie run stopping decisions and that matter more for renegotiation decisions than they do for continuation decisions: coefficients compare 0.07 to 0.03 and 0.18 to 0.12. When testing the statistical significance of these differences, χ^2 statistics are 19.64 and 2.03 respectively (statistically significant at 99% and 85% respectively). Even though not both differences support the model, these results qualitatively validate the model in the paper. Note as well that there is still a 22% statistically significant correlation between the two decisions (reported in Table 9).[11]

The effects of revenue expectation and deviation from expectation on the renegotiation decision do not vary qualitatively from those found in Table 4. Following the model, I test whether current revenue expectation matters. I find that the effect of revenue expectation is not robust for the movie's run termination decision. I include for robustness the realization of revenue (instead of its

[11] The existence of this correlation could mean that there may be other explanations driving the two decisions, or that my measures of revenue expectation and its deviation from expectation are not accurate enough.

expectation), but this did not seem to matter either. The effect of the deviation magnitude and direction on contract termination did not change when I changed revenue realization for revenue expectation. Some nice features out of the results in this table are the different effects that the number of screens and run length have for the two decisions under study here. The number of screens in the movie theater does not affect the renegotiation decisions since renegotiation only occurs if revenue goes below the opportunity cost of the screen in particular, but it does affect the continuation decisions on movie runs because multiplexes switch movies from screen to screen, whereas monoscreen theaters simply switch movies. I find that an increase in the number of screens does not affect renegotiation decision, but decreases the probability of contract termination. I also find that an increase in run length decreases renegotiation probability (less uncertainty at the end of the run of the movie due to the endogenous movie attrition), but increases the probability of contract termination.

The model also suggests that movies with less precise prior distribution will be more sensitive to negative deviations from expectations than movies with more precise prior distribution. To test this implication, I divide the sample into 4 different groups of movies: movies not released in the US (control group), movies released in the US that collected less than $10 million (FilmC), movies that collected between $10 and $100 million (FilmB), and movies that collected over $100 million (FilmA). Results from this specification (Table 9, column (4)) suggest that FilmA and FilmB movies are less sensitive to negative revenue deviations from expectations than movies not released in the US and FilmC movies.

Throughout the paper, Figures 5 to 8 have supported this implication of learning. Movies with different ex-ante information and different uncertainty levels (US Release and US revenue collection) start their run with different renegotiation probabilities and renegotiation spread paid. More uncertain movies have always higher renegotiation probabilities and higher premiums than less uncertain movies. Despite this, differences vanish as movie runs continue. This fact is consistent with the idea that as information reveals and uncertainty disappears, exhibitors continue the run of a movie taking into account the new information. This means that the information existing previously to the movie release cannot explain patterns in renegotiation probability and spreads after a few weeks.

The evidence in this last section suggests that exhibitors learn gradually about the demand of a movie and that use this new information to optimally adjust sharing terms (renegotiation) and maximize the value of the contractual relationship by stopping the run of a movie when optimal. This finding is not only important to characterize the maximizing behavior of firms by using all the available information, but also to justify an important characteristic in movie exhibition contracts:

movie run length is not specified in the contract. The fact that firms do better by letting exhibitors economize the use of new information than by fixing a contract length is the reason why exhibition contracts are incomplete with respect to the movie run length (even though run length is perfectly observable and verifiable in front of a court of law).

6 Concluding Remarks

In this paper, I empirically investigate the renegotiation mechanism in the movie exhibition industry. I analyze the existence of contractual incompleteness and how firms use renegotiation to adjust ex-post their participation constraints. I argue that renegotiation and endogenous contract termination enhance efficiency in the contractual relationships if learning exists and firms are in a long term business relationships (relational contract). I then test whether renegotiation is used to adjust ex-post participation constraints, and whether learning takes place.

I test the implications of my model using a new data set of renegotiated contract terms in the Spanish movie industry. I find that negative deviations from revenue expectation increase the probability of renegotiation. Similarly, I find that the magnitude of this deviation determines the magnitude of the renegotiation. Besides these, anecdotal evidence from interviews with industry managers supports the model implications that cannot be captured in the data. I take these results as supporting evidence of the theory.

Finally, I investigate the existence of learning across periods. Firms use information valuable for renegotiation purposes to optimally decide when to stop the run of a movie. This is important because learning allows firms not to commit to a contract of fixed length, and therefore maximize profits from that relationship by updating their decisions every period to the new incoming information. Then, firms optimally choose to write incomplete contracts on the movie run length not only because of unobservability or unverifiability, but also to maximize the value of the contractual relationship.

Future lines of research should focus on understanding the use of informal contracts together with formal contracts, and the gains of individuals and firms when relying on them. Similarly, in the future we should investigate the effect of specific contractual forms on the mechanism supporting the informal agreement as it remains unexplained.

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Figure 1. Sample Contract

Date

Contract/Confirmation

Distribution Firm | Exhibition Firm

Contract #. The two people signing this contract, one as a representative of the distribution firm and the other as a representative of the exhibition firm, agree on the current date to formalize the contract of rights disposal and the handing over of the movie material indicated below. This contract is driven by the conditions specified in the front and the back of it. The two parties signing the contract understand and recognize that all of those conditions are clauses of this contract.

Theater: ---------------- City: -----------------

Opening Date | Type | Number of Days| Movie Title | Version | Format | Dolby | Duration | Length | Rating | Exhibition License #

Contract Specific Conditions

1st Week Share | 2nd Week Share | 3rd Week Share | 4th Week Share | 5th Week Share | 6th Week Share
Overtime Share Specified if Applicable.

