Searching for the Concentration-Price Effect in the German Movie Theater Industry

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SEARCHING FOR THE CONCENTRATION-PRICE EFFECT IN THE GERMAN MOVIE THEATER INDUSTRY

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Abstract

This paper investigates whether a price-concentration relationship can be found on local cinema markets in Germany. First, we test a model of monopolistic pricing using a new set of German micro data and find no significant difference in admission prices on monopoly and oligopoly markets. In a next step, we test whether this can be explained by the existence of local monopolies, but find no hint of that. Implicit or explicit collusion among cinema operators might explain our observations.

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1. Introduction

It is a well-established empirical insight of industrial organization research that a higher number of competing suppliers for a homogeneous good leads to lower prices on the market. At least since the seminal contribution of Weiss (1989), price-concentration studies have been established in economic literature and applied in antitrust assessments of many merger cases. A huge empirical literature confirms the price-concentration relationship for a range of different industries. For instance, Brewer and Jackson (2006), Cyrnak and Hannan (1999), Hannan (1992), Hannan and Liang (1993), Kozak (2008), Neumark and Sharpe (1992), and Xie (2007) study the banking industry, and Borenstein (1989), (1990), Brueckner et al. (1992), Evans and Kessides (1993), Kim and Singal (1993), Morrison and Winston (1990), and Singal (1996) study airlines. To avoid problems related to differentiated products, especially the degree of substitutability, most price-concentration studies focus on markets for "sufficiently homogeneous" goods (see, e.g., the examples in the recent comprehensive literature surveys by Newmark (2006) and Pautler (2003)). Cross-section analyses may be conducted using different industries, but more frequently geographically separated markets within the same industry are used. For instance, the aforementioned literature on airlines analyzes specific flight routes. This paper studies the German movie theater industry, focusing on mainstream movies.

With a gross turnover of only €757.9 million (Berauer (2008)), the movie theater industry is a rather small part of the German economy. Nevertheless, almost every small city has at least one movie theater, and despite more or less continuously declining ticket sales over the last six decades, an average of 1.52 cinema visits per capita in 2007 (Berauer (2008)) makes going to the movies still an important leisure activity.

Existing studies on the movie theater industry usually use macro data and try to identify a cinema demand function. As economic intuition suggests, price and income are the most important determinants of demand. However, estimated price elasticites vary widely across different studies. In the short run, Cameron (1986) finds a price elasticity of −0.8, Sisto and Zanola (2005) estimate −0.37, and Dessy and Gambaro (2008) estimate −0.27. Long-run elasticities are generally higher (in absolute terms) and estimated to be −2.25 (Dewenter and Westermann (2005)), −3.51 (Fernández Blanco and Baños Pino (1997)), and −0.8 (Sisto and Zanola (2005)).

Income elasticities vary between 0.9 (Fernández Blanco and Baños Pino (1997)) and 0.37 (Dessy and Gambaro (2008)) in the short run, and between 4.48 (Dewenter and Westermann (2005)) and 1.55 (Fernández Blanco and Baños Pino (1997)) in the long run. These differences are most likely caused by cultural factors, as those studies use data from different countries and per capita ticket sales vary widely across different countries (Dewenter and Westermann (2005)).

In addition, cinema demand is determined by some product-specific factors, especially by the existence of close subsitutes. Cameron (1986) uses UK macro time-series data and finds a significant negative impact of TV set diffusion on cinema demand, which means that TV must be seen as a substitute for cinema. Fernández Blanco and Baños Pino (1997) confirm this for Spain, and Dewenter and Westermann (2005) for Germany. Sisto and Zanola (2005), on the other hand use, Italian data and find a positive influence of TV, meaning that TV might as well be a complement to cinema. Dewenter and Westermann (2005) find a significant substitutive relationship between theater (including opera) and cinema.

This leads to a more general question: What is a substitute for cinema? If going to the cinema is only about watching a movie, then TV or a DVD is a substitute. But since the price of watching TV is the same in all parts of Germany and almost every German household has at least one TV set (Dewenter and Westermann (2005)), the constant term will control for this in a cross-section analysis. If going to the cinema is about going out on a Saturday night, then there are lots of other possible activities with various prices. Fernández Blanco and Baños Pino (1997) try to control for this by incorporating the average wage per hour as the price of all other substitutes, but find no significant influence. However, the number of available leisure activities will certainly be positively correlated with the size of the local market. Therefore, controlling for the number of inhabitants indirectly reflects the availability of substitutes.

In the present paper, we focus on whether a price-concentration relationship can be found in the German movie theater industry. Comparable studies were done for other countries by Davis (2005) and Beckert and Mazzarotto (2006). Davis (2005) uses data of the US movie theater industry to directly estimate the price as a function of several market and competition variables. Beckert and Mazzarotto (2006) develop a model that simultaneously explains market structure and prices, and test it using UK data. We try to confirm their findings, but extend the methodology by modeling optimal pricing behavior in the monopoly case. We calibrate this model using micro data from actual monopoly markets and use this calibrated

model to predict monopoly prices in oligopoly markets. If there actually is an effect of market concentration on prices, we will expect to find significantly lower prices on oligopoly markets than our calibrated monopoly model predicts. If, however, we do not find such a relationship, further investigation will be required to identify the reasons for the missing price effect.

2. The Model

In the following section we will develop a simple model to describe the price-setting behavior of a monopolistic cinema operator. We assume that there are *n* spatially separated monopoly markets and the cinema operator on market *k* is facing a local cinema demand that can be described by[1]

(1) $$D_k(p_k) = \alpha_1 \cdot I_k^{\alpha_2} + \alpha_3 \cdot p_k^{\alpha_4} + \alpha_5 \cdot N_k^{\alpha_6},$$

where I_k is the local (per capita) income, p_k is the admission price, N_k is the number of local inhabitants, and α_1 to α_6 are parameters.[2] Since the major part of the costs for maintenance, heating, etc., is independent of the number of viewers, we impose fixed costs *F*, while variable costs, in line with Macmillan and Smith (2001), are assumed to be zero. In addition, each cinema operator has to pay license fees to movie distributors that consist of a fixed and a variable component. The fixed amount is part of *F*, while the variable amount is a share (*t*) of their box-office revenues.

Each cinema operator is maximizing her profit Π. Hence, the optimization problem (2) of a monopolistic operator is

(2) $$\max_p \Pi = p \cdot D(p) \cdot (1-t) - F = p \cdot (\alpha_1 I^{\alpha_2} + \alpha_3 p^{\alpha_4} + \alpha_5 N^{\alpha_6}) \cdot (1-t) - F,$$

and the monopoly price p_1 can be described by

(3) $$p_1 = \sqrt[\alpha_4]{\frac{-\alpha_1 \cdot I^{\alpha_2} - \alpha_5 \cdot N^{\alpha_6}}{(1+\alpha_4)\alpha_3}},$$

with a resulting demand *y** that is given by

(4) $$y^* = \frac{\alpha_4}{1+\alpha_4} \cdot \left(\alpha_1 \cdot I^{\alpha_2} + \alpha_5 \cdot N^{\alpha_6}\right).$$

[1] Cameron (1986) uses a similar additive demand function. When estimating demand functions, often isoelastic demand functions are preferred. We do not use an isoelastic demand function, because it generates corner solutions for the optimal monopoly price that do not correspond with real-world observations at all.

[2] For simplicity, the index *k* is omitted for the rest of the paper.

In the case that the optimal cinema demand y^* exceeds the operator's cinema capacity K, which is assumed to be given and fixed, the operator will charge a higher price p_2, so that the available capacity is just exhausted. Thus, for $y^* \geq K$ we obtain

$$D(p_2) = K \quad \Leftrightarrow \quad p_2 = \sqrt[\alpha_4]{\frac{K - \alpha_1 \cdot I^{\alpha_2} - \alpha_5 \cdot N^{\alpha_6}}{\alpha_3}}, \tag{5}$$

and the optimal price p^* of a monopolistic cinema operator can be finally described by the pricing rule

$$p^* = \begin{cases} \sqrt[\alpha_4]{\dfrac{-\alpha_1 \cdot I^{\alpha_2} - \alpha_5 \cdot N^{\alpha_6}}{(1+\alpha_{t+1}) \cdot \alpha_3}} & \text{for } K > y^*, \\ \sqrt[\alpha_4]{\dfrac{K - \alpha_1 \cdot I^{\alpha_2} - \alpha_5 \cdot N^{\alpha_6}}{\alpha_3}} & \text{for } K \leq y^*. \end{cases} \tag{6}$$

Since the optimal price as determined by (6) is independent of t, the price-setting behavior is not distorted by the variable part of the license fee. The pricing rule deduced here will be used later to estimate values for parameters α_1 to α_6. It is easy to verify that the price elasticity in the optimum with a nonbinding capacity constraint equals -1.

3. The Data

For the US movie theater market, Davis (2005, 2006a, 2006b) is able to exploit exhaustive time-series data on a disaggregated basis. Beckert and Mazzarotto (2006) can use similar time-series data from the UK Competition Commission. Time-series data on the German movie theater industry is available only on a highly aggregated level (Berauer (2008)) that is unsuitable for our purposes. Hence, cross-sectional data was collected from scratch in August 2008. In a first step, we identified areas that constitute geographically separated markets for cinema demand. Large integrated areas cause several types of problems in the data collection, for instance regarding the appropriate number of inhabitants that will be used to describe market size. Take Berlin for instance: As a customer would need up to two hours to get from the north to the south of the city, it is rather unlikely that a cinema in the north and a cinema in the south compete on the same market. Hence, the data set should contain only the northern or the southern population to describe the market. This creates two problems: First, there is the question of where exactly the borders of the catchment area are. In densely populated areas like Berlin, a slight change in the definition of the catchment area can easily cause large changes in the "appropriate" number of inhabitants in the market. Second, often data is only available on the city level, so in a lot of cases, the appropriate data would be unavailable. The

same holds for areas like Rhein-Main and the Ruhr, where cities are more or less seamlessly connected by densely populated commuter belts.[3]

Having identified 65 suitable areas[4], we collected data on the number of inhabitants and per capita income. Since there was no central data source available at the required aggregation level, data on the former was taken from and matched with different sources, like the Federal Statistical Office, Wikipedia, and city or community websites as of December 2007. For the same reason, data on the latter was taken from various sources, including State Statistical Offices and city and community websites. The data consists of the values for the year 2005.[5]

For each city the number of cinemas was identified by performing a search for "[city name], kino" on Google Maps. The result was matched with information from http://www.meinestadt.de, an Internet portal that offers comprehensive information about almost every city and region in Germany. Our study focuses on mainstream movie theaters, so art houses, drive-ins, and other cinemas have been ignored because of their lack of homogeneity with mainstream cinema. Furthermore, only cinemas featuring a certain up-to-date portfolio of movies have been selected for the sample. Data on entry fees, capacities, and owners was collected using the cinemas' websites. Similarly to Beckert and Mazzarotto (2006), entry fees for a common[6] Saturday 8 p.m. show were identified. In case of differentiated prices depending on the type of seat (e.g., front row, back row, loge), the median price category was chosen. Capacity is measured by the number of seats the cinema provides, which according to Dewenter and Westermann (2005) is a more appropriate measure than the number of screens. For multiplexes (which almost all the cinemas were), the sum of seats for all screens was taken.

The total sample consists of 108 cinema locations from 65 distinct areas. An average cinema charges an admission price of €7.10 and has a capacity of 1,456 seats. An average area has 172,184 inhabitants with an average annual income of €16,507 per capita (Table 1). Note that the values of price and capacity as given in Table 1 are calculated on the level of the individual cinema location, while values of inhabitants and income are on an area basis, which leads to the different numbers of observations in the last column.

[3] Beckert and Mazzarotto (2006) seem to have run into similar difficulties. They excluded the London area, "as it is considered to have very different market features compared to those prevailing in the rest of England" (p. 9).
[4] Most areas are monocentric around a city.
[5] More recent data was available only for a few areas. To keep the data set consistent, the 2005 values were used.
[6] German movie theaters usually charge extra for extra-long performances. "Common" means that the movie is not extra-long.

Variable	Mean	SD	Min	Max	No. of obs.
Price	7.10	0.56	5.00	8.00	108
Capacity	1455	770	203	3390	108
Inhabitants	172184	131678	14500	655000	65
Avg. income	16507	1972	13837	21804	65

Table 1: Description of the sample – all markets included

The analysis in the following section requires the data to be aggregated on the area level. Furthermore, the sample needs to be split into monopoly and oligopoly areas. To do so, we use the (directly observable) information on cinema operators. An area with only one cinema operator, even if she runs several locations within this area, is considered to be a monopoly. Table 2 presents some descriptive information on the monopoly subsample, which consists of 42 observations. In the case of one owner with multiple locations in one area, capacities are summed over all locations.[7]

Variable	Mean	SD	Min	Max	No. of obs.
Price	7.18	0.50	6.00	8.00	42
Capacity	1396	744	447	4091	42
Inhabitants	111997	75694	14500	360000	42
Avg. income	16312	2042	13837	21804	42

Table 2: Description of the sample – monopoly markets only

In the case of more than one cinema operator, the area is considered to be an oligopoly. To obtain per area data, the number of seats is summed over all cinemas in an area. Admission prices are calculated as the capacity-weighted average of all locations in the area. Table 3 shows the descriptive data of this subsample, which consists of 23 observations.

Variable	Mean	SD	Min	Max	No. of obs.
Price	7.23	0.29	6.66	8.00	23
Capacity	4192	1917	1639	9030	23
Inhabitants	282091	140870	88000	655000	23
Avg. income	16865	1784	14071	19990	23

Table 3: Description of the sample – oligopoly markets only

[7] In all those cases, admission prices are identical across locations.

As can be seen by comparing Tables 2 and 3, oligopoly markets are on average more than two and a half times as large as monopoly markets, while the average (aggregated) capacity on oligopoly markets is around three times larger than on monopoly markets. Hence, the relative capacity (number of seats per inhabitant) is rather similar in the two cases (0.0138 for monopolies and 0.0152 for oligopolies).

In a last step, data on competition was gathered. Beckert and Mazzarotto (2006) consider the driving time to the next cinema as the appropriate measure. We convert their measure into distance with a rough calculation and find that their maximum radius is some 18 km.[8] Since actual driving time heavily depends on the means of transportation used, we prefer to follow Davis (2005), who uses linear distance from the cinema. He states that in the USA "few customers drive more than 20 miles to the cinema" (p. 26), which is roughly 32 km. We included cinemas up to 20 km linear distance from the cinema considered, which is between the limits used in Beckert and Mazzarotto (2006) and in Davis (2005). This suits the usual geographic layout of a city with a lot of small towns around. We consider these areas to be agglomerations equipped with roads and public transportation. Traveling out of an agglomeration will require more time and cause more inconvenience than traveling within the agglomeration. For that reason, a local market is very unlikely to exceed the borders of the area.

4. Empirical Results

In section 2, we developed a simple monopoly model and deduced a pricing rule for a monopolistic cinema operator (equation (6)). We will now use the monopoly data described in Table 2 to estimate the parameters α_1 to α_6 of equation (6). As (6) is a branched function, standard OLS technique cannot be applied. Instead we do a nonlinear least squares regression (NLS) and obtain the results presented in Table 4. NLS is an iterative procedure that fits the parameter values of a model so that they minimize the sum of the squared residuals. The NLS algorithