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Products: A Spatial Competition Application

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## ABSTRACT

This paper applies the 'hypothetical monopolist' test of market definition to a retail market with products differentiated by means of location and other dimensions. The test for defining the relevant product and geographic market follows the conditions required by the European Union Competition Law and so it takes into account both demand- and supply-side substitution. The empirical model using sales data from a set of movie theatres in the North of Spain, incorporating the observed locations of consumers vis-à-vis the stores, shows that empirical tests of market definition may lead to an implausible definition of the relevant market if supply-side substitution is not accounted for.

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# Market Definition with Differentiated Products: A Spatial Competition Application

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*Key Words:* Market definition, Spatial competition, Horizontal product differentiation, Supply-side substitution, Demand estimation

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## 1. Introduction

Market definition consists of the delineation of the relevant product and geographic market. It has a preliminary role in the analysis of market power in the investigations of mergers or abuses of dominant positions. Once the market has been properly defined, we can calculate firms' market shares which have traditionally been seen as a screening measure of likely market power.

In European Union Competition Law, the key concept for the definition of the relevant market is the substitutability of goods.<sup>1</sup> Two goods are said to be in the same relevant market if they are substitutable. There are two possible ways of substitution: from the demand side and from the supply side. Demand-side substitutes are goods that are in the market and towards which the demand of consumers could move if the vector of prices changed. Supply-side substitutes are goods that are not currently in the market but the firm possesses the necessary assets to produce and market them in the short run and without incurring significant sunk costs.

When products are differentiated, there are two drivers of competition: in prices and in product characteristics. In retail markets, even with homogeneous products, there are at least two sources of competition: price and location.

The objective of this paper is to develop an empirical test of market definition with products differentiated in location and other attributes. It is the first work that takes into account supply-side substitution in addition to demand-side substitution and defines in the same test both the relevant product and geographic markets. It uses real data for the movie theatre market in the North of Spain for ten different weeks in the period 2001-2005.

The test is based on the hypothetical monopolist test that has become predominant in competition law.<sup>2</sup> It postulates that, if a set of goods forms a relevant market, then a firm that were monopolist over all those goods would enjoy some degree of market power and would thus be able to fix prices above competitive levels.

One of the main goals of this work is also to analyse the role of supply-side substitution in the competition for retail goods and therefore in the definition of relevant retail markets.<sup>3</sup> Retailing goods are differentiated along some long-term characteristics, such as location and space, and, if the goods are heterogeneous, they are also defined by

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<sup>1</sup> European Commission (1997a).

<sup>2</sup> Werden (2003).

<sup>3</sup> See Elizalde (2010) for a theoretical approach to market definition analysis with differentiated products.

some short-term characteristics. Supply-side substitution can be analysed by a change in the vector of those short-term product characteristics. The results of the empirical analysis show the main role that product characteristics play in competition with retailing goods implying that retail markets may be defined in a more realistic way when we take into account supply-side substitution in addition to demand-side substitution.<sup>4</sup>

The remainder of this paper is organised as follows: Section 2 reviews the related literature on empirical market definition analysis. Section 3 presents the test of market definition that is performed in Section 6. Section 4 presents the main facts of the Spanish movie theatre exhibition market and the approach to market definition used in some investigations of mergers between movie theatre exhibitors in Spain and also in the United Kingdom. Section 5 presents the demand model, the data used and the results of the demand estimation work and Section 7 concludes.

## **2. Related literature**

The literature on market definition has mainly been devoted to proposing empirical tests of market definition compatible with the definition of a relevant market described in the Horizontal Merger Guidelines in the United States, firstly issued in 1982.<sup>5</sup>

Most tests are rooted on the definition of an economic market that follows Marshall (1920) such that products that belong to the same market must have the same price with due allowance for transportation costs. Due to the availability of price data for several industries, many tests have used time series of prices to analyse whether two goods belong to the same geographic or product market. These are tests of correlations of price series, convergence of prices after shocks, causality of price movements due to a shock in one of the areas and stationarity of the logarithm of the price ratio.

Richer databases including sales data allowed for the use of cross-price elasticities of demand to test whether two goods are in the same market, such that the price of one of them affects the level of sales of the other good.

Some critiques, such as Werden and Froeb (1993) and Werden (1998), pointed out that the tests using the methodologies just mentioned were not valid for the definition of an

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<sup>4</sup> A thorough analysis about the use of supply-side substitution in competition investigations can be read in Padilla (2001).

<sup>5</sup> For a thorough review of the different types of tests see Office of Fair Trading (1999) and Elizalde (2010).

*antitrust* market in the fashion of relevant market described by the U.S. Horizontal Merger Guidelines. Some economists tried to solve this problem using alternative approaches. One was by using the own-price elasticity of the residual demand curve facing a firm. This approach is based on the idea that, when products are differentiated, the elasticity of the residual demand of a firm provides information about the existence of relevant substitutes for a good and therefore about the degree of market power enjoyed by the firm.<sup>6</sup> Another technique that has been widely used in market definition is the analysis of critical elasticity and critical loss. The critical elasticity and critical loss analysis compares the prevailing price with the price that maximises the hypothetical monopolist's profit. Recent developments in availability of scanner data and computation have favoured the usage of simulations by estimating the demand function of the industry and therefore the change in the level of sales and profits of each firm in the market when the price changes (Brenkers and Verboven (2006) and Ivaldi and Lörincz (2011)).

### **3. A Hypothetical Monopolist Test of Demand- and Supply-Side Substitution**

I start this section by explaining the rationale for the method I use to test for the definition of the relevant market with differentiated products. I consider goods that are differentiated along more than one dimension and I will use a hypothetical monopolist test considering both demand-side and supply-side substitution. The relevant market is defined according to the European Union market definition policy.

Movie theatres offer a good (a film screened in a particular venue) that is differentiated in location (as consumers typically prefer to travel a shorter distance) and in other dimensions (the film screened and the characteristics of the venue, such as the quality of sound, the comfort of seats and stalls, the existence of free parking, etc.).

In this market, consumers will not only switch to a different movie theatre because of price differences, but also because of the other characteristics. When two cinemas are not located close to each other and show different movies, the degree of price competition is usually very low, so a test of market definition incorporating only the competitive effect of demand-side substitutes is very likely to define narrow cinema markets, as we will see below. A price increase (of 5%-10% as it is customary in the

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<sup>6</sup> Baker and Bresnahan (1988), Scheffman and Spiller (1987).

literature and in practice) will not create an incentive for many consumers to choose a different theatre.<sup>7</sup>

Empirical models of market definition up-to-date have focused on the competitive role played by demand-side substitutes. My work incorporates both demand- and supply-side substitution into the analysis of market definition. Demand-side substitution is considered by analysing the demand responses of consumers to a price increase by the firms in a candidate relevant market. Supply-side substitution is analysed by calculating the demand responses of consumers to a change in the bundle of characteristics of goods outside the candidate market in addition to the increase in price. Movie theatres can be simplified to be differentiated along three main dimensions: variety (approximated by the number of screens and the proximity to other leisure activities), the location of the cinema and the bundle of movies exhibited. The first two characteristics can not be changed in the short run, while the bundle of movies can be changed in the short-run, as screening decisions are short-run decisions and movie theatres are hardly ever tied by exclusive dealing with distributors.<sup>8</sup> Therefore, supply-side substitution in this work will be analysed by computing responses of the demand of theatres inside the candidate market to changes in the bundle of movies exhibited in theatres outside the candidate market.

Another relevant feature of this test is that it defines the relevant market in both the geographic and product dimensions. Most Economics works in market definition had focused on empirical tests that define the relevant market in just one of the two dimensions.<sup>9</sup>

The product analysed in the movie theatre industry is a daily movie theatre session. If the product analysed were just *movie theatres* the geographic and product market definitions would be the same, as a product has one location. But by considering the daily session of a movie theatre the two tasks differ. The geographic market task is focused on the location dimension and the product market is focused on the bundle of movies exhibited.

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<sup>7</sup> This is corroborated by Davis (2006) who finds that cross-revenue effects of movie theatres are very low.

<sup>8</sup> See Tribunal de Defensa de la Competencia (2006), p. 47.

<sup>9</sup> Scheffman and Spiller (1987) and Slade (1986) analyse the relevant geographic market for a homogeneous good (wholesale gasoline), so that the product dimension is not an issue. Other works (such as Ekelund et al. (1999), for the market for radio advertising in the United States and Argentesi and Ivaldi (2007), for the market for magazines in France) focus on the definition of the product market, assuming that the geographic market is the whole country.

The analysis in this work is a non-equilibrium analysis. Even if we assume that the industry is originally in equilibrium, the increase in price by firms in the candidate market and the change in the bundle of characteristics of firms outside is expected to cause further firms' reactions that lies beyond the reach of the hypothetical monopolist test.

The test follows the approach on competition with differentiated products that was first described by Hotelling (1929). Firms take decisions in two stages. In the first stage they choose locations and in the second stage they choose prices. Let us take the assumption that the original situation is an equilibrium, that is described by a vector of locations, prices, sales and profits of the firms:  $\{x_0, p(x_0), q(x_0), \Pi(x_0)\}$ .<sup>10</sup> Each vector can in turn be divided into two vectors, one for firms inside the candidate market and one for firms outside the candidate market. In the case of locations, we can denote it  $x_0 = \{x_0^I, x_0^O\}$ , where  $I$  stands for "inside" and  $O$  for "outside".

The hypothetical monopolist test is performed by analysing whether a small increase in price by firms inside the candidate market is profitable for them. I consider an increase in price of  $\lambda$  (in percent terms). Under demand-side substitution alone, firms in the candidate market constitute a separate market if they increase their sum of profits with the price increase of  $\lambda$  percent given the unchanged locations of all firms:

$$\frac{\sum_I \Pi_j((1+\lambda)p_j(x_0)|x_0) - \sum_I \Pi_j(p_j(x_0)|x_0)}{\sum_I \Pi_j(p_j(x_0)|x_0)} > 0$$

Under both demand- and supply-side substitution, firms in the candidate market will constitute a separate market if they increase their joint profit after the location reactions of firms outside the candidate market:

$$\frac{\sum_I \Pi_j((1+\lambda)p_j(x_0)|x_0^I, x_1^O) - \sum_I \Pi_j(p_j(x_0)|x_0)}{\sum_I \Pi_j(p_j(x_0)|x_0)} > 0$$

As it can be observed, inside firms only change prices once and do not further change prices nor locations. Outside firms are allowed to react by changing prices in the first case and both prices and locations in the second case.

Let us now describe the agenda of the analysis of market definition in this work:

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<sup>10</sup> Location in this exercise refers to the whole bundle of characteristics of the goods, and not only to geographic location.



In Section 5, an econometric model of movie theatre demand is estimated incorporating the observed locations of theatres as well as the geographic distribution of consumers. Once the parameters of the model have been calculated, I perform the market definition analysis for four towns in the database (in Section 6). For each town I choose a set of theatres as the candidate market. I perform the analysis just described by computing the new equilibrium profits of firms inside the candidate market in two cases: first, with a 5% increase in price by the candidate market firms (demand-side substitution); and second, with changes in the bundle of movies shown in the outside cinemas (demand- and supply-side substitution). In each case we compare the sum of the profits of the inside firms with the original sum of profits.

In all but one of the cases analysed in Section 6 below the relevant markets defined on demand-side grounds can be enlarged if we allow for supply-side substitution as well. This suggests that the customary analysis of market definition may be defining markets too narrowly

#### **4. Movie Theatre Exhibition Market**

I divide this Section into two subsections. The first subsection describes the main features of the Spanish movie theatre exhibition market, whereas subsection 4.2 reviews the approaches used when defining the relevant movie theatre exhibition market in the investigations of different merger cases by the antitrust authorities in the United Kingdom and in Spain.<sup>11</sup>

##### *4.1. Spanish movie theatre exhibition market*

Let us now describe the main features and trends of the Spanish movie theatre exhibition market.

From the demand side, we can observe in Graphs A1 and A2 in Appendix 1 that movie theatre exhibition both in the whole of Western Europe and in Spain is a mature market. The number of admissions followed an increasing trend over the 1990's until 2001. The decrease in the Spanish figures in 2004-2008 may have coincided with the popularisation of other ways of watching movies.

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<sup>11</sup> The reason why the United Kingdom has been chosen is that this country properly has its own market definition guidelines (see Office of Fair Trading (1998)) in addition to the ones contained in the European Commission Notice. In addition to this, and as it has been pointed out by Padilla (2001), "the Competition Commission regularly makes use of supply-side considerations for defining relevant markets".

From the supply side, we can observe from Tables A1–A3 in Appendix 1 that the Spanish movie theatre market has renovated. Some old theatres have been closed and new theatres have been opened with a higher number of screens. We can observe in Table A1 that, while the number of theatres has decreased during the whole period reported (1999-2009), the number of screens increased until 2005 and decreased after that year, but the ratio of screens per cinema has kept on increasing.

We can compare the Spanish figures with those in other big Western European countries looking at Graphs A3–A5. We can observe that Spain has experienced the biggest decrease in the number of cinemas since 1999 and the biggest increase in the number of screens since 1993, reaching the lowest level of population-to-screen ratio of the five countries analysed.

We can deduce from this analysis that the evolution described by movie theatre markets in Europe and the United States, where newer and bigger theatres have been opened and smaller and older ones have been closed, has been especially acute in Spain in the last decade.<sup>12</sup>

Let us now observe the level of concentration in the Spanish exhibition market. Looking at Table A4, we observe that no circuit has a large share of total cinema screens in Spain. Looking at these figures, we might conclude that the movie exhibition industry has a very low degree of concentration at a national level. However, conclusions may seem different if we look at the figures of cinema screens locally town by town. Table A5 shows the percentages of the number of cinema screens run by the different circuits in each province capital in Spain, including both first- and second-run theatres, even those venues that just screen movies occasionally. We can therefore observe that, even though the national movie theatre market is not concentrated, local markets tend to be considerably concentrated and may be described as markets with a low number of firms with relatively high shares of total cinema screens in town.

Figures in Table A5 must not be seen as market shares nor as a proper measure of the degree of concentration, for several reasons: First, some of the movie theatres that are in the city suburbs belong to a different municipality than those in the table, that only include those cinemas registered in the province capitals and may be very close to suburban cinemas that may be part of the same relevant market. Second, a proper calculation of market shares aiming to analyse the degree of concentration must only be

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<sup>12</sup> Explanations for the United States movie theatre exhibition market can be read in Davis (2006).

done once the exercise of market definition has been performed and the boundaries of the market have been properly defined.

Tables A6 and A7 help us understand the relevance of price competition in cinema exhibition industry, that has been typically described in the literature as an industry with rigid prices.<sup>13</sup> Table A6 shows the traditional movie theatre pricing scheme in Spain. Adult admission prices are rigid but there is one day (called Spectator's Day) with discounted price for all moviegoers. Table A7 shows that demand is very sensitive to the prices in different venues. A theatre's share of daily town attendance tends to be quite constant over the week except for Mondays and Wednesdays. Those cinemas with Monday as Spectator's Day considerably increase their shares on Mondays and decrease them on Wednesdays. And for those cinemas with Wednesday as Spectator's day the opposite pattern holds.

This explains why the elasticities of demand (with respect to own price and to close rivals' prices) reported in Section 5 are significantly high even though the industry is characterised by rigid prices.

The observed pattern of renovation of the industry has implied a high number of firms entering and exiting the market. This means that the structure of the industry has frequently changed implying changes in the nature and degree of competition.

The two main observed facts, the variation of relative prices across different days of the week and the changes in competition conditions across periods and towns, make the estimation of movie theatre demand with panel data, using information on different days of the week, periods and towns, the optimal data structure.

#### *4.2. Mergers of cinema exhibitors*

I review in this section the approach used by the competition authorities to define the relevant markets in the investigations of mergers between movie theatre exhibitors in the United Kingdom and in Spain.<sup>14</sup>

In the United Kingdom, in those cases investigated by the Office of Fair Trading (OFT) and the Competition Commission, the scope of the analysis was "movie theatres".<sup>15</sup> In

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<sup>13</sup> See Einav and Orbach (2007).

<sup>14</sup> There was one case of merger between exhibition chains that had European Community dimension (merger between Warner Bros. International Theatres, Lusomundo and Sogecable). See European Commission (1997b). The relevant product and geographic markets were not delineated considering in both cases that "even the narrowest possible definition does not give rise to the creation or strengthening of a dominant position".

<sup>15</sup> See Competition Commission (2006) and Office of Fair Trading (2005a, 2005b, 2005c, 2008).

all of them the relevant product market was defined as “cinema exhibition”, therefore supply-side substitution was tackled as either “switching an auditorium to cinema exhibition from another use” or “building a new cinema”.<sup>16</sup> As neither of them can be done in the short-run without incurring significant sunk costs, they concluded that there was no supply-side substitution in the cinema exhibition industry.

There have been two relevant merger cases in Spain investigated by competition authorities.<sup>17</sup> In the merger between two exhibition circuits, ÁbacoCine and Cinebox, the relevant product for the exhibition stage was “exhibition of commercial films in movie theatres”. The term “commercial” excludes all the repositions of classical movies and *art house* movies with little commercial interest. For the definition of the relevant geographic market, the investigation focused on local exhibition markets. As we can see in Table A4 in Appendix 1, the level of concentration at national level is very small, so the merger was not expected to have an anticompetitive effect on the national market. No supply-side substitution considerations were used in the market definition stage of this investigation.

The analysis I do in this work differs considerably from those performed in the investigations just mentioned. The main reason is that the scope of my analysis is “a daily session in a movie theatre” and not just “movie theatres”. The characteristics of the good are a bundle of theatre characteristics (such as location, quality of the theatre, accessibility, etc.) and the bundle of films shown on the day analysed. This good allows for supply-side substitution as the bundle of movies shown can be changed in the short run. By contrast, when the scope of analysis is “a movie theatre”, the characteristics of the good are mainly theatre characteristics, which cannot be changed in the short run without incurring significant sunk costs. That good does not allow for supply-side substitution.

## 5. The Demand Model

In this section, I start by presenting the estimable model of demand and I then describe the data used for each of the variables in the model and the sources of those data. The third subsection discusses the estimation procedure and the way the identification problem is solved. The last part of the section presents the econometric results of the

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<sup>16</sup> Competition Commission (2006).

<sup>17</sup> Tribunal de Defensa de la Competencia (2006) and Servicio de Defensa de la Competencia (2005).

estimated model. It interprets the results analysing the main drivers of movie theatre attendance and the implications for competition in retail markets. From a set of four valid model specifications one of them is chosen for the market definition analysis of Section 6.

### 5.1. Estimable demand model

The first task in the empirical analysis of market definition in the cinema exhibition market is the estimation of the demand function for movie theatre attendance. I need to describe an estimable model of demand when products are differentiated in location and other dimensions, incorporating the observed locations of stores as well as the actual geographic distribution of consumers within the market. By doing so, the demand model can help explain the observed variation in sales across the stores and, in addition, substitution patterns between stores depend directly on the distribution of consumers vis-à-vis the stores.

I use the standard methodology to model demand for differentiated products. This amounts to projecting products into the space of characteristics. Heterogeneous consumers value products through those characteristics.

The model of demand estimation used is based on Davis (2006) and is within the broad class of Mixed Multi-Nomial logit models, see McFadden (1973).

The product is defined as a daily session of a movie in a cinema. The demand of that product is the horizontal sum of demands of each movie in that cinema that day. Let us thus describe the shape of the demand for a film exhibited in a theatre on a particular day. The conditional indirect utility consumer  $i$  obtains from watching film  $f$  at theatre (house)  $h$ , on a day (time)  $t$ , is assumed to be of the form:

$$u_{ifht} = x'_{fht} \beta - g(d(L_i, L_h); \lambda) + \xi_{fht} + \tau_f + \gamma_h + \kappa_t + \varepsilon_{ifht}$$

$$i = 1, \dots, I, \quad f = 1, \dots, F^h, \quad h = 1, \dots, H, \quad p = 1, \dots, P, \quad t = 1, \dots, T,$$

where  $(\beta, \lambda)$  are parameters,  $x_{fht}$  are  $K_1$  observable product characteristics (including the ticket price  $p_{ht}$ ),  $\tau_f$ ,  $\gamma_h$  and  $\kappa_t$  are control variables for film, cinema and time respectively. The distance from the consumer's location  $L_i$  to the theatre's location  $L_h$  is denoted as  $d(L_i, L_h)$  and  $g(\cdot; \cdot)$  is a function such as linear or quadratic function of  $d(L_i, L_h)$ , known up to the  $(K_2 \times 1)$  vector of parameters  $\lambda$ .  $\xi_{fht}$  represents an

unobserved (by the econometrician) product characteristic and  $\varepsilon_{ift}$  is a mean zero individual- and product-specific stochastic term.

Examples of observed product characteristics include the number of screens in the cinema, the circuit that runs the cinema and the location of the theatre in either a shopping mall or an individual building. The observed product characteristics are assumed observed by, and common to, all individuals. With same values of all other characteristics (including price), each consumer prefers a product with a higher  $\xi_{ift}$ . I assume that the relevant features of theatres and movies are public information and therefore both firms and consumers observe all product characteristics and use all that information when taking their decisions.

The consumer characteristics are her socio-economic conditions and her location  $L_i$ . The location  $L_i$  with which consumer  $i$  is endowed determines her distance to each theatre  $h$ ,  $d(L_i, L_h)$ . I assume that, all else equal, an individual attends her closest movie theatre. I calculate distance as the driving distance between consumer's location and theatre's location in the shortest available way. The reason why I use driving distance in the shortest available way is that I understand that it is the best approximation to the standard assumption of Euclidean distance, frequently used in the literature of spatial competition. The (global) Euclidean distance assumes that a consumer's indifference curves in geographic space are concentric circles about her location and the distance is therefore measured as a straight line between consumer's location and theatre's location.<sup>18</sup>

To complete the demand system, we need to define the existence of an *outside option*: every day some consumers decide not to attend any film in a movie theatre at all. The conditional indirect utility from the outside option is:

$$u_{i0t} = \xi_{0t} + \pi S_i + \varepsilon_{i0t}$$

where  $S_i$  is a  $s \times 1$  vector of the consumers' socio-economic characteristics and  $\pi$  is a vector of parameters which measures how the taste for going to the theatres varies with those socio-economic characteristics, such as GDP per capita, level of studies and the

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<sup>18</sup> Another distance concept employed in the literature is the (local) common-market-boundary measure used by Feenstra and Levinsohn (1995), that allows for multiple dimensions of product diversity and compute endogenous market boundaries in that space. It assumes that products that do not share a market boundary do not compete directly. For a more complete discussion on these issues the reader is referred to Slade (2005).

employment status. I assume that consumers attend at most one performance of a film at a single theatre each day.

The model is formulated as a static choice model. Explanations of the advantages and disadvantages of such a specification can be read in Davis (2006).

Given the choice model described, the set of consumers who choose each product is defined as:

$$A_{fht}(x_t, \xi_t; \theta) = \{(L_i, S_i, \varepsilon_{ifht}) \mid u_{ifht} > u_{igl} \quad \forall g, h, f, l \text{ s.t. } (h, f) \neq (g, l)\}$$

where  $x_t$  and  $\varepsilon_t$  are the  $J' \times 1$  observed and unobserved characteristics,  $(L_i, S_i)$  are consumer characteristics and  $\theta = (\beta, \lambda, \pi)$  is a vector containing all the parameters of the model.

The aggregate market share of film  $f$  at theatre  $h$  each day is the sum of all consumers who choose that option:

$$s_{fh}(x, \delta; \theta_2) = \int_{A_{fh}} dP^*(L, S, \varepsilon) = \int_{A_{fh}} dP^*(\varepsilon) dP^*(L, S)$$

where  $P^*(\cdot)$  denotes a population distribution function and the second equality follows from an assumption of independence of  $(L, S)$  and  $\varepsilon$ .

The following subsection describes the data used and the identification issues involved in the estimation of this demand model.

## 5.2. Data

I will now enumerate the variables used in each of the vectors of variables described in the previous subsection, the data sources and some of their main features:

- Market shares  $s_{fht}$ : The figures of market shares are calculated from the information on attendance provided by Nielsen. The figures collected by Nielsen are figures of attendance and box office revenue for each movie at each theatre each day. We thus do not observe the actual scale of prices, but the average ticket price for each film per day (this is the ratio of box office revenue to number of spectators).<sup>19</sup>

The data correspond to a subset of first-run movie theatres that report their data to Nielsen Spain. Those are the movie theatres in the North of Spain (except for the Mediterranean coast), namely in the regions of Galicia, Asturias, Cantabria, Basque Country, Navarre and Rioja and in the provinces of Valladolid, Palencia, Burgos and

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<sup>19</sup> The model may therefore perform poorer in estimating the market shares in those theatres where the range of available ticket prices for different groups of spectators varies more significantly.

Huesca.<sup>20</sup> The dataset corresponds to those theatres for which the closest cinema is at a distance no greater than twenty kilometres that gave permission to Nielsen to have their data disclosed.

The data include all first-run films exhibited in ten different weeks, reported in Table A8, one in March and one in October for the years 2001-2005. Table A9 in Appendix 1 reports the cinemas included in the analysis, some of their main features and the periods in which they have been active.<sup>21</sup> I will preserve the confidentiality of the data.

As we can observe in Table A9, the exhibition industry has been very active in terms of openings and closings. This has a positive implication for the estimation of the model as prices are instrumented with different measures of rival cinemas' characteristics. The frequent changes in the number and features of rivals help explain the changes in prices across periods.

Table A10 reports the number of cinemas and screens in the area on each period analysed and the number and percentage of them for which we observe data. We can observe that the dataset corresponds to a high subset of the market.<sup>22</sup>

- Observable product characteristics  $x_{jht}$ : A product characteristic is the vector of ticket prices,  $p_{ht}$ , assumed to be equal for each movie exhibited in a theatre on a particular day. As mentioned above, I do not observe the whole distribution of prices at each cinema each day.<sup>23</sup> I instead observe the average ticket price paid at each theatre each day (obtained by dividing the daily theatre's box office revenue by the number of spectators). The source of these data is Nielsen again. Among other reasons, the fact that price data are obtained from attendance data raises concerns about identification and the need to use instruments for price that will be discussed below. The vector of ticket prices  $p_{ht}$  also includes the prices of cinemas around. I observe data on rivals' prices for all cinemas in the dataset. Different measures of rivals' prices are created including the weighted average ticket prices within different radii of distance.

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<sup>20</sup> The total population in the area is eight million.

<sup>21</sup> There are a few number of theatres, specially those with one screen, that had been active in some of the periods analysed but they have not been included in the analysis as the movies exhibited were not first-run movies and their figures were not reported to Nielsen.

<sup>22</sup> A big part of the cinemas for which I don't have data are small cinemas that had already closed down when I started the collection of data. Actually, for the last period analysed I have data for all the cinemas in the area except for one cinema that was at bankruptcy at that time and was not allowed to disclose the data without judicial permission.

<sup>23</sup> I use the word *distribution* because many cinemas in my sample do not just charge a ticket price for all spectators, but they have different prices for different groups of spectators, regarding their age and their belonging to several associations or consumer networks.



Other observable product characteristics, relevant for the market definition exercise, are the counts of cinemas screening the same movie within the different distance areas. These variables allow us to analyse the role of supply-side substitution. We can estimate what would have been the attendance to a movie in a cinema if its neighbour cinema(s) had screened the same movie.<sup>24</sup>

I have also collected information on the number of theatres, screens and capacity (both in total and in shopping malls) that a cinema has for each of the periods analysed within the distance areas that have been considered. The number of rival theatres and their characteristics tend to affect the ticket price of a cinema. I also use counts about the rivals of the rivals which analogously affect rivals' prices.

- Cinema fixed effects  $\gamma_h$ : The main characteristics of a cinema are the number of screens, total cinema capacity and whether the theatre is located in a shopping mall.<sup>25</sup>

The source of this information is the Census of Movie Theatres for each of the years analysed published by the Asociación para la Investigación de Medios de Comunicación (AIMC), the Media Research Association in Spain.

I use a dummy variable for each cinema in the dataset and a dummy variable for the circuit (chain) that runs each movie theatre. Cinemas belonging to the same circuit usually have very similar characteristics in terms of screen and sound quality, comfort of seats and convenience of ticket purchase.<sup>26</sup>

- Observable socio-economic characteristics  $S_i$ : In this dataset, we do not observe the behaviour of attendance to movie sessions by individual consumers. We observe the location of movie theatres and the socio-economic characteristics of the areas where all the potential customers live. For each town, I have collected the following information from the Census of Population and Dwellings published by the Spanish National Statistics Institute (INE). The data collected correspond to the populations in 2004:

- Population: Number of people and number of people by group age (cohorts 0-4, 5-9, etc.) and gender.
- Average economic level.

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<sup>24</sup> The information about the location of each cinema is taken from the Census of Movie Theatres published by the Asociación para la Investigación de Medios de Comunicación (AIMC), the Media Research Association. The information on the titles screened at each cinema has been provided by Nielsen and the distances between theatres have been calculated from the Michelin Guide.

<sup>25</sup> These are the main features analysed as they approximate the variety dimension that, as I have explained above, I take as one of the three main characteristics of a movie theatre besides location and the bundle of movies exhibited.

<sup>26</sup> Online and telephone ticketing is not available in most (if not all) independent movie theatres that do not belong to any circuit.

- Average education level.
- Average number of children per family unit.
- Labour force participation.
- Employment rate.
- Rate of people living with their partner.

In addition to these town-specific variables, I use information on regional GDP per capita. The corresponding figures are calculated by dividing the figures of GDP, taken from the Contabilidad Regional de España (the Spanish Regional Accounts), by the figures of population, taken from the Census of Population and Dwellings just mentioned. The data collected correspond to the period 2001-2005.

Variables	Mean	Std. Dev.	Min	Max	Obs.
Cinema-Film-Day Variables					
Attendance	70.72	113.40	0	3217	50123
Cinema-Day Variables					
Daily attendance	563.72	780.17	0	6934	6381
Daily price (in real terms 2001=0)	4.00	0.60	1.52	5.95	6285
Cinema Variables					
Screens	5.45	4.00	1	18	139
Capacity	1228.50	756.41	200	4083	134
Shopping mall	0.35	0.48	0	1	139
Cinema-Period Variables					
Cinemas in 0-1 km	0.62	0.90	0	4	935
Cinemas in 1-2 km	0.94	1.06	0	5	935
Cinemas in 2-3 km	0.53	0.81	0	4	935
Cinemas in 3-4 km	0.32	0.66	0	3	935
Cinemas in 4-5 km	0.32	0.66	0	3	935
Cinemas in 5-10 km	1.00	1.57	0	10	935
Cinemas in 10-20 km	0.98	1.76	0	8	935
Cinemas in 0-5 km	2.73	1.83	0	8	935
Other-group cinemas in 0-5 km	2.11	1.62	0	8	935
Screens in 0-5 km	16.58	12.34	0	53	935
Screens in 5-10 km	7.94	11.13	0	61	935
Screens in 10-20 km	6.42	11.51	0	46	935
Film Variables					
Number of weeks in exhibition	4.80	8.75	1	257	51114
Number of copies	180.57	110.33	1	452	51114
Cinema-Film Variables					
Number of screens showing same movie in 0-5 km	0.68	0.81	0	5	6121
Number of screens showing same movie in 5-10 km	0.92	0.94	0	7	3691
Number of screens showing same movie in 10-20 km	0.95	1.02	0	5	2544

Table 1: Summary statistics for the main variables in the data

- Location  $(L_i, L_h)$ : The location of a movie theatre  $h$ ,  $L_h$ , is published in the Census of Movie Theatres recently mentioned. The locations of consumers are taken

from the Census of Population and Dwellings also mentioned above. The distance between the location of a movie theatre and the location of a person living in a particular post code has been calculated using the "distance calculator" of the Michelin Guide, as the distance between the theatre address and the centroid of the post code where the person lives in the shortest driving route. By doing this, I am using the assumption that all people living in a post code are living in the very same geographic point.

- Film fixed effects  $\tau_f$ : Film fixed effects include the film title itself, the number of weeks that the movie has been in exhibition, the number of copies of that movie distributed in all cinemas in Spain and the distributor. The number of copies of a film distributed at one particular week typically decreases with the number of weeks after national release. The use of both number of copies and number of weeks allows us to differentiate the effects of attraction that a film has when it has been recently released (the more recent the release, the higher the number of copies in circulation) from the effect of spectators' valuation of a movie that tends to be higher the higher the number of weeks that the movie has been projected.

In Table 1, we can observe summary statistics for the main variables in the data.

### 5.3. Estimation

I now explain the identification issues and the estimation procedure followed in the econometric model of movie theatre demand. In my model, I estimate movie theatre attendance using as regressors the observed characteristics of population, cinemas, films and time. As each cinema decides on the ticket prices for their sessions, my measure of price  $p_{ht}$  is correlated with the unobserved product characteristic  $\xi_{fht}$ . I therefore need to use valid instruments for ticket price that are uncorrelated with the unobserved product characteristic. Notationally:

$$E[\bar{\xi}_{ht}(\theta^*)Z_{ht}] = 0$$

where  $\bar{\xi}_{ht}$  is the average across films of the unobserved product characteristic and  $Z_{ht}$  is a set of instruments.

The main source of price change across time in the Spanish movie theatres is due to the scheme of price discounts. Typically, ticket prices are lower on weekdays than on weekends, as the discounts to different groups of consumers generally take place on weekday sessions only. Moreover, as I have explained above and shown in Table A6,

there is usually one day in each cinema with reduced price for all spectators popularly known as “Spectator’s Day”. Different movie theatres have different days as their Spectator’s Day, but the most frequent days are Monday and Wednesday. We can observe this pattern in Table 2:

Day of the Week	Mean	Std. Dev.	Min	Max	Obs.
Monday	3.71	0.52	1.76	5.27	897
Tuesday	3.83	0.57	1.76	5.21	903
Wednesday	3.68	0.61	1.76	5.18	884
Thursday	3.90	0.58	1.74	5.19	863
Friday	4.13	0.51	1.52	5.96	910
Saturday	4.35	0.50	1.78	5.67	914
Sunday	4.37	0.49	2.54	5.37	914

Table 2: Summary statistics for ticket price on each day of the week (in real terms, base year 2001)

There may also be price variation across periods. Table 3 shows that there exists some variation.

Period	Mean	Std. Dev.	Min	Max	Obs.
March 2001	3.87	0.56	1.80	5.24	613
October 2001	3.97	0.59	1.80	5.00	675
March 2002	3.98	0.58	1.74	5.95	656
October 2002	4.03	0.58	1.74	4.84	622
March 2003	4.00	0.58	2.15	5.15	651
October 2003	4.05	0.61	1.87	5.25	605
March 2004	4.01	0.59	1.82	5.37	613
October 2004	4.08	0.62	2.28	5.28	623
March 2005	3.97	0.64	1.52	5.19	632
October 2005	4.04	0.66	1.76	5.27	595

Table 3: Summary statistics for ticket price on each period (in real terms, base year 2001)

We must thus look for instruments of prices that change across cinemas, across periods and across different days of the week. Davis (2006) suggests the use of rivals’ characteristics as instruments for prices. In the area and period of Davis (2006)’s analysis, he found that one of the main drivers of attendance was the quality of sound. All else equal, a spectator preferred to go to a cinema with digital sound system rather than without digital system, and also preferred one with last generation digital sound than with an older digital system, implying that the higher the number of neighbour cinemas with digital sound system the lower the cinema’s ticket price.

In my interviews with exhibitors and other cinema experts, many of them agreed that the main driver of attraction of a theatre in Spain during the period analysed was stadium seating. In the North of Spain theatres with stadium seating are mostly those

opened after year 2000 and especially those located in shopping malls. As stadium seating is a fixed characteristic that does not change across the different days of the week, I perform a regression using the weekly ticket price (in real terms again) as a dependent variable to check whether the ticket price is lower for cinemas with a higher number of surrounding shopping mall cinemas. I use dummy variables to control for period, region, circuit and cinema and take the number of shopping mall theatres within 5 kilometres as a regressor. The method of estimation is OLS. We can see in the left column in Table 4 that the number of shopping mall cinemas within 5 km has a negative and significant effect on ticket price so it might be a valid instrument.

Another regression of ticket price adding other regressors including a dummy for shopping mall (with results reported in the second column on the left of Table 4) reveals that a movie theatre itself tends to charge average lower prices if it is in a shopping mall. Another variable that affects prices in a similar way is the number of other-group theatres within 5 km. The first two columns from the right-hand side of Table 4 show that this value affects prices negatively and there is no reason to expect that it is correlated with the errors in the main regression. Therefore, we have two candidate variables as instruments for price to be used in the estimation of the demand for daily movie theatre attendance: shopping-mall theatres within 5 km and other-group theatres within 5 km.

Independent Variables	Dependent Variable: Weekly ticket price in real terms (base year 2001)							
	Parameter	t	Parameter	t	Parameter	t	Parameter	t
Constant	2.2190	5.47	4.3067	9.98	2.1357	5.23	4.7809	10.87
Screens	-	-	0.0468	5.95	-	-	0.0340	4.22
Shopping mall	-	-	-0.5246	-5.89	-	-	-0.3345	-3.66
Regional GDP	-	-	-2.27E-05	-1.09	-	-	-4.02E-05	-1.89
Population within 10 km	-	-	1.90E-06	5.79	-	-	2.06E-06	6.25
Shopping mall theatres within 5 km	-0.1092	-11.64	-0.1057	-9.98	-	-	-	-
Other-group theatres within 5 km	-	-	-	-	-0.0306	-5.38	-0.0395	-6.79
Dummy Variables								
Period	√	√	√	√	√	√	√	√
Region	√	√	√	√	√	√	√	√
Circuit	√	√	√	√	√	√	√	√
Cinema	√	√	√	√	√	√	√	√
Number of observations	7256		7123		7256		7123	
R-Squared	0.7832		0.7846		0.7799		0.7821	

Table 4: Coefficients of the OLS estimation of the weekly ticket price

As those two variables vary across periods and across cinemas, we just need to make them interact with a measure of the different days of the week to account for the three

sources of price variation explained above (periods, cinemas and days of the week). As theatres usually charge the same price for Saturdays and Sundays (see Table 2), I use as instruments for price the corresponding counts of cinemas within 5 km interacted with the day of the week, with Saturday and Sunday taken together.

In the estimation of the model of demand reported in subsection 5.4, I use data on prices of other firms, as attendance is not only affected by own price but also by rivals' prices. This allows us to estimate not only own-price elasticities of demand but also cross-price elasticities. Rivals' prices are instrumented in an analogous way, using counts of rival theatres within 5 km for the rivals of the cinema considered interacted with the same measure of the day of the week.

The coefficients of the demand model are estimated by using two-stage least squares with the instrumental variables (IV) just explained .

#### *5.4. Econometric Results*

I now present the results of the econometric model of demand of a daily session of a movie in a cinema whose procedure has been explained at the beginning of this section. Table 5 summarises the main results of the econometric model estimated. The values of attendance and real ticket prices are taken in logarithms so the correspondent coefficients of prices are own-price or cross-price elasticities of demand.

I have done the exercise for the two sets of instrumental variables explained in the previous subsection. For each of them, I have made two versions of the model: one including some additional control variables of cinemas and films and the other one without those control variables. As I already use dummy variables for cinemas and films (those reported in Table 5) the inclusion of those variables is a kind of check of the robustness of the model.<sup>27</sup>

We observe that, when we instrument with the number of shopping mall cinemas within 5 km, although the coefficients of elasticities of demand and number of neighbouring

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<sup>27</sup> It might look striking at first glance that the inclusion of those additional regressors causes a decrease in the R-squared value of the regression. This would not be possible if attendance would have been estimated with an OLS using non-instrumented prices as regressors. With an OLS, the inclusion of further variables adds new regressors to the same regressors, so the R-squared value would necessarily increase. In the case of 2SLS, the regressor of the estimation is not the non-instrumented price but the instrumented price. When we add regressors to the model, we are changing the instrumented price as the latter is also estimated with those new regressors in the first stage. This means that the instrumented price used in the original regression and the instrumented price used in the regression in which we add new regressors are different variables. Therefore, with 2SLS we are not adding variables to the same regression but to a different one, so this explains why the R-squared value may be higher in the regression with a lower number of independent variables. This may be better understood by reading Wooldridge (2001), p. 91.

screens showing the movie have the expected sign, two of them are not significant. Some of those coefficients change significantly with the introduction of the cinema and film fixed effects. By contrast, the use of the number of theatres within 5 km as instruments yields significant coefficients of the expected sign that are robust to the inclusion of fixed effects. For this reason, I will use the number of other-group movie theatres within 5 kilometres as the instrument for price in the empirical analysis of market definition performed in Section 6. In order to allow the market definition analysis to be as informative as possible of the idiosyncrasy of the cinemas and movies, I will use the results in the third column of Table 5 in the calculations of the estimated attendance levels.

Variables	Parameter	t	Parameter	t	Parameter	t	Parameter	t
Constant	1.8043	0.62	-0.8071	-0.37	6.3316	2.68	-8.1749	-4.84
Ticket Price	-2.1760	-1.29	-1.0434	-0.54	-2.2855	-3.03	-2.1069	-2.77
Ticket Price of Other-Group Cinemas within 2 km	1.5781	1.53	1.0258	1.11	2.0173	2.54	1.9995	2.52
Ticket Price of Cinemas in 2-10 km	1.6404	1.99	1.5606	1.82	0.2087	0.44	0.2738	0.58
Screens	0.0857	2.79	-	-	0.1250	1.88	-	-
Shopping Mall	0.4346	1.62	-	-	1.9106	2.10	-	-
Regional GDP	-0.0005	-1.07	-	-	-0.0001	-1.33	-	-
Population within 10 km	0.0000	2.56	-	-	0.0000	3.00	-	-
No. of Screens Showing Same Movie within 5 km	-0.2580	-20.0	-0.2597	-20.2	-0.2545	-19.8	-0.2565	-20.0
No. of Screens Showing Same Movie in 5-10 km	-0.1560	-9.13	-0.1553	-9.18	-0.1566	-9.43	-0.1540	-9.28
No. of Weeks of National Exhibition	0.0153	5.18	-	-	0.0153	5.24	-	-
No. of Copies	0.0053	3.16	-	-	0.0055	3.34	-	-
Dummy Variables								
Period	√	√	√	√	√	√	√	√
Calendar Day	√	√	√	√	√	√	√	√
Region	√	√	√	√	√	√	√	√
Circuit	√	√	√	√	√	√	√	√
Distributor	√	√	√	√	√	√	√	√
Movie	√	√	√	√	√	√	√	√
Cinema	√	√	√	√	√	√	√	√
Day of the Week	√	√	√	√	√	√	√	√
Cinema*Day of the Week	√	√	√	√	√	√	√	√
Number of Observations	10621		10621		10621		10621	
R-Squared	0.793		0.7953		0.7943		0.7944	
Instruments	Shopping mall cinemas within 5km				Other-group cinemas within 5km			

Table 5: Econometric Results of the Demand Model of Daily Movie Theatre Attendance

It is very notorious the level of significance of the number of other cinemas' screens showing the same movie. Whereas rivals' prices only affect attendance when rivals are very closely located (less than 2 kilometres away), the bundle of movies shown in other cinemas affect both for close cinemas and for more distant ones (further than five kilometres, whereas attendance is only significantly affected by the price of rivals

within two kilometres). This supports our conjecture that the main source of competition in this industry is not price but the bundle of films exhibited.

The fact that the coefficient for movies shown in 5-10 kilometres is lower (in absolute value terms) than for movies shown within 5 kilometres means that the total level of transportation costs is higher the higher the distance travelled. An inference about the shape of the transportation cost function requires a more thorough analysis with a higher number of distance-related supply-substitution variables.

There are three main conclusions we can take from the results of the econometric model: First, ticket prices affect attendance significantly. Second, price competition in this industry is very important just for neighbouring cinemas. Third, the main source of competition in the industry is the bundle of movies shown. This plays a relevant role in the analysis of market definition with supply-side substitution explained in the following section.

## **6. Market Definition Analysis**

In this section I perform the analysis of market definition analysing the competitive constraints imposed by both demand-side and supply-side substitutes.

The product analysed is the service offered by a movie theatre. That service can be thought of as being differentiated by three main dimensions: variety (that, in our model, is approximated by the number of screens – variety of films– and by whether the cinema is in a shopping mall – variety of other leisure activities–), proximity (described by the location of the cinema and the population around) and quality of the product (that is represented by the set of films exhibited in that cinema on a particular day). Two of those characteristics (variety and proximity) can not be changed in the short run. The other characteristic (quality, described by the bundle of movies) can be changed in the short run.<sup>28</sup> If the price of a movie theatre increases significantly, a competing theatre may decide to reduce the degree of differentiation of its product and the only way it can do this in the short-run is by showing some of the movies that are shown by its rival. Supply-side substitution in this market takes place by replacing some of the movies that are currently exhibited in own theatre by movies exhibited in rival theatres.

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<sup>28</sup> Another important source of differentiation is the quality of the cinema, in terms of quality of sound, comfort of seats, visibility, etc. As that feature cannot be changed in the short, I will abstract from it.



Let us illustrate our market definition exercise with a simple example: There are three cinemas in a town ( $C_1$ ,  $C_2$ ,  $C_3$ ), each with two screens. The original situation is depicted in Table 6(a).

	C1	C2	C3
(a)	A	D	F
	B	E	G
(b)	A	D	A
	B	E	G
(c)	A	D	A
	B	E	D
(d)	A	D	A
	B	E	B

Table 6: Example of supply-side substitution in movie theatre exhibition

Films shown in  $C_1$  are  $A$  and  $B$ , films shown in  $C_2$  are  $D$  and  $E$  and films shown in  $C_3$  are  $F$  and  $G$ . Abstracting from location and other long-run variables, we can say that product offered by  $C_1$  is  $\{A, B\}$ , product offered by  $C_2$  is  $\{D, E\}$  and product offered by  $C_3$  is  $\{F, G\}$ .

Let us now describe supply-side substitution in this industry. The firm that we assume that wants to offer a more substitutable product of its rivals' is  $C_3$ . Table 6(b) describes a marginal relocation of  $C_3$  in terms of product specification.  $C_3$  now shows one of the movies shown in either  $C_1$  or  $C_2$ . Table 6(b) considers that  $C_3$  is still showing film  $G$  and shows film  $A$  instead of film  $F$ . Under this assumption,  $C_3$ 's product becomes more similar to  $C_1$ 's.<sup>29</sup>

Let us now consider the case that  $C_3$  wants its product to become even more substitutable of its rivals' products. Table 6(c) describes a case where  $C_3$ 's product becomes closer to those of both  $C_1$  and  $C_2$  and Table 6(d) shows the case where  $C_3$ 's product becomes a perfect substitute of  $C_1$ 's.

We can thus conclude that, even though the product initially produced by  $C_3$  may not be a demand-side substitute of those produced by  $C_1$  and  $C_2$ , firm  $C_3$ 's product is a supply-side substitute of theirs, so  $C_3$  is a competitor of  $C_1$  and  $C_2$  and they should all

<sup>29</sup> The analysis does not change if we assume that it screens film  $B$ ,  $D$  or  $E$  instead.

be included in the definition of the relevant market according to the European Union competition law.

I will now define the relevant market for a daily cinema exhibition session for four towns in my dataset. For each town the procedure will be the following:

- Once described the town in terms of number of cinemas, number of screens in each cinema and distances between theatres I pick a set of cinemas that are the closest ones in terms of geographic location to be the candidate market. I then report the predicted level of sales (attendance) and profit of each cinema of the candidate market using the values of the coefficients estimated in the regression reported in the third column of Table 5.<sup>30</sup>

- I will then analyse the role played by demand-side substitution by calculating the new level of attendance and profits of those two firms when each of them increases its ticket price by 5%. This allows us to define the relevant market under demand-side considerations alone.<sup>31</sup>

- I then analyse the role played by supply-side substitution (in addition to demand-side substitution) by testing whether the 5% increase in price is still profitable if the firm outside the candidate market reduces its degree of product differentiation with respect to the product of one or two of the cinemas in the candidate market. If no rivals are showing a movie that is shown by a candidate market firm, the variable that corresponds to the number of rivals showing the same movie takes a value 0 for that movie in that cinema. Then, we can simulate what is the effect of supply-side substitution by giving a value 1 to that variable and computing the corresponding levels of attendance and profit. Supply-side substitution is the change in attendance between the two cases. In order to start with a marginal change in product specification and then proceed to more substantial changes, I first allow the cinema outside the candidate market to show the movie that is actually shown in either of the candidate market cinemas with the lowest level of demand and calculate the figures of sales and profits for the two firms in the candidate area. I repeat the analysis by considering that the third cinema exhibits the second least important movie in the other two instead and so on,

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<sup>30</sup> I have data on box office revenue of cinemas, but not on profits. We can realistically assume that all cinema's costs are fixed costs so that unit cost per additional spectator is zero. Profits therefore increase with revenue. We are interested in the rate of change of profits that is the same as the rate of change of revenues, so I will indistinctively use both names.

<sup>31</sup> This corresponds to Scenario 1 of the price-increase approach analysed in Elizalde (2010).

one movie at each time. This will allow us to identify how much substitution is necessary to include all the firms in the definition of the relevant market.

By doing this, we are not only defining the geographic market (e.g. whether the relevant market includes the cinemas in the suburbs in addition to the cinemas in the town centre) but also the product market, as we assess which movies have to be substituted.

The analysis is done for four towns in my database.<sup>32</sup> We will observe that the degree of relocation (in terms of product characteristics) necessary to make the increase in price unprofitable depends on the number and size of competitors and on the distance between cinemas.

	A	B	C
A	-	1	1.8
B	-	-	2.5
C	-	-	-
Screens	8	2	12

Table 7: Description of Town 1

Table 7 reports the size of each cinema in Town 1 (in terms of screens) and the distances, measured in kilometres, between any two of them. We can observe that cinema *C* has a higher number of screens than the sum of the other two. Cinemas *A* and *B* are the ones that are closest, so we will take the candidate market as firms *A* and *B*.

A		B		A+B		% Change		Relevant Market
output	profit	output	profit	output	profit	output	profit	-
21.5	75.30	14.4	38.95	35.9	114.25	-	-	-
<i>after 5% price increase by firms A and B</i>								
19.3	70.99	14.2	40.36	33.5	111.35	-6.69%	-2.54%	A+B+C

Table 8: Market definition analysis for Town 1

The first row of numbers in Table 8 correspond to the predicted values of output and profit by each of the firms in the candidate market and by both of them jointly. The second row of numbers reports the values that would be reached if firms *A* and *B* increased their prices by 5%. As it was expected, the output of each firm decreases. As for profits, while firm *B*'s profit increases with the increase in price, firm *A*'s profit decreases and more than offsets the increase in profit experienced by firm *B*. Their

<sup>32</sup> I will not mention the names of the towns analysed in order to preserve the privacy of the data agreed for their disclosure.

joint profit thus decreases so we can conclude that, even when taking only into account demand-side substitution, the relevant cinema exhibition market in Town 1 is formed by all three cinemas  $A$ ,  $B$  and  $C$ , as it is indicated in the last column.

	A	B	C
A	-	0.7	2.5
B	-	-	2.5
C	-	-	-
Screens	5	11	13

Table 9: Description of Town 2

Table 9 presents Town 2. We see that, in this case, cinema  $C$  is a bit further from cinema  $A$  than it was in Town 1 and also the number of screens in cinema  $C$  is, in this case, lower than the sum of screens in the other two cinemas. We can thus expect that the competitive constraint imposed by cinema  $C$  in Town 2 is lower than the one that took place in Town 1.

The first row of numbers in Table 10 presents the figures of output and profit for firms  $A$  and  $B$  in the original situation. When they both raise prices by 5%, their joint profit increases by 1.58%, so we can conclude that in Town 2 firms  $A$  and  $B$  form a separate market under demand-side substitution considerations.

A		B		A+B		% Change		Relevant Market
output	profit	output	profit	output	profit	output	profit	-
129	638	323	1817	452	2456	-	-	-
<i>after 5% price increase by firms A and B</i>								
127	662	319	1883	446	2545	-1.30%	3.63%	A+B
<i>after 5% price increase and relocation by C: "The Crossing"(A)</i>								
126	656	319	1883	445	2539	-1.54%	3.41%	A+B
<i>after 5% price increase and relocation by C: "Sinfin"(B)</i>								
127	662	318	1874	445	2536	-1.64%	3.26%	A+B
<i>after 5% price increase and relocation by C: "Otros Días Vendrán"(B)</i>								
127	662	315	1859	442	2521	-2.20%	2.66%	A+B
<i>after 5% price increase and relocation by C: "Trauma"(A)</i>								
121	630	319	1883	440	2513	-2.64%	2.35%	A+B
<i>after 5% price increase and relocation by C: "El Desenlace"(A)</i>								
114	592	319	1883	433	2475	-4.26%	0.80%	A+B
<i>after 5% price increase and relocation by C: "Siete Vírgenes"(B)</i>								
127	662	307	1809	434	2471	-4.07%	0.62%	A+B
<i>after 5% price increase and relocation by C: "An Unfinished Life"(B)</i>								
127	662	303	1788	430	2450	-4.86%	-0.24%	A+B+C

Table 10: Market definition analysis for Town 2

We now allow firm *C* to *relocate*, in the sense that it will stop showing one of the movies it was showing and will start showing one of the movies currently shown in either cinema *A* or cinema *B* or in both. The letter in brackets denotes the cinema (*A* or *B*) where that movie is shown. With a marginal relocation of one movie, the relevant market is formed by cinemas *A* and *B* except in the case of “An unfinished life”. If firm *C* adopts the characteristic of their rivals’ goods that is most highly valued by consumers (in this case the movie “An unfinished life”), the 5% price increase would not be profitable, so the relevant market must be defined as all three firms under supply-side substitution. The fact that just one movie is necessary to make the price increase unprofitable proves the high relevance of supply-side substitution in this industry. An analysis of the effect of demand- and supply-side substitution on the estimated levels of attendance and box office revenue is reported in Appendix 2.

Let us now analyse Town 3. As Table 11 shows, in this town the most distant cinema (*C*), is not big in terms of number of screens in comparison to the other two cinemas and is significantly further located than in the previous cases. We can thus expect a degree of substitution of cinema *C*’s product with respect to those of cinemas *A* and *B* smaller than in the towns previously analysed. So the degree of relocation necessary to have all those firms included in the same relevant market is expected to be bigger than before. We can observe in Table 12 that this is actually the case. Cinema *C* needs to exhibit two movies shown in cinemas *A* and *B* in order to make the 5% increase in price unprofitable.

	A	B	C
A	-	1.8	6.5
B	-	-	5.5
C	-	-	-
Screens	11	7	8

Table 11: Description of Town 3

A		B		A+B		% Change		Relevant Market
output	profit	output	profit	output	profit	output	profit	-
287	1368	205	965	492	2332	-	-	-
<i>after 5% price increase by firms A and B</i>								
283	1417	202	1000	485	2417	-1.30%	3.63%	A+B
<i>after 5% price increase and relocation by C: "Astronautas"(B)</i>								
283	1417	202	996	485	2414	-1.43%	3.50%	A+B
<i>after 5% price increase and relocation by C: "Dark blue"(A)</i>								
281	1411	202	1000	484	2410	-1.57%	3.35%	A+B
<i>after 5% price increase and relocation by C: "The station agent"(A)</i>								
281	1408	202	1000	483	2408	-1.67%	3.24%	A+B
<i>after 5% price increase and relocation by C: "21 grams"(A)</i>								
280	1405	202	1000	483	2404	-1.82%	3.09%	A+B
<i>after 5% price increase and relocation by C: "Cachorro"(A)</i>								
280	1403	202	1000	482	2402	-1.89%	3.01%	A+B
<i>after 5% price increase and relocation by C: "Girl with a pearl earring"(A)</i>								
278	1391	202	1000	480	2391	-2.35%	2.52%	A+B
<i>after 5% price increase and relocation by C: "Lost in Translation"(A)</i>								
277	1388	202	1000	479	2387	-2.51%	2.36%	A+B
<i>after 5% price increase and relocation by C: "Gothika"(A+B)</i>								
279	1396	198	978	477	2375	-3.02%	1.83%	A+B
<i>after 5% price increase and relocation by C: "Big fish"(A+B)</i>								
279	1396	198	978	477	2374	-3.06%	1.79%	A+B
<i>after 5% price increase and relocation by C: "Gothika"(A+B) + "Big fish"(A+B)</i>								
274	1375	194	957	468	2332	-4.78%	-0.02%	A+B+C

Table 12: Market definition analysis for Town 3

In the last town analysed, Town 4, there are four cinemas. Three of them (*A*, *B* and *C*) are within a radius of 2 kilometres (they are in the town centre), whereas cinema *D* (located in a suburban shopping mall) has its closest cinema at a distance of 4.5 kilometres. In this town, the ability of firm *D* (the firm outside the candidate market) to offer a closer substitute to those of *A*, *B* and *C* is not very big as many of the most highly valued movies in *A*, *B* and *C* are already shown in *D*.

	A	B	C	D
A	-	1.1	2	5
B	-	-	2	4.5
C	-	-	-	5.5
D	-	-	-	-
Screens	6	6	7	8

Table 13: Description of Town 4

A		B		C		A+B+C		% Change		Relevant Market
Output	profit	output	profit	output	profit	output	profit	output	profit	-
839	4365	1147	5965	1987	10417	3974	20747	-	-	-
<i>after 5% price increase by firms A, B and C</i>										
828	4523	1133	6182	1961	10795	3922	21501	-1.30%	3.63%	A+B+C
<i>after 5% price increase and relocation by C: "The Alamo"(C)</i>										
828	4523	1133	6182	1957	10771	3918	21476	-1.41%	3.52%	A+B+C
<i>after 5% price increase and relocation by C: "Horas de luz"(A)</i>										
820	4480	1133	6182	1961	10795	3914	21457	-1.50%	3.42%	A+B+C
<i>after 5% price increase and relocation by C: "Touching the void"(A)</i>										
816	4455	1133	6182	1961	10795	3910	21432	-1.62%	3.30%	A+B+C
<i>after 5% price increase and relocation by C: "Tiovivo C. 1950"(A)</i>										
810	4425	1133	6182	1961	10795	3904	21402	-1.75%	3.16%	A+B+C
<i>after 5% price increase and relocation by C: "Roma"(A)</i>										
790	4315	1133	6182	1961	10795	3884	21293	-2.26%	2.63%	A+B+C
<i>after 5% price increase and relocation by C: "Diarios de motocicleta"(A)</i>										
780	4261	1133	6182	1961	10795	3874	21238	-2.51%	2.37%	A+B+C
<i>after 5% price increase and relocation by C: "The sea inside"(A+C)</i>										
774	4225	1133	6182	1894	10423	3800	20830	-4.38%	0.40%	A+B+C
<i>after 5% price increase and relocation by C: "Diarios de motocicleta"(A) + "The Sea Inside"(A+C)</i>										
725,6	3962	1133	6182	1894	10423	3752	20567	-5.59%	-0.86%	A+B+C+D

Table 14: Market definition analysis for Town 4

All the movies shown in cinema *B* are already shown in cinema *D*, so there is no way for cinema *D* to offer a closer substitute to cinema *B*'s product, as we can see in Table 14. There are just two movies exhibited in cinema *C* that are not exhibited in cinema *D*, so substitution mainly takes place by showing movies exhibited in cinema *A*, specialised in art house movies.

The relevant market is formed by all four cinemas when cinema *D* shows the two most highly valued movies in cinemas *A* and *C*, which are "The sea inside", a Spanish movie that won the Academy Prize for best foreign film and "Diarios de motocicleta", a biographic story of Che Guevara.

We can conclude from the analysis of this section that the definition of the relevant market in merger control depicts some of the main features of spatial competition: The degree of competition between firms that produce differentiated products depends on the number and size of competitors, the degree of product differentiation and the geographic distance between retailers.

We have observed that, in most of the towns analysed, a 5% price increase by neighbouring cinemas is profitable by demand-side considerations alone. But, under supply-side considerations too, the relevant market must be aggregated including supply-side substitutes. This illustrates that, in industries with highly differentiated

products, the main source of competition is not price but the characteristics of the products.<sup>33</sup> In the cases analysed, the bundle of movies is the main driver of consumer demand. A relocation of one movie is sometimes enough to make the increase in price unprofitable. This example illustrates the need to account for supply-side substitution when products are differentiated.

The conclusions of this analysis deserve a discussion about the convenience of accounting for supply-side substitution in the definition of the relevant market for retailing goods. According to the Office of Fair Trading's market definition guidelines under the 1998 Competition Act, the convenience of the approach to be used for defining a market "often depends on whether the product is retailing, wholesaling or manufacturing. Retailing markets are more likely to be defined on the demand-side, while wholesaling and manufacturing markets are more likely to be defined on the supply-side".

My opinion contrasts with the OFT's. I agree that the definition of the relevant market for retailing goods is better defined on demand-side substitution grounds only if products are homogeneous, so that people will not travel longer distances unless the price is significantly lower. Nevertheless, when products are differentiated in dimensions other than location, people are ready to travel longer so supply-side substitution plays a key role for defining the relevant retailing market.

In the analysis of Elizalde (2010), the European hypothetical monopolist test is included in Scenario 3 of the price-increase approach. That scenario considers both price and location reaction by firms outside the candidate market. In the analysis of market definition performed in this section I have analysed location reaction only. In order to show the validity of the conclusions of this analysis, Table A12 in Appendix 3 reports the results of the analysis of market definition for Town 2 when firm *C* modifies its price. It is not easy to predict the optimal price reaction of firm *C* so I have replicated the price reaction of firm 1 in the analysis of the price-increase approach in Elizalde (2010) and I have repeated the analysis when firm *C* increases its ticket price by 2.5%. The main conclusion of the analysis does not change even though we now need to relocate in two movies.

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<sup>33</sup> This is supported by the investigation report of the merger between Ábacocine and Cinebox reviewed in Section 4. The Tribunal de Defensa de la Competencia affirmed that the main driver of demand in cinema exhibition was the movie title and, in second instance, the quality and comfort of the theatre (Tribunal de Defensa de la Competencia (2006), p. 48).



## 7. Conclusions

The objective of this work is to develop a market definition test following the conditions published in the 1997 European Competition Notice on the definition of the relevant market for the purposes of Community competition law.

The test uses data for the movie theatre exhibition market in the North of Spain in the period 2001-2005. The first task in the empirical analysis is to estimate the demand for daily film screenings for each of the movies shown in each of the cinemas. The model analyses spatial competition including the observed locations of both movie theatres and population along with other town, cinema and movie observed characteristics. The estimates of the model show that the main driver of competition in retail markets is the bundle of goods offered. Whereas the cross-price elasticities of demand for retailers further apart are significantly lower than for closer located retailers, the level of competition in product characteristics is found to be significant both for close and for more distant retailers.

The second part of the empirical work performs the market definition test for four different towns in the dataset, using the estimated coefficients of the variables obtained in the demand estimation work. It is the first empirical test in the literature that analyses supply-side substitution, in addition to demand-side substitution, by estimating the change of demand that takes place when there is a change in the vector of product characteristics. The analysis shows that, in retail markets, the relevant market should also include supply-side substitutes as consumers are ready to travel a longer distance in order to consume the good that is most similar to their favourite variety, with price competition being a less important driver of retailers' competition.

The findings in this work confirm the Bishop and Walker (1999)'s critique to the European Commission practice when defining relevant markets that "supply-side substitution, if it is considered at all, tends to be more of an after thought". Consequently, markets may have been defined too narrowly.<sup>34</sup> A policy recommendation to the competition authorities in the European Union is to foster the use of tests that include the analysis of both demand- and supply-side substitutes, as the one developed in this work, in order to solve this problem.

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<sup>34</sup> Bishop and Walker (1999), pp. 56 and 64.

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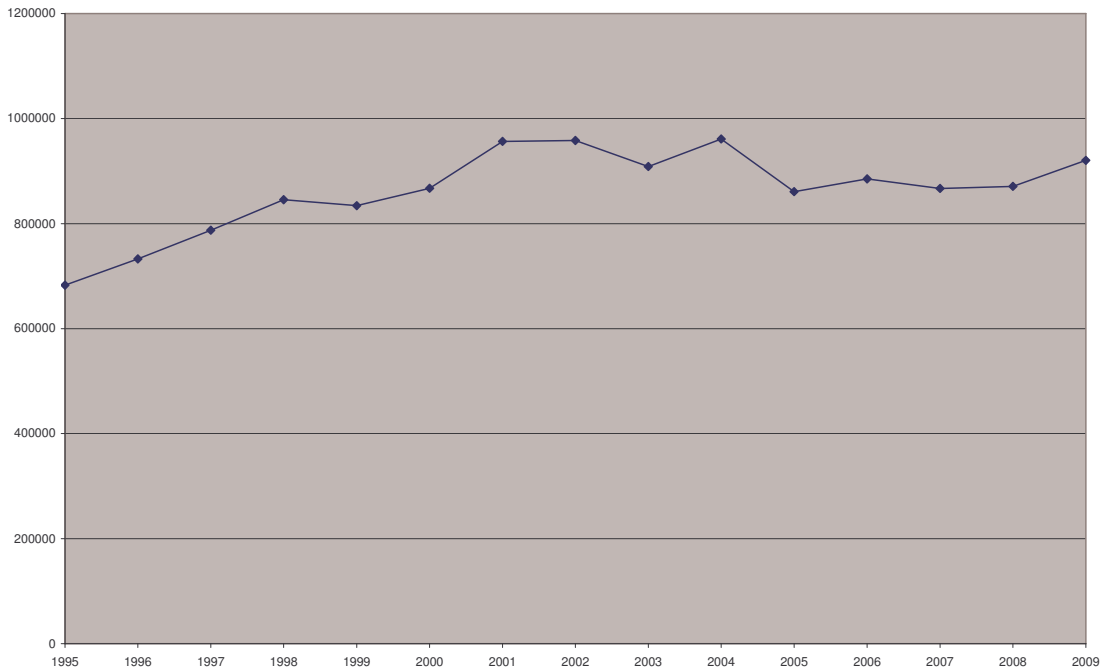
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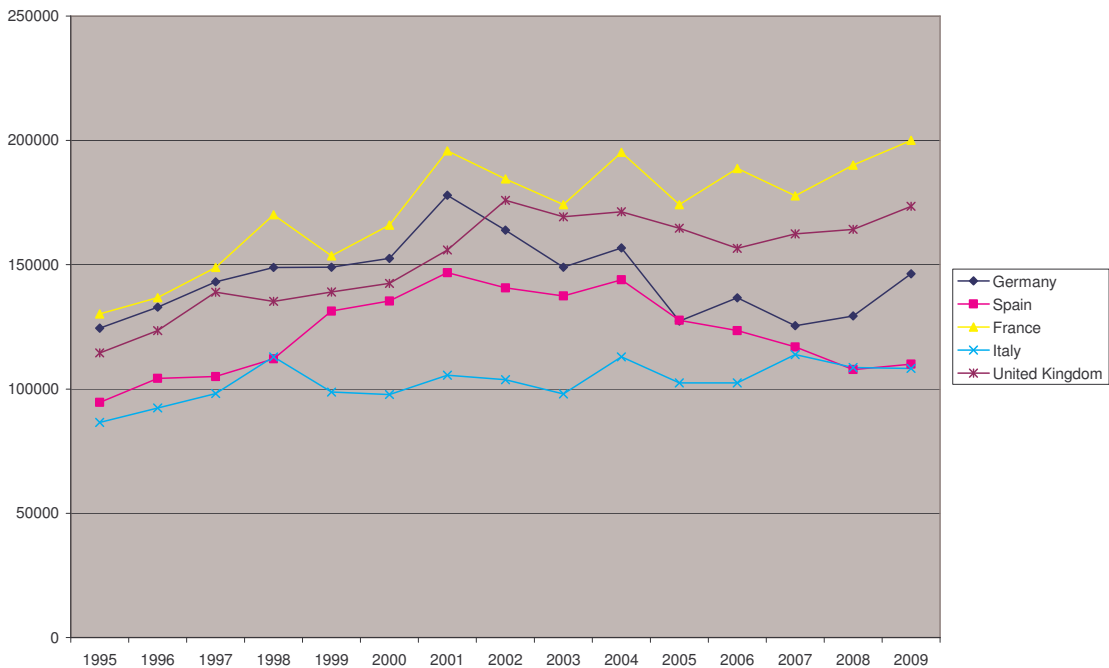
## Appendix 1: Graphs and Tables

**Graph A1: Cinema Attendance in Western Europe (1995-2009)**



Evolution of the number of admissions in the movie theatres in Western Europe. Source: Media Salles

**Graph A2: Cinema Attendance in the Biggest Western European countries (1995-2009)**



Evolution of the number of admissions in the movie theatres in the biggest Western European countries. Source: Source: European Cinema Yearbook, 2009. Media Salles.

**Table A1: Evolution of the Spanish Movie Theatre Exhibition Market (1999-2009)**

	Cinemas	Screens	Screens per Cinema
1999	1334	3343	2,51
2000	1298	3500	2,70
2001	1254	3770	3,01
2002	1223	4039	3,30
2003	1194	4253	3,56
2004	1126	4390	3,90
2005	1052	4401	4,18
2006	936	4299	4,59
2007	907	4296	4,74
2008	868	4140	4,77
2009	851	4082	4,80

The figures are, in the first column, the number of cinemas operating in Spain each year, in the second column, the number of screens and, in the third column, the number of screens per cinema. Source: Spanish Ministry of Culture.

**Table A2: Evolution of Movie Theatres' Size I (1998-2010)**

	1 screen		2 screens		3 screens		4 screens		5-6 screens		7-9 screens		10 and more	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1998	418	52.6	72	9.1	81	10.2	66	8.3	77	9.7	60	7.6	20	2.5
1999	516	54.2	92	9.7	87	9.1	64	6.7	85	8.9	77	8.1	31	3.3
2000	543	53.9	88	8.7	86	8.5	64	6.4	95	9.4	87	8.6	44	4.4
2001	523	51.4	93	9.1	81	8.0	66	6.5	101	9.9	99	9.7	55	5.4
2002	463	47.8	80	8.3	78	8.1	62	6.4	100	10.3	113	11.7	72	7.4
2003	456	46.8	78	8.0	71	7.3	58	6.0	99	10.2	121	12.4	91	9.3
2004	425	44.1	78	8.1	68	7.1	53	5.5	99	10.3	127	13.2	113	11.7
2005	414	44.0	65	6.9	57	6.1	53	5.6	92	9.8	136	14.5	124	13.2
2006	387	43.0	61	6.8	48	5.3	44	4.9	94	10.5	135	15.0	130	14.5
2007	353	41.6	51	6.0	42	5.0	39	4.6	89	10.5	132	15.6	142	16.7
2008	310	39.5	47	6.0	41	5.2	33	4.2	80	10.2	129	16.4	145	18.5
2009	305	39.9	41	5.4	37	4.8	35	4.6	77	10.1	126	16.5	144	18.8
2010	292	39.1	40	5.4	38	5.1	31	4.1	76	10.2	124	16.6	146	19.5

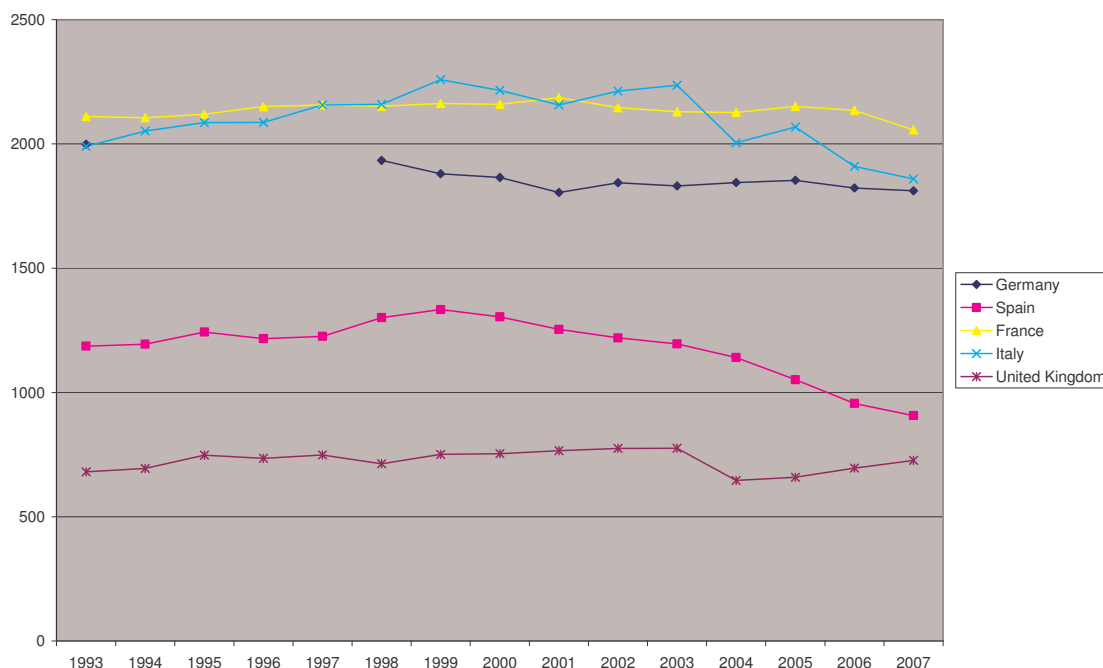
The figures in this table are the number of cinemas (both in absolute value and in percentage terms) with different number of screens. Source: Movie Theatre Census, May 2010. Association for Media Research (AIMC).

**Table A3: Evolution of Movie Theatres' Size II (1998-2010)**

	1 screen		2 screens		3 screens		4 screens		5-6 screens		7-9 screens		10 and more	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1998	418	19.0	144	6.0	243	11.1	264	12.0	423	19.3	467	21.3	238	10.8
1999	516	19.2	184	6.8	261	9.7	256	9.5	471	17.5	609	22.6	394	14.6
2000	543	18.1	176	5.9	258	8.6	256	8.5	525	17.5	687	22.9	555	18.5
2001	523	16.1	186	5.7	243	7.5	264	8.1	561	17.3	787	24.3	677	20.9
2002	463	13.3	160	4.6	234	6.7	248	7.1	556	15.9	899	25.8	928	26.6
2003	456	12.1	156	4.1	213	5.7	232	6.2	548	14.5	956	25.4	1208	32.1
2004	425	10.6	156	3.9	204	5.1	212	5.3	549	13.6	1008	25.0	1475	36.6
2005	414	10.0	130	3.1	171	4.1	212	5.1	509	12.3	1082	26.2	1618	39.1
2006	387	9.4	122	3.0	144	4.0	176	4.3	520	12.6	1073	26.0	1698	41.2
2007	353	8.6	102	2.5	126	3.0	156	3.8	494	12.0	1051	25.4	1851	44.8
2008	310	7.7	94	2.3	123	3.1	132	3.3	444	11.1	1023	25.5	1890	47.0
2009	305	7.8	82	2.1	111	2.8	140	3.6	426	10.8	1000	25.4	1868	47.5
2010	292	7.5	80	2.0	114	2.9	124	3.2	418	10.7	984	25.2	1895	48.5

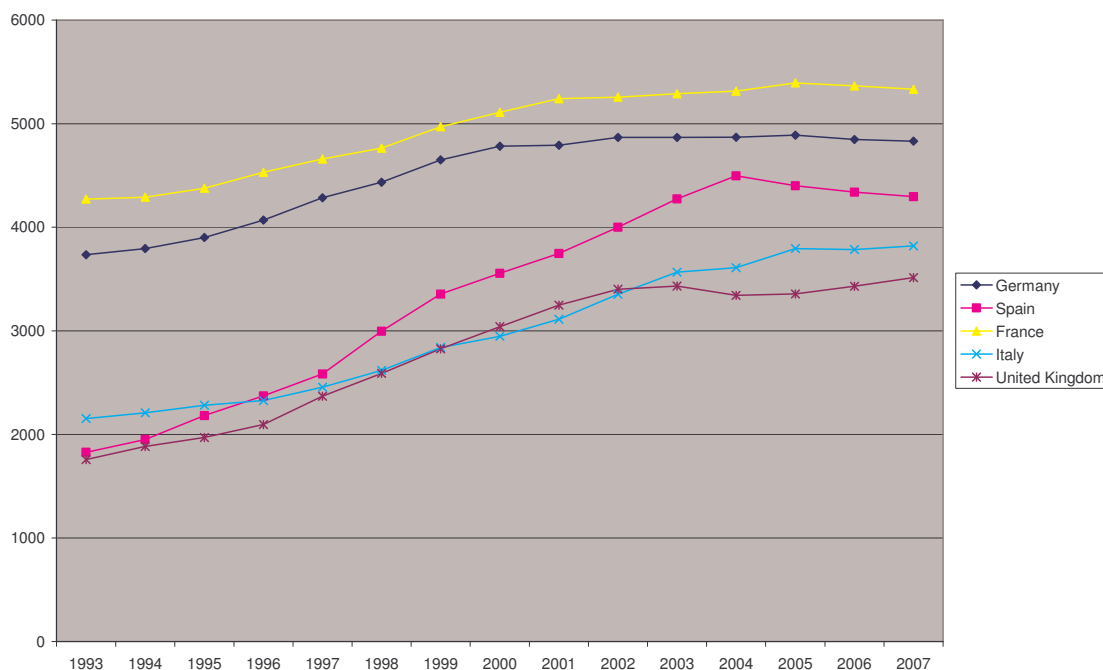
The figures in this table are the number of screens in all the cinemas (both in absolute value and percentage terms) with different number of screens. Source: Movie Theatre Census, May 2010. Association for Media Research (AIMC).

**Graph A3: Evolution of the Number of Cinemas in the Biggest Western European Countries (1993-2007)**



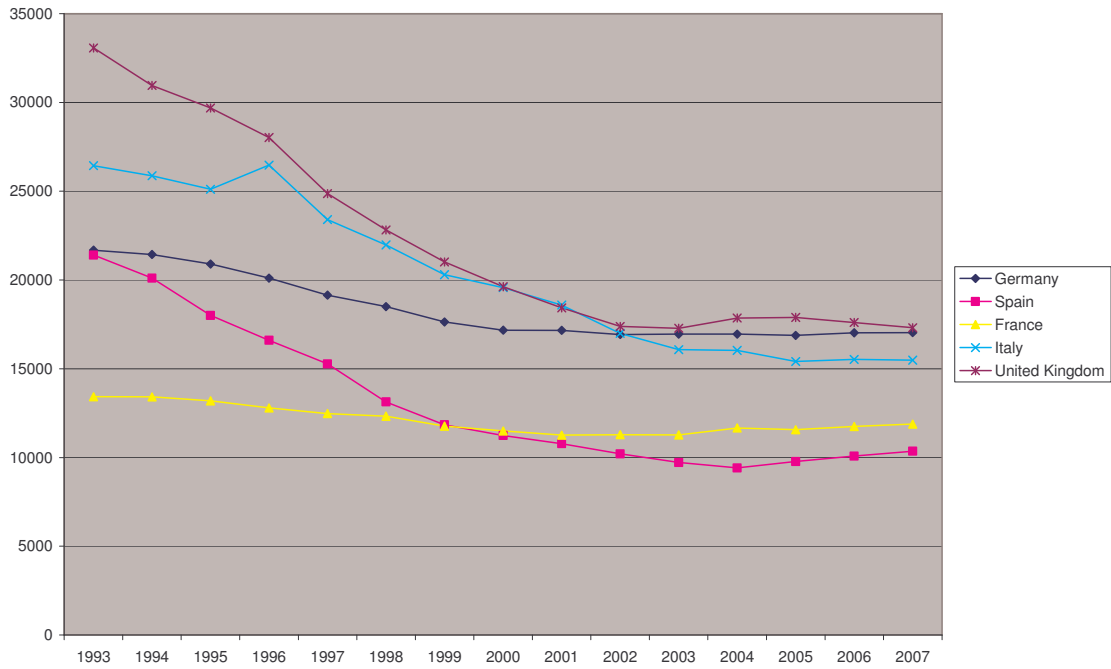
The values in this graph are the number of cinemas in each of the five biggest Western European countries each year between 1993 and 2007. Source: European Cinema Yearbook, 2009. Media Salles.

**Graph A4: Evolution of the Number of Cinema Screens in the Biggest Western European Countries (1993-2007)**



The values in this graph are the number of cinema screens in each of the five biggest Western European countries each year between 1993 and 2007. Source: European Cinema Yearbook, 2009. Media Salles.

**Graph A5: Evolution of the Ratio of Population to Screens in the Biggest Western European Countries (1993-2007)**



The values in this graph are the values of the ratio of population to screens in each of the five biggest Western European countries each year between 1993 and 2007. Source: European Cinema Yearbook, 2009. Media Salles.



**Table A4: Number of Screens and Share of Main Circuits in Spain**

	Circuit	Screens	
		No.	%
1	<b>Cinesa- Warner Lusomondo</b>	350	6.76
2	<b>A.C.E.C.</b>	342	6.60
3	<b>Yelmo Cineplex</b>	332	6.41
4	<b>UCC</b>	256	4.94
5	<b>Lauren</b>	205	3.96
6	<b>Ábaco</b>	181	3.49
7	<b>Cinebox</b>	167	3.22
8	<b>Ramade</b>	135	2.61
9	<b>Macho</b>	127	2.45
10	<b>Coliseo</b>	97	1.87
11	<b>UGC</b>	89	1.72
12	<b>AMC</b>	86	1.66
13	<b>Chiclana</b>	80	1.54
14	<b>Pechuán</b>	77	1.49
15	<b>La Dehesa</b>	70	1.35
16	<b>Neocine</b>	70	1.35
17	<b>Kinépolis</b>	64	1.24
18	<b>Balaña</b>	57	1.10
19	<b>Al-Andalus</b>	52	1.00
20	<b>Vigo</b>	52	1.00
21	<b>Golem</b>	50	0.97
22	<b>Soler</b>	49	0.95
23	<b>Porto Pi</b>	48	0.93
24	<b>Asensio</b>	39	0.75
25	<b>Urgellene</b>	38	0.73

The figures in this table are the number of screens run by the 25 cinema circuits with the highest number of screens. Source: Nielsen, November 2005.

**Table A5: Percentage of the Number of Cinema Screens for each Circuit in each Province Capital in Spain**

	Circuit 1	Circuit 2	Circuit 3	Circuit 4	Circuit 5	Circuit 6	Circuit 7	Circuit 8	Circuit 9	Circuit 10
Albacete	36.0	28.0	16.0	12.0	4.0	4.0				
Alicante	41.8	19.4	14.9	13.4	7.5	3.0				
Almería	79.3	10.3	6.9	3.4						
Ávila	50.0	25.0	16.7	8.3						
Badajoz	36.4	36.4	22.7	4.5						
Barcelona	25.7	18.8	18.3	8.3	7.3	6.9	6.0	4.1	0.9	0.9
Bilbao	57.1	17.1	11.4	5.7	2.9	2.9	2.9			
Burgos	40.0	26.7	23.3	6.7	3.3					
Cáceres	58.3	41.7								
Cádiz	40.0	36.0	12.0	8.0	4.0					
Castellón de la Plana	32.3	32.3	25.8	9.7						
Ceuta	41.2	41.2	17.6							
Ciudad Real	93.3	6.7								
Córdoba	30.8	23.1	21.5	9.2	1.5	1.5	1.5	1.5	1.5	1.5
Cuenca	57.1	35.7	7.1							
Gerona	31.0	19.0	17.2	15.5	8.6	6.9	1.7			
Granada	37.3	31.4	15.7	7.8	2.0	2.0	2.0	2.0		
Guadalajara	63.6	9.1	9.1	9.1	9.1					
Huelva	66.7	25.0	8.3							
Huesca	90.9	9.1								
Jaén	56.3	18.8	6.3	6.3	6.3	6.3				
La Coruña	43.3	40.0	3.3	3.3	3.3	3.3	3.3			
Las Palmas de Gran Canaria	37.3	33.9	22.0	1.7	1.7	1.7	1.7			
León	45.0	30.0	20.0	5.0						
Lérida	50.0	30.0	15.0	5.0						
Logroño	34.4	31.3	21.9	12.5						
Lugo	42.1	36.8	10.5	10.5						
Madrid	13.1	13.1	11.2	9.3	8.0	5.8	5.4	3.5	2.9	2.9
Málaga	42.2	31.3	15.6	6.3	1.6	1.6	1.6			
Palma de Mallorca	63.6	14.5	14.5	5.5	1.8					
Melilla	60.0	20.0	20.0							
Murcia	67.9	21.4	3.6	3.6	3.6					
Orense	47.1	23.5	17.6	5.9	5.9					
Oviedo	38.6	34.1	22.7	2.3	2.3					
Palencia	52.4	38.1	4.8	4.8						
Pamplona	57.1	31.0	11.9							
Pontevedra	53.3	33.3	13.3							
Salamanca	26.3	21.1	21.1	15.8	10.5	5.3				
San Sebastián	50.0	22.7	20.5	2.3	2.3	2.3				
Santander	36.4	36.4	24.2	3.0						
Segovia	66.7	33.3								
Sevilla	38.7	21.5	15.1	8.6	5.4	4.3	1.1	1.1	1.1	1.1
Soria	66.7	33.3								
Tarragona	48.5	33.3	18.2							
Santa Cruz de Tenerife	45.8	25.0	20.8	8.3						
Teruel	50.0	50.0								
Toledo	64.3	35.7								
Valencia	38.3	15.0	13.1	8.4	7.5	4.7	3.7	2.8	0.9	0.9
Valladolid	30.0	22.0	20.0	16.0	6.0	2.0	2.0	2.0		
Vitoria	30.0	24.3	22.9	12.9	5.7	2.9	1.4			
Zamora	40.0	33.3	26.7							
Zaragoza	33.3	23.5	17.6	13.7	7.8	3.9				

The figures in this table are the percentages of the number of cinema screens of each circuit in each province capital in Spain, in decreasing order. Source: Nielsen, November 2005.

**Table A6: Pricing Scheme in a Town in the Database**

Cinema	Spectator's Day
A	Wednesday
B	Monday
C	Monday
D	Monday
E	Wednesday

This table reports the pricing scheme in one of the towns in the database. In all the days other than the Spectator's Day the adult admission price does not change.

**Table A7: Average Attendance to each of the Cinemas in the Town during the Year**

Cinema	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Average	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
A	565	22%	688	36%	2010	53%	932	39%	1411	39%	1989	39%	2071	38%	1381	39%
B	874	34%	420	22%	525	14%	471	20%	761	21%	1134	22%	1229	23%	774	22%
C	498	19%	227	12%	284	7%	279	12%	493	14%	708	14%	749	14%	463	13%
D	338	13%	169	9%	202	5%	194	8%	302	8%	463	9%	578	11%	321	9%
E	318	12%	381	20%	803	21%	496	21%	634	18%	768	15%	805	15%	601	17%

The figures in this table are the number of moviegoers to each cinema and the percentage of town moviegoers each day of the week and the weekly average

**Table A8: Data Dates**

March 9th-15th 2001
October 19th-25th 2001
March 8th-14th 2001
October 18th-24th 2001
March 7th-13th 2001
October 17th-23rd 2001
March 5th-11th 2001
October 15th-21st 2001
March 11th-17th 2001
October 14th-20th 2001

The dates correspond to cinema weeks, from Friday (day of releases in Spain) to Thursday.

**Table A9: Cinemas included in the dataset**

Cinema	Town	Region	screens	capacity	shopping mall	Mar-01	Oct-01	Mar-02	Oct-02	Mar-03	Oct-03	Mar-04	Oct-04	Mar-05	Oct-05
Avenida	Palencia	Palencia	7	1062	no	x	x	x	x	x	x	x	x	x	x
Abaco Boulevard	Vitoria	Alava	12	2331	yes							x	x	x	x
Abaco Lakua	Vitoria	Alava	9	1830	yes		x	x	x	x	x	x	x	x	x
ABC	Pontevedra	Pontevedra	3	625	no	x	x	x	x	x	x	x	x	x	x
Antiguo Berri	San Sebastian	Guipuzcoa	8	699	no									x	x
Las Huertas	Palencia	Palencia	8	1000	yes	x	x	x	x	x	x	x	x	x	x
Arlequín	Torrelavega	Cantabria	2	405	no	x	x	x	x	x					
Astoria	San Sebastian	Guipuzcoa	7	1929	no	x	x	x	x	x	x	x	x		
Avenida	Bilbao	Biscay	6	807	yes	x	x	x	x	x	x	x			
Azul	Ferrol	La Coruña	1	376	no	x	x	x	x	x					
Bahía	Santander	Cantabria	5	1685	no	x	x	x	x	x					
Berceo	Logroño	Rioja	10	1964	yes								x	x	x
Bilbondo	Basauri	Biscay	8	1775	yes	x	x	x	x	x	x	x	x	x	x
Brooklyn	Oviedo	Asturias	7	1760	no	x	x	x	x	x	x	x	x	x	x
Teatro Capitol	Santander	Cantabria	1	750	no	x	x	x							
Capitol	Bilbao	Biscay	4	1374	no	x	x	x	x	x	x	x	x	x	x
Carlos III	Pamplona	Navarre	5	1088	no	x	x	x	x	x	x	x	x	x	x
Centro	Gijón	Asturias	5	1589	yes	x	x	x	x	x	x	x	x	x	x
Chaplin	La Coruña	La Coruña	4	480	no	x	x	x	x	x	x	x	x	x	
Cinebox Itaroa	Huarte	Navarre	12	2448	yes									x	x
Ortega	Palencia	Palencia	4	1122	no	x	x	x	x	x	x	x	x	x	x
Cinesa Area Central	Santiago de Compostela	La Coruña	7	1232	yes	x	x	x	x	x	x	x	x	x	x
Cinesa Artea	Lejona	Biscay	9	2155	yes	x	x	x	x	x	x	x	x	x	x
Cinesa Bahía	Santander	Cantabria	12	2482	yes	x	x	x	x	x	x	x	x	x	x
Clarín	Oviedo	Asturias	3	655	no	x	x	x	x	x	x	x	x		
Coliseo Albia	Bilbao	Biscay	1	1975	no	x	x								
Coliseo Max Ocio	Barakaldo	Biscay	16	3397	yes	x	x	x	x	x	x	x	x	x	x
Coliseo Zubiarte	Bilbao	Biscay	8	1701	yes									x	x
Teatro Colón	La Coruña	La Coruña	1	1361	no	x	x	x							
Compostela	Santiago de Compostela	La Coruña	6	815	no	x	x	x	x	x	x	x	x	x	x
Cristal	Lugo	Lugo	3	631	no	x	x	x	x	x	x	x	x	x	x
Do Deza	Lalín	Pontevedra	5	877	yes							x	x	x	x
Dumas	Lugo	Lugo	3	378	no	x	x	x	x	x	x	x	x	x	x
Dúplex	Ferrol	La Coruña	2	269	no	x	x	x	x	x	x	x	x	x	x
Dúplex	Ourense	Ourense	3	395	no	x	x	x	x	x	x	x	x	x	x
Equitativa	La Coruña	La Coruña	5	680	no	x	x	x	x	x	x	x	x	x	x
Filmex A Coruña	La Coruña	La Coruña	11	2591	yes										x
Filmex Pontinas	Lalín	Pontevedra	5	942	yes									x	x
Florida Guridi	Vitoria	Alava	7	804	no		x	x	x	x	x	x	x	x	x
Galicia	Ferrol	La Coruña	8	992	no	x	x	x	x	x	x	x	x	x	x
Garbera	Garbera	Guipuzcoa	7	1760	yes	x	x	x	x	x	x				
Golem Logroño	Logroño	Rioja	11	2098	no	x	x	x	x	x	x	x	x	x	x
Golem Bayona	Pamplona	Navarre	6	1332	no	x	x	x	x	x	x	x	x	x	x
Golem La Morea	Pamplona	Navarre	12	2746	yes				x	x	x	x	x	x	x
Abaco Burgos	Burgos	Burgos	8	1424	yes	x	x	x	x	x	x	x	x	x	x
Golem Yamaguchi	Pamplona	Navarre	6	556	no	x	x	x	x	x	x	x	x	x	x
Gónviz	Pontevedra	Pontevedra	1	1282	no	x	x								
Yelimo Gorbela	Vitoria	Alava	14	2948	yes			x	x	x	x	x	x	x	x

Goya	Ferrol	La Coruña	2	317	no	x	x	x	x						
Groucho	Santander	Cantabria	2	200	no									x	x
Guridi	Vitoria	Alava	7	1463	no	x	x	x	x	x	x	x	x	x	x
Hollywood	Gijon	Asturias	4	1070	no	x	x	x	x	x	x	x	x	x	x
Ideales	Bilbao	Biscay	8	1605	no	x	x	x	x	x	x	x	x	x	x
Las Cañas	Viana	Navarre	8	1394	yes							x	x	x	x
Los Angeles	Santander	Cantabria	1	766	no	x	x	x	x	x					
Los Fresnos	Gijon	Asturias	7	1406	yes	x	x	x	x	x	x	x	x	x	x
Marta	Aviles	Asturias	4	930	no	x	x	x	x	x	x	x	x	x	x
Mikeldi	Vitoria	Alava	1	500	no	x									
Mikeldi	Bilbao	Biscay	4	1328	no	x	x	x	x	x	x	x	x	x	x
Mikeldi Complejo	Vitoria	Alava	9	1744	no	x	x	x	x	x	x	x	x	x	x
Minicines	Oviedo	Asturias	4	500	no	x									
Minicines Centro	Vigo	Pontevedra	5	900	no	x	x	x	x	x	x	x	x		
Moderno	Logroño	Rioja	7	1143	no				x	x	x	x	x	x	x
Multicines	Bilbao	Biscay	7	571	no	x	x	x		x	x	x	x	x	x
Norte	Vigo	Pontevedra	5	810	no	x	x	x	x	x	x	x	x	x	x
Novocine 1	Ourense	Ourense	4	453	no	x	x	x	x	x	x	x	x	x	x
Novocine 2	Ourense	Ourense	2	221	no	x	x								
Olite	Pamplona	Navarre	4	818	no	x	x	x	x	x	x	x	x	x	x
Oscar Txingudi	Irun	Guipuzcoa	11	2446	yes	x	x	x	x	x	x	x	x	x	x
Oscar La Bretxa	San Sebastian	Guipuzcoa	9	1450	yes	x	x	x	x	x	x	x	x	x	x
Cinebox El Mirador	Burgos	Burgos	7	1408	yes	x	x	x	x	x	x	x	x	x	x
Peñacastillo Cinemas	Santander	Cantabria	12	1985	yes	x	x	x	x	x	x	x	x	x	x
Plata	Vigo	Pontevedra	1	614	no	x	x	x							
Pontevedra	Pontevedra	Pontevedra	2	500	no	x	x	x	x	x	x				
Príncipe	San Sebastian	Guipuzcoa	10	1483	no	x	x	x	x	x	x	x	x	x	x
Príncipe de Viana	Pamplona	Navarre	3	695	no	x	x	x	x	x	x	x	x	x	
Renoir Deusto	Bilbao	Biscay	6	807	yes									x	x
Rialto	Eibar	Guipuzcoa	1	400	no	x	x		x	x		x	x	x	
Yelmo Rosales	La Coruña	La Coruña	13	2305	yes	x	x	x	x	x	x	x	x	x	x
Teatro Salesianos	Vigo	Pontevedra	1	601	no					x					
Serantes Kultur Aretoa	Santurce	Biscay	3	1066	no	x	x	x	x	x	x	x	x	x	x
Starcine	La Ramallosa	Pontevedra	2	300	yes						x	x	x	x	x
Torreababal Kultur Etxea	Galdacano	Biscay	1	400	no	x	x		x	x			x		x
Trueba	San Sebastian	Guipuzcoa	2	352	no	x	x	x	x	x	x	x	x	x	x
Unzaga	Eibar	Guipuzcoa	1	550	no	x	x	x	x	x	x	x	x		x
Valle Inclán	Santiago de Compostela	La Coruña	6	904	no	x	x	x	x	x	x	x	x	x	x
Valle Real	Santander	Cantabria	8	2002	yes	x	x	x	x	x	x	x	x	x	x
Vigo	Vigo	Pontevedra	1	661	no	x	x	x							
Warner Donostia	San Sebastian	Guipuzcoa	10	2206	yes	x	x	x	x	x	x	x	x	x	x
Warner Parque Principado	Oviedo	Asturias	12	2832	yes		x	x	x	x	x	x	x	x	x
Van Golem Aranzón	Burgos	Burgos	6	1270	no	x	x	x	x	x	x	x	x	x	x
Yelmo Los Prados	Oviedo	Asturias	14	2720	yes				x	x	x	x	x	x	x
Yelmo Lugo	Lugo	Lugo	8	1440	no	x	x	x	x	x	x	x	x	x	x
Yelmo Ocimax	Gijon	Asturias	13	3200	yes	x	x	x	x	x	x	x	x	x	x
Yelmo Vigo	Vigo	Pontevedra	10	1996	yes							x	x	x	x
Van Golem Plata	Burgos	Burgos	6	1275	yes	x	x	x	x	x	x	x	x	x	x
Alai	Mondragon	Guipuzcoa	1	800	no				x						
Cinemundo	Huesca	Huesca	6	998	no		x	x	x	x	x	x	x	x	x
Almirante	Aviles	Asturias	4	737	no	x	x	x							

Avenida	Huesca	Huesca	1	950	no	x	x	x	x	x	x	x	x		
Azul	Vitoria	Alava	2	481	no				x	x	x	x			
Olimpia	Huesca	Huesca	1	1049	no	x	x	x							
Baztarko Antzokia	Azcoitia	Guipuzcoa	1	540	no			x							
Abaco Valladolid	Valladolid	Valladolid	8	1327	yes	x	x	x	x	x	x	x	x	x	x
Broadway	Valladolid	Valladolid	11	1854	no	x	x	x	x	x	x	x	x	x	x
Cinebox Vallsur	Valladolid	Valladolid	11	1757	yes	x	x	x	x	x	x	x	x	x	x
Cinebox Mendibil	Irun	Guipuzcoa	6	1061	yes					x	x	x	x	x	x
Cinebox Narón	Naron	La Coruña	12	2659	yes					x	x	x	x	x	x
Cinebox Ourense	Ourense	Ourense	8	1285	yes		x	x	x	x	x	x	x	x	x
Cinebox Parque Astur	Aviles	Asturias	10	2269	yes	x	x	x	x	x	x	x	x	x	x
Cinebox Plaza Eliptica	Vigo	Pontevedra	8	1461	yes	x	x	x	x	x	x	x	x	x	x
Cinebox Urbil	Usurbil	Guipuzcoa	8	1573	yes	x	x	x	x	x	x	x	x	x	x
Cinebox Vialia	Pontevedra	Pontevedra	8	1612	yes	x	x	x	x	x	x	x	x	x	x
Coliseo Java	Portugalete	Biscay	1	956	no			x	x	x	x				
Domus	La Coruña	La Coruña	1		no					x					
Esperanza	Mieres	Asturias	1	800	no	x	x	x							
Manhattan	Valladolid	Valladolid	3	770	no	x	x	x	x	x	x	x	x	x	x
Filarmónica	Oviedo	Asturias	1	930	no	x									
Mantería	Valladolid	Valladolid	2	460	no	x	x	x	x	x	x	x	x	x	x
Parque Sol Plaza	Valladolid	Valladolid	6	1501	yes	x	x	x	x	x	x	x	x	x	x
Gran Cinema	Guecho	Biscay	1	413	no		x			x	x				
Hamaila Trikimailu	Azcoitia	Guipuzcoa	1		no			x							
Roxy	Valladolid	Valladolid	2	1000	no	x	x	x	x	x	x	x	x	x	x
Coca	Valladolid	Valladolid	3	1066	no	x	x	x	x						
Lauren Getxo	Guecho	Biscay	12	2232	yes	x	x	x	x	x	x	x	x	x	x
Casablanca	Valladolid	Valladolid	3	320	no						x	x	x	x	
Maripeña	La Felquera	Asturias	1	470	no		x	x	x						
Modelo	Zarauz	Guipuzcoa	1	700	no		x	x	x						
UGC Cine Cité	Valladolid	Valladolid	18	4083	yes					x		x	x	x	x
Novedades	Vergara	Guipuzcoa	1	625	no		x								
On Bide	Rentería	Guipuzcoa	1	300	no		x		x						
Samaniego	Vitoria	Alava	4		no	x									
Seixo	Seixo	Pontevedra	1		no		x								
Sozial Antzokia	Basauri	Biscay	1	800	no	x	x	x	x	x	x			x	x
Teatro Ayala	Oviedo	Asturias	1	815	no	x	x	x							
Victoria	Pontevedra	Pontevedra	1	1261	no	x	x	x							
Yago	Santiago de Compostela	La Coruña	1	320	no	x	x	x							
Zornotza Aretoa	Amorebieta	Biscay	1		no		x								
Zugaza	Durango	Biscay	1	800	no					x		x	x		x

**Table A10: Number of Cinemas and Screens in the Area Studied**

	Number of Cinemas			Number of Screens		
	Area	Dataset	% Data	Area	Dataset	% Data
March 2001	98	86	87,8	515	480	93,2
October 2001	106	96	90,6	554	530	95,7
March 2002	100	93	93,0	560	539	96,3
October 2002	95	88	92,6	577	558	96,7
March 2003	96	94	97,9	609	595	97,7
October 2003	89	85	95,5	588	570	96,9
March 2004	91	89	97,8	631	617	97,8
October 2004	91	89	97,8	634	619	97,6
March 2005	91	89	97,8	657	642	97,7
October 2005	87	86	98,9	632	620	98,1

The figures in this table are the number of cinemas and screens in the area studied and the number and percentage for which the data have been disclosed

## Appendix 2: Calculation of Estimated Values of Attendance and Revenue

Table A11 shows the calculation of the estimated values of attendance and box office revenue of movie “An unfinished life” in Cinema B of Town 2 for the analysis of Section 6.

	Coefficient	Original	Price in A and B is increased by 5%	In addition, the movie is screened in Cinema C
		Value	Value	Value
Constant	6.7783			
Screens	0.0796	11	11	11
Shopping Mall	1.1138	1	1	1
Population within 10 km	5.76E-06	267,486	267,486	267,486
Regional GDP	-1.74E-04	15,228	15,228	15,228
No. of Screens Showing Same Movie within 5 km	-0.2559	0	0	1
No. of Screens Showing Same Movie in 5-10 km	-0.1599	0	0	0
No. of Weeks of National Exhibition	0.0157	1	1	1
No. of Copies	0.0055	199	199	199
Cinema	3.2796	dummy=37	dummy=37	dummy=37
Day of the Week	0.9947	dummy=3	dummy=3	dummy=3
Cinema*Day of the Week	1.9781	dummy=37*3	dummy=37*3	dummy=37*3
Period	0.2782	dummy=10	dummy=10	dummy=10
Calendar Day	-0.2836	dummy=69	dummy=69	dummy=69
Region	2.8458	dummy=7	dummy=7	dummy=7
Circuit	-1.3120	dummy=2	dummy=2	dummy=2
Distributor	-3.3552	dummy=8	dummy=8	dummy=8
Movie	1.7512	dummy=526	dummy=526	dummy=526
Ticket Price	-2.2855	1.60	1.65	1.65
Ticket Price of Other-Group Cinemas within 2 km	2.0173	1.47	1.52	1.52
Ticket Price of Cinemas within 2-10 km	0.2087	1.56	1.56	1.56
Attendance		72.30	71.36	55.24
Box Office Revenue		406.23	421.00	325.94

Table A11: Calculation of estimated values of attendance and box office revenue

The figures of attendance and box office revenue for each combination of movie-cinema-day used in the analysis are estimated using the variables reported in the first column. As it has been explained in Sections 5 and 6, I have used the coefficients of the third numerical column of Table 5, instrumenting price with the number of other-group cinemas within 5 km and including several fixed effects of cinemas and films. The price values correspond to the logarithms of ticket prices in real terms (base year 2001). The second column reports the values of the coefficients of the variables used in the estimation of attendance of “An unfinished life” in Cinema B of Town 2 on Wednesday October 19<sup>th</sup> 2005. The model predicts 72.3 moviegoers in that session with a box-office



revenue of 406 euros. If firms A and B in Town 2 increased their respective ticket prices by 5%, we observed that the model predicts a lower number of attendants (71.4) and a higher revenue (421 euros), as the third column reports. The fourth column predicts a significant decrease in both attendance and revenue should the movie had been screened in Cinema C of that town, considered by a value 1 for the variable “number of screens showing the same movie within 5 km”.

### Appendix 3: Calculation of Estimated Values of Attendance and Revenue

A		B		A+B		% Change		Relevant market
output	profit	output	profit	output	profit	output	profit	-
129	638	323	1817	452	2456	-	-	-
<i>after 5% price increase by firms A and B and 2.5% price increase by firm C</i>								
128	665	321	1893	449	2558	-0,80%	4,16%	A+B
<i>after price changes and relocation by C: "The Crossing"(A)</i>								
127	659	321	1893	448	2552	-1,04%	3,93%	A+B
<i>after price changes and relocation by C: "Sinfin"(B)</i>								
128	665	319	1884	447	2549	-1,15%	3,79%	A+B
<i>after price changes and relocation by C: "Otros Días Ventrán"(B)</i>								
128	665	317	1869	445	2534	-1,70%	3,18%	A+B
<i>after price changes and relocation by C: "Trauma"(A)</i>								
122	633	321	1893	443	2526	-2,15%	2,87%	A+B
<i>after price changes and relocation by C: "El Desenlace"(A)</i>								
114	595	321	1893	435	2488	-3,78%	1,31%	A+B
<i>after price changes and relocation by C: "Siete Vírgenes"(B)</i>								
128	665	308	1819	436	2483	-3,59%	1,13%	A+B
<i>after price changes and relocation by C: "An Unfinished Life"(B)</i>								
128	665	305	1798	433	2462	-4,38%	0,27%	A+B
<i>after price changes and relocation by C: "The Crossing"(A) + "An Unfinished Life"(B)</i>								
127	659	305	1798	431	2457	-4,62%	0,04%	A+B
<i>after price changes and relocation by C: "Trauma"(A) + "An Unfinished Life"(B)</i>								
122	633	305	1798	426	2430	-5,73%	-1,02%	A+B+C

Table A12: Market definition analysis for Town 2 with price and location reactions by cinema C