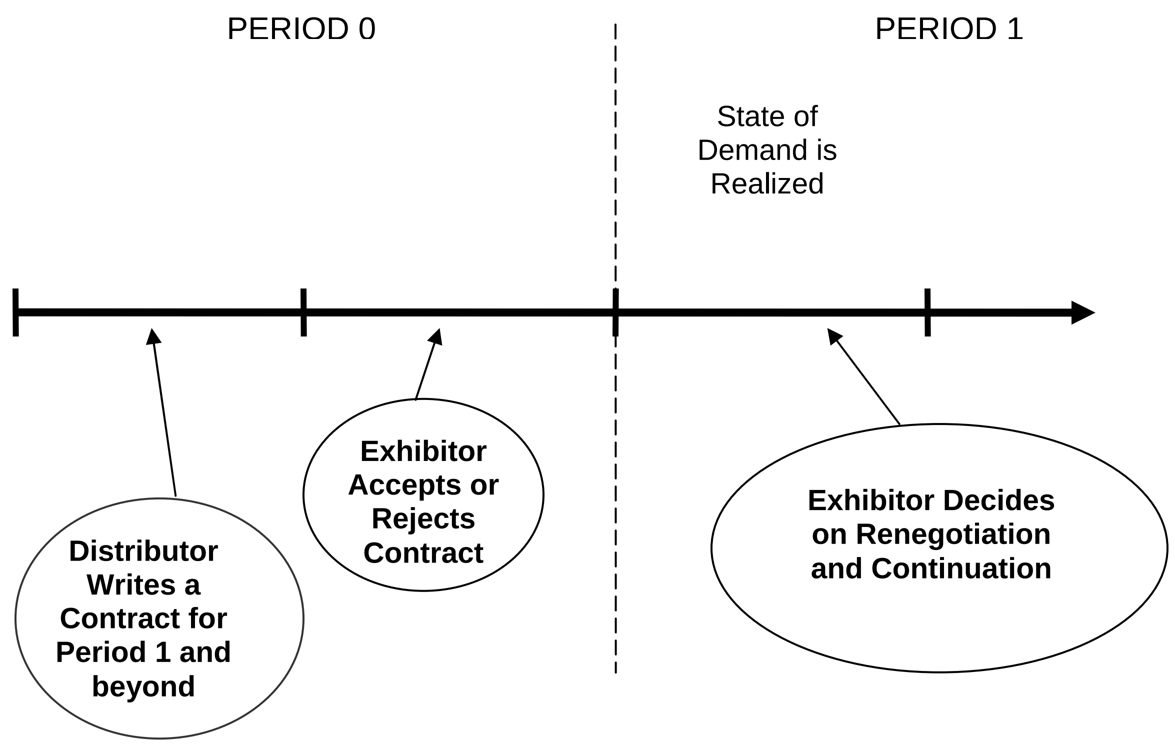
Some Contracts Specify Management, Previews and Advertising Expenses. Others include the number of seats and screen that they want the movie to be showed on, and some extreme cases include the retailing Price

Distributor's Signature | Exhibitor's Signature

General Conditions

- Goal of the Contract.
- Exhibition Period.
- Movie copy, previews and advertising material.
- Publicity.
- Privacy and Confidentiality.
- Auditing and Monitoring Rights.
- Taxes.
- Movie Title Change.
- Contract Length.
- Means of Payment.
- Special Discount Day.
- Unilateral Contract Termination.
- Court Enforceability.

Figure 2. Timing of Actions



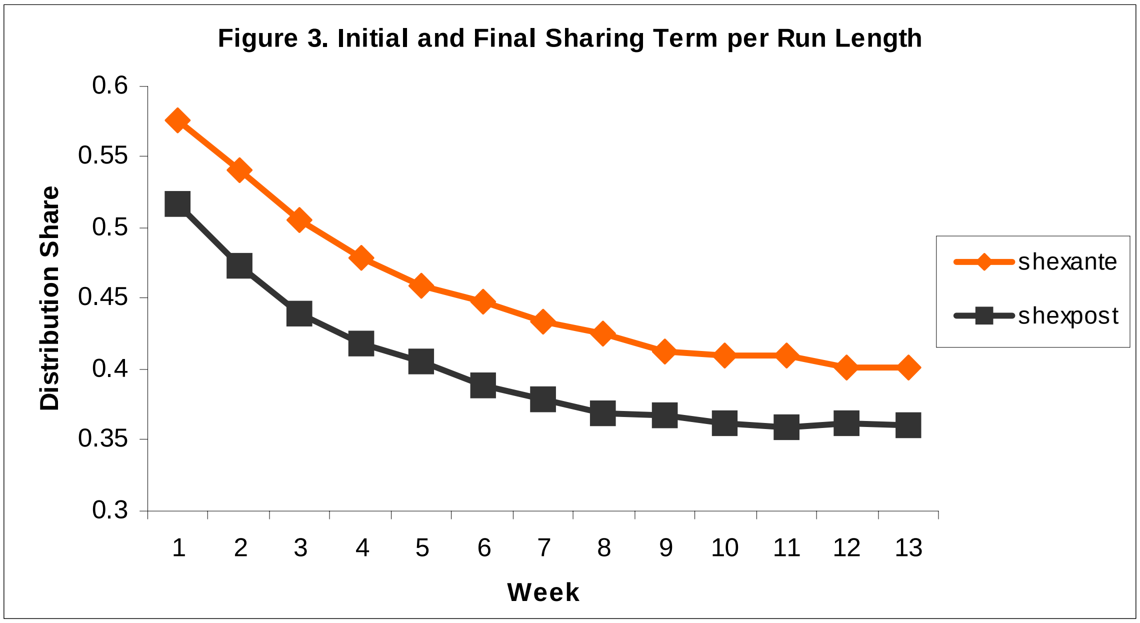


Figure 3. Initial and Final Sharing Term per Run Length
Distribution Share
0.6
0.55
0.5
0.45
0.4
0.35
0.3
1 2 3 4 5 6 7 8 9 10 11 12 13
Week
shexante
shexpost

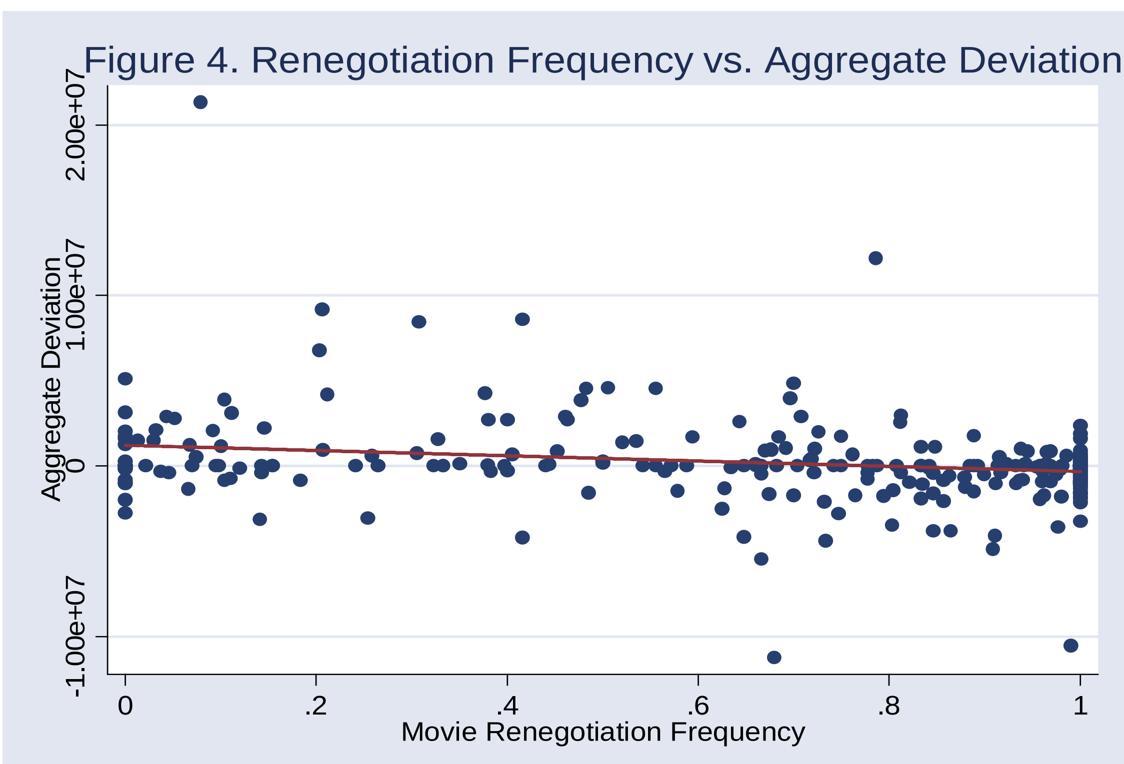


Figure 4. Renegotiation Frequency vs. Aggregate Deviation
Aggregate Deviation
2.00e+07
1.00e+07
0
-1.00e+07
0 .2 .4 .6 .8 1
Movie Renegotiation Frequency

Figure 5. Renegotiation Probability by US Release or Not

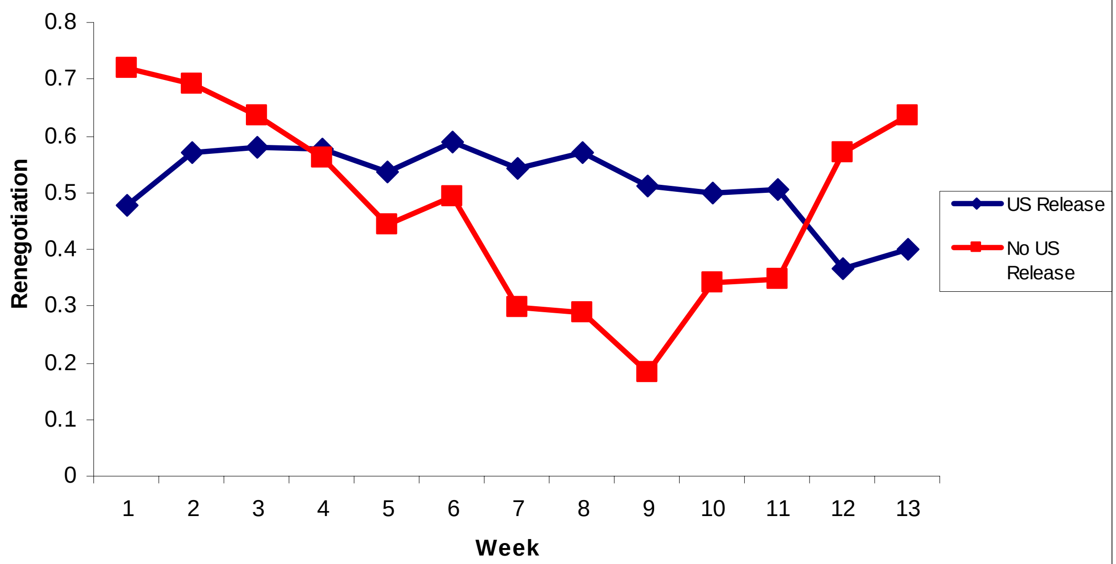


Figure 6. Renegotiation Probability per US Box Office Revenue

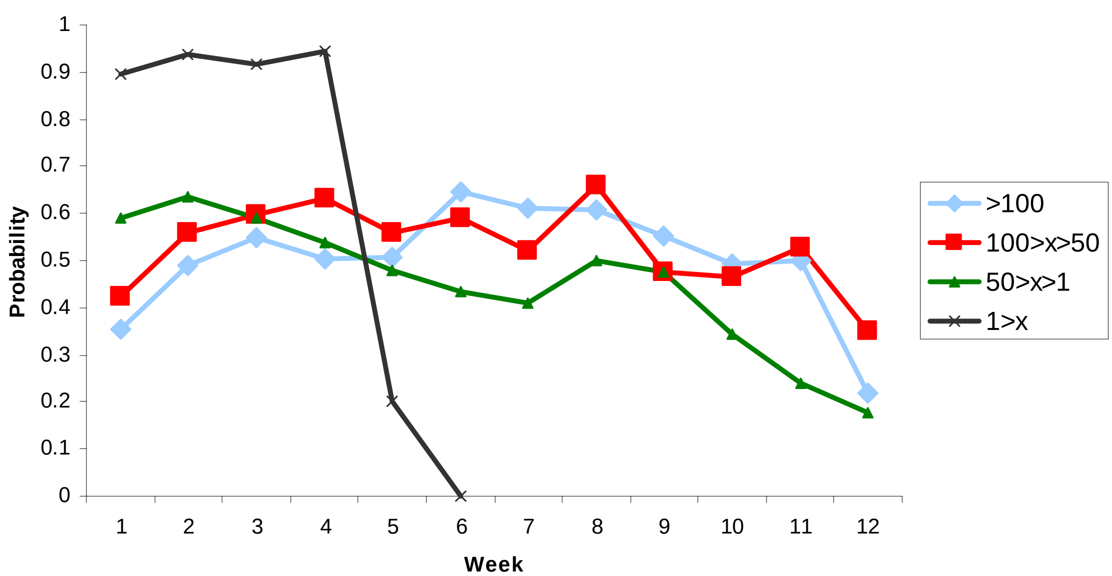


Figure 7. Renegotiation Spread by US Release or Not

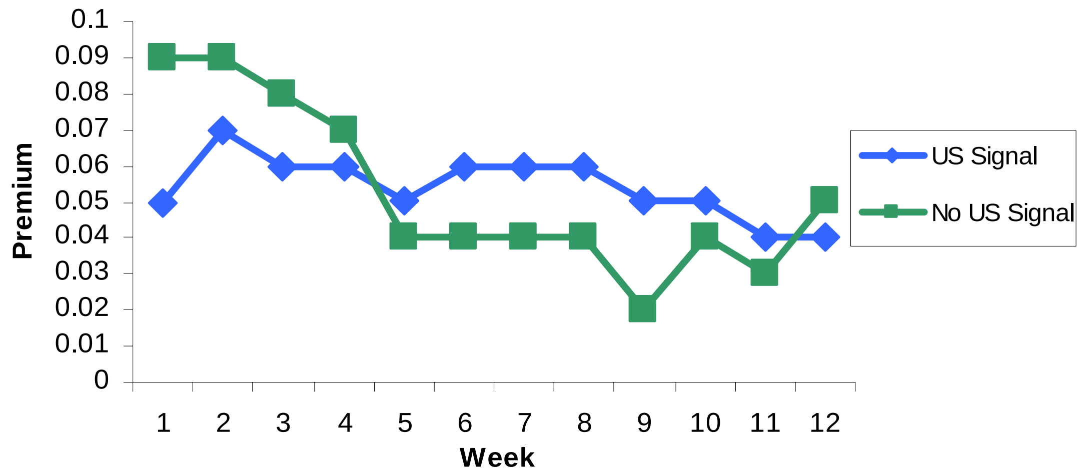


Figure 8. Renegotiation Spread per US Box Office Revenue

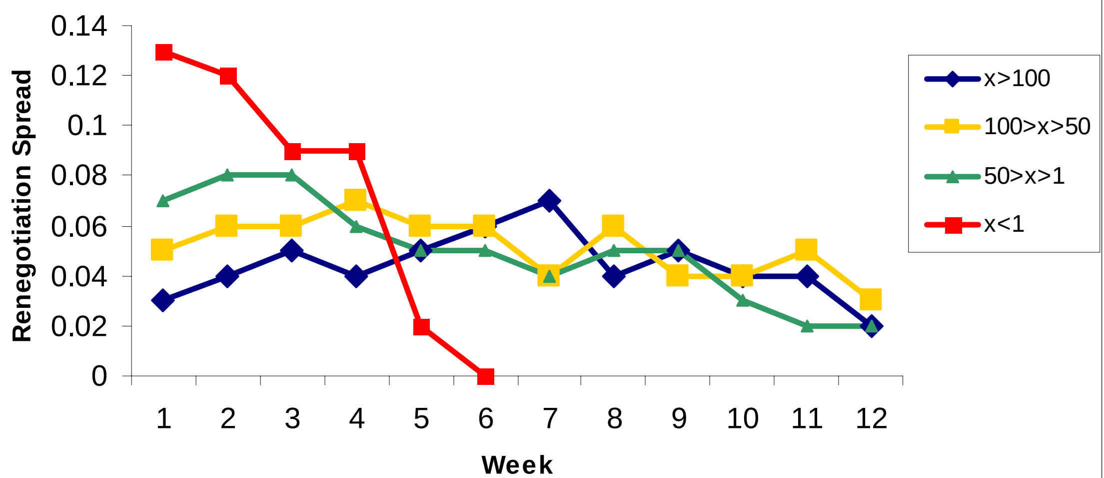


Figure 9. Distribution of Observations per Week since Release

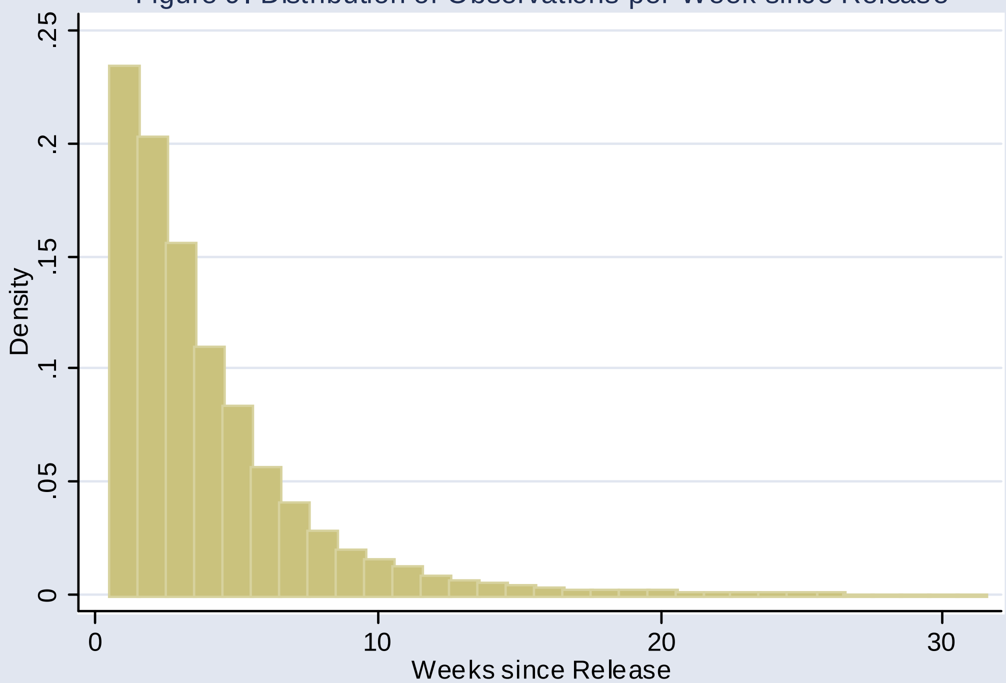


Table 1. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Renegotiated?	18727	0.5509	0.4974	0	1
Initial Term	18727	0.5047	0.0740	0.1	0.6
Final Term	18727	0.4460	0.0923	0.1091	0.6049
Diff. Initial-Final	18727	0.0600	0.0678	0	0.3100
Avg. Renegotiation per Movie	371	0.7309	0.3501	0	1
Difference if Renegotiated	10316	0.1089	0.0548	0.0125	0.3100
Spain Revenue (million Euros)	371	2.570	4.275	0.002	30.900
US Revenue (million dollars)	237	51.6	65	0.001	404
US Release	371	0.6388	0.4810	0	1
Population Size	16	256841.1	363653.3	8452	1505325
Income Index	16	5.9375	1.5692	3	9
# Screens	25	7.32	3.5204	1	16
# Seats	25	1789.64	823.0338	396	3875
# Firms	896	3.0625	3.2895	1	15
# Releases	56	7.5886	2.5990	2	13
Local Deviation	10470	28.3592	2255.691	-37908.69	76102.25
Negative Local Deviation	10470	0.5466	0.4978	0	1
Aggregate Deviation	313	-0.0016	2528224	-11200000	21300000
Negative Aggregate Deviation	313	0.6070	0.4892	0	1
Revenue	10470	5125.897	3468.061	359.1314	122167
E[Revenue]	1412	5382.518	2541.208	625.5417	46064.79
Theater Revenue	1314	41477.72	30157.62	1188.952	189434.5

This table reports summary statistics for all variables used in the statistical analysis later in the paper. The number of observations is different for each one of them because each has a different unit of variation: Theater level (25 theaters), market level (16 cities), period level (56 weeks), movie level (371 movies out of which 237 were released in the US), and combined levels of variation.

Table 2. Average Renegotiation per Deviation Type and Quantile

	Aggregate Deviation		Local Deviation
4 Quantiles		**4 Quantiles**	
Lowest	0.769	Lowest	0.607
Low	0.758	Low	0.595
High	0.755	High	0.561
Highest	0.442	Highest	0.482
6 Quantiles		**6 Quantiles**	
Lowest	0.757	Lowest	0.599
Very Low	0.762	Very Low	0.615
Low	0.772	Low	0.589
High	0.753	High	0.565
Very High	0.623	Very High	0.558
Highest	0.418	Highest	0.442
8 Quantiles		**8 Quantiles**	
Lowest	0.734	Lowest	0.597
Very Low	0.804	Very Low	0.617
Mid Low	0.797	Mid Low	0.583
Low	0.720	Low	0.606
High	0.763	High	0.568
Mid High	0.746	Mid High	0.554
Very High	0.470	Very High	0.547
Highest	0.414	Highest	0.417

This table reports the average renegotiation when dividing the two types of deviations constructed in the paper into different number of quantiles. The first deviation (aggregate deviation) counts with 237 observations, and the second deviation (local or theater deviation) counts with 10470 observations.

Table 3. The effect of Deviation from Expectations given US Performance on Renegotiation Frequency

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
US Release	-0.1352 (0.0361)***	-0.0611 (0.0401)	-0.1300 (0.0354)***	-0.0573 (0.0403)	-0.1092 (0.0421)**	-0.0191 (0.0461)	-0.1046 (0.0402)**	-0.0187 (0.0446)	-0.2465 (0.0449)***	-0.1704 (0.0488)***	-0.2281 (0.0532)***	-0.1359 (0.0577)**
USBOR (millions)		-0.0014 (0.0003)***		-0.0014 (0.0003)***		-0.0016 (0.0003)***		-0.0016 (0.0004)***		-0.0013 (0.0003)***		-0.0015 (0.0004)***
Deviation (millions)			-0.0374 (0.0069)***	-0.0368 (0.0082)***			-0.0418 (0.0094)***	-0.0403 (0.0109)***				
Negative Deviation									0.1953 (0.0457)***	0.1836 (0.0444)***	0.2098 (0.0574)***	0.1919 (0.0565)***
Constant	0.8166 (0.0275)***	0.8166 (0.0276)***	0.8166 (0.0276)***	0.8166 (0.0276)***	0.8000 (0.0306)***	0.7957 (0.0306)***	0.8007 (0.0297)***	0.7966 (0.0298)***	0.8166 (0.0276)***	0.8166 (0.0276)***	0.7996 (0.0303)***	0.7957 (0.0304)***
Release Week Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes
R-squared	0.03	0.08	0.09	0.13	0.25	0.29	0.30	0.33	0.08	0.12	0.29	0.32

The dependent variable is the average renegotiation for each movie, that is, the frequency with which a movie is renegotiated in the data. "US Release" is a dummy variable that takes value 1 if the movie was released in the US previous to its release in Spain; "US BOR" stands for the total revenue (in US$) collected by each movie in its US run; "Deviation" is the movie error obtained when we regress total revenue in Spain on total revenue in US; and, "Negative Deviation" is a dummy variable that takes value 1 if the above "Deviation" is negative.
The dependent variable values lie between 0 and 1, "US BOR" units are in millions of dollars, and "Deviation" units are in millions of Euros.
Industry managers suggested that they use movie performance in the US to predict performance in Spain. The estimates suggest a strong correlation.
All twelve regressions have 371 observations. Robust standard errors are in parentheses. * means significant at 10%; ** significant at 5%; and, *** significant at 1%.

Table 4. The Effect of Deviation from Expectations at Theater Level on Renegotiation Extensive Margin: Renegotiate or not Renegotiate.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
E[Revenue] **(thousands)**	-0.029 (0.002)***	-0.029 (0.002)***	-0.049 (0.007)***	-0.048 (0.007)***	-0.041 (0.009)***	-0.027 (0.002)***	-0.026 (0.002)***	-0.047 (0.008)***	-0.046 (0.007)***	-0.035 (0.010)***
Deviation **(thousands)**	-0.029 (0.003)***	-0.029 (0.003)***	-0.033 (0.002)***	-0.029 (0.004)***	-0.021 (0.004)***					
Negative Deviation						0.081 (0.025)***	0.077 (0.020)***	0.082 (0.017)***	0.059 (0.020)***	0.024 (0.016)
# Firms		0.026 (0.009)***	0.027 (0.008)***	-0.001 (0.002)	-0.005 (0.001)***		0.030 (0.009)***	0.031 (0.009)***	0.001 (0.003)	-0.006 (0.001)***
Other Controls	No	Theater, Market & Week	Theater & Market	Theater	No	No	Theater, Market & Week	Theater & Market	Theater	No
Fixed Effects	No	Run Length	Run Length, Week.	Run Length, Week, City.	Run Length, Week, City, Theater.	No	Run Length	Run Length, Week.	Run Length, Week, City.	Run Length, Week, City, Theater.
Observations	10470	10469	10446	10446	10446	10470	10469	10446	10446	10446

The dependent variable Renegotiation is a dummy variable that takes value 1 if the revenue of split of movie i, in theater j in period t is renegotiated, and 0 otherwise.
The coefficients reported in the table are marginal effects on the probability of renegotiation (DPROBIT). "E[Revenue]" is the average revenue collected by a movie in a certain week across theaters in thousands of Euros; "Deviation" is the difference between the actual revenue of that movie in that theater and that period with respect to E[Revenue]; "Negative Deviation" is a dummy variable that takes value 1 if "Deviation" takes negative value; and, "# Firms" specifies the number of firms owning theaters in the same city as that same theater in every period (there is firm entry).
I also included other regressors in the estimations of columns (2)-(4) and (7)-(9). Those are regressors that vary at the week level (number of releases), at the market level (population size and economic level) and at the theater level (number of screens and seats). These regressors are quite robust on sign, but appear as non-significant. One exception is population size which has a statistically significant negative effect on renegotiation.
I also include fixed effects per number of week showing (run length), week of the year, city and theater for the estimation in columns (2)-(5) and (7)-(10).
Robust standard errors are in parentheses, and I cluster standard errors at the theater level. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Table 5. The Effect of Deviation Magnitude on Renegotiation Magnitude (All Observations)

	(1)	(2)	(3)	(4)	(5)
E[Revenue] **(thousands)**	-0.0029	-0.0028	-0.0069	-0.0067	-0.0053
	(0.0003)***	(0.0003)***	(0.0011)***	(0.0010)***	(0.0015)***
Deviation **(thousands)**	-0.0030	-0.0028	-0.0028	-0.0023	-0.0011
	(0.0005)***	(0.0003)***	(0.0003)***	(0.0003)***	(0.0003)***
# Firms		0.0036	0.0034	0.0002	0.0001
		(0.0017)*	(0.0016)**	(0.0004)	(0.0001)
# Releases		0.0005			
		(0.0002)***			
Other Controls	No	Theater, Market.	Theater, Market.	Theater	No
Fixed Effects	No	Run	Run, Week	Run, Week, City	Run, Week, City, Theater.
Constant	0.0787	0.0744	0.3320	0.3205	0.2628
	(0.0031)***	(0.0430)*	(0.0778)*	(0.0721)***	(0.0748)***
R-squared	0.02	0.05	0.1	0.1	0.11

The dependent variable here is Premium which equals the difference between initial revenue-sharing term in the contract and the final (renegotiated or not) term. In each one of the columns, I run OLS of Premium on different regressors: "E[Revenue]" is the average revenue collected by movie I in period t; "Deviation" is the difference b/w that average and the revenue collected by movie in period t in that particular theater; "# Firms" is the number of firms operating in each period in each market (city); and, "# Releases" is the number of movies released in that particular week. I include other controls at the theater level (number of screens and seats) and at the market level (population size and economic level). I substitute this by fixed effects from columns (1) to (5).
Each one of the estimations counts with 10470 observations, and the dependent variable lies always between 0 and 0.5. Robust standard errors are in parentheses. * significant at 10%; ** significant at 5%; and, significant at 1%.

Table 6. The Effect of Deviation Magnitude on Renegotiation Magnitude (If Renegotiated)

	(1)	(2)	(3)	(4)	(5)
E[Revenue] **(thousands)**	-0.0034	-0.0023	-0.0052	-0.0050	-0.0041
	(0.0005)***	(0.0004)***	(0.0012)***	(0.0011)***	(0.0014)***
Deviation **(thousands)**	-0.0029	-0.0025	-0.0025	-0.0022	-0.0008
	(0.0007)***	(0.0006)***	(0.0006)***	(0.0006)***	(0.0007)
# Firms		0.0012	0.0010	0.0005	0.0003
		(0.0013)	(0.0012)	(0.0003)	(0.0002)**
# Releases		0.0008			
		(0.0002)***			
Other Controls	No	Theater, Market.	Theater, Market.	Theater	No
Fixed Effects	No	Run	Run, Week	Run, Week, City	Run, Week, City, Theater.
Constant	0.1292	0.1239	0.0295	0.0276	0.0136
	(0.0027)***	(0.0081)***	(0.0115)***	(0.0111)**	(0.0116)***
R-squared	0.02	0.05	0.1	0.1	0.11

The dependent variable here and the regressors are the same as those in Table 5. The difference in this table with respect to the previous one is the sample used. Table 6 uses only those observations where renegotiation exists.
Each one of the estimations counts with 5875 observations, and the dependent variable lies always between 0 and 0.5. Robust standard errors are in parentheses. * significant at 10%; ** significant at 5%; and, significant at 1%.

Table 7. TOBIT Estimation: Whether or Not Renegotiate and How Much to Renegotiate.

	(1)	(2)	(3)	(4)	(5)
E[Revenue] **(thousands)**	-0.0089	-0.0080	-0.0080	-0.0081	-0.0081
	(0.0006)***	(0.0006)***	(0.0006)***	(0.0006)***	(0.0006)***
Deviation **(thousands)**	-0.0085	-0.0083	-0.0083	-0.0086	-0.0088
	(0.0006)***	(0.0007)***	(0.0007)***	(0.0007)***	(0.0007)***
# Firms		0.0065	0.0065	0.0005	0.0005
		(0.0015)***	(0.0015)***	(0.0002)**	(0.0002)**
Run Length		-0.0026	-0.0026	-0.0026	-0.0026
		(0.0003)***	(0.0003)***	(0.0003)***	(0.0003)***
Other Controls	No	Theater, Market, Week.	Theater, Market.	Theater.	No
Constant	0.0734	0.0826	0.0835	0.0799	0.0779
	(0.0033)***	(0.0086)***	(0.0074)***	(0.0048)***	(0.0034)***

The dependent variable here is Premium which is the difference between initial revenue-sharing term and final revenue-sharing term. There are 10470 observations. I include all observations, non-renegotiated and renegotiated observations. I fix the censoring threshold at 0 (left-censored sample), so that all observations lie between 0 and 0.5. STATA returns an ancillary parameter (SE) equal to 0.11 which is robust and significant across all specifications.
I include other controls at the theater level (number of screens and seats), at the market level (population size and economic level) and at the week level (number of movies released in each week). All of these turned out to be statistically non-significant, with the exception of population size.
Standard errors are in parentheses. * means significant at 1%; ** significant at 5%; and, *** significant at 1%.
Note: When Fixed Effects of any type were included, the estimation did not converge.

Table 8. The Effect of Positive Deviations from Expectations on Renegotiation Frequency, Renegotiation Probability and Renegotiation Magnitude

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Positive Deviation Dummy	-0.1231	-0.1300	-0.0439	-0.0611	-0.0354	-0.0385	-	-	-	-
	(0.0490)**	(0.0614)**	(0.0154)***	(0.0130)***	(0.0134)***	(0.0218)*	-	-	-	-
Dummy*Deviation ($10K)	-0.0003	-0.0003	-0.2910	-0.3110	-0.3090	-0.3440	-0.031	-0.031	-0.025	-0.0195
	(0.0001)***	(0.0001)**	(0.0555)***	(0.0381)***	(0.0484)***	(0.0763)***	(0.0048)***	(0.0029)***	(0.0037)***	(0.0061)***
Controls	US Release, US Box Office	US Release, US Box Office	Box Office, Firms, Screens, Seats, Population, Economic Level, Releases	Box Office, Firms, Screens, Seats, Population, Economic Level	Box Office, Firms, Screens, Seats	Box Office, Firms,	Box Office, Firms, Screens, Seats, Population, Economic Level, Releases	Box Office, Firms, Screens, Seats, Population, Economic Level	Box Office, Firms, Screens, Seats	Box Office, Firms,
Fixed Effects	No	Release Week	Run Length	Run Length, Release Week	Run Length, Release Week, City	Run Length, Release Week, City, Theater	Run Length	Run Length, Release Week	Run Length, Release Week, City	Run Length, Release Week, City, Theater
Observations	371	371	10469	10406	10406	8414	10470	10470	10470	10470
R-squared	0.13	0.33	-	-	-	-	0.05	0.28	0.28	0.64

Columns (1) and (2) follow the estimation in Table 3, columns (3) to (6) follow the estimation in Table 4, and columns (7) to (10) follow the estimation in Table 5. Therefore the dependent variables are Renegotiation Frequency, Renegotiation and Renegotiation Spread respectively.
Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9. BIPROBIT Joint Estimation of Renegotiation and Movie Run Stopping Decisions.

	(1)		(2)		(3)		(4)	
	RENEG	CUT	RENEG	CUT	RENEG	CUT	RENEG	CUT
E[Revenue] (thousands)	-0.0659 (0.0056)***	0.0108 (0.0065)	-0.0573 (0.0046)***	0.0081 (0.0037)**	-0.0587 (0.0046)***		-0.058 (0.005)***	0.011 (0.003)***
Deviation (thousands)	-0.0693 (0.0082)***	-0.0341 (0.0051)***						
Negative Deviation			0.1896 (0.0502)***	0.1252 (0.0459)***	0.1896 (0.0502)***	0.1200 (0.0471)**	0.1892 (0.0502)***	0.3947 (0.0627)***
Negative Deviation FilmA								-0.7141 (0.0576)***
Negative Deviation FilmB								-0.2549 (0.0412)***
Negative Deviation FilmC								0.1684 (0.0580)***
Revenue (thousands)						-0.0022 (0.0023)		
# Screens	-0.0080 (0.0234)	-0.0397 (0.0219)*	-0.0207 (0.0300)	-0.0485 (0.0261)*	-0.0208 (0.0300)	-0.0487 (0.0255)*	-0.0256 (0.0301)	-0.0469 (0.0269)*
# Seats	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)
Population (thousands)	-0.0005 (0.0002)**	-0.0003 (0.0002)	-0.0006 (0.0003)**	-0.0003 (0.0002)*	-0.0006 (0.0003)**	-0.0003 (0.0002)*	-0.0007 (0.0003)**	-0.0003 (0.0002)
Economic Level	-0.0193 (0.0190)	0.0099 (0.0131)	-0.0256 (0.0224)	0.0083 (0.0139)	-0.0256 (0.0224)	0.0085 (0.0137)	-0.0263 (0.0209)	-0.0007 (0.0143)
# Firms	0.0621 (0.0253)**	0.0258 (0.0172)	0.0694 (0.0269)**	0.0301 (0.0181)*	0.0694 (0.0269)***	0.0302 (0.0178)*	0.0742 (0.0251)***	0.0257 (0.0197)
# Releases	-0.0048 (0.0029)*	-0.0011 (0.0046)	-0.0042 (0.0029)	-0.0016 (0.0047)	-0.0045 (0.0029)	-0.0043 (0.0050)	-0.0028 (0.0035)	-0.0035 (0.0047)
Run Length	-0.0204 (0.0082)**	0.0108 (0.0052)**	-0.0192 (0.0085)**	0.0119 (0.0049)**	-0.0191 (0.0085)**	0.0125 (0.0048)***	-0.0195 (0.0089)**	0.0216 (0.0067)***
Constant	0.6359 (0.0884)***	-0.6651 (0.0734)***	0.5626 (0.1056)***	-0.7055 (0.0772)***	0.5721 (0.1043)***	-0.6357 (0.0735)***	0.5462 (0.0998)***	-0.6704 (0.0851)***

The dependent variables here are two dummy variables: RENEG takes value 1 if the sharing term for movie i in theater j and period t is renegotiated, and 0 otherwise. On the other hand, CUT takes vaue 1 if movie i does not continue playing in theater j in period t+1. Regressors are "E[Revenue]" which is the average revenue of that movie in that period; "Revenue" the actual revenue of that movie in that theater; "Deviation" the difference between those two; "Negative Deviation" a dummy variable that takes value 1 if "Deviation" value is negative and 0 otherwise; theater characteristics (# Screens and # Seats); market characteristics (Population and an Index of Economic Level); Firm Competition (# Firms and # Releases); and the number of weeks movie i has been playing in theater j at period t.

FilmA are those films that collected more than $100 million in their US run, FilmB those between $100m and $10m, and FilmC those less than $10m. I interact this clasification with the variable "Negative Deviation" to observe the effect of negative deviations in different movie types (see specification 4).

All four specifications have 10470 observations, and all reported a correlation rho statistically significant of magnitud 0.22.

Robust standard errors are in parentheses, and clustered by theater. * means significant at 10%, ** significant at 5%, and *** significant at 1%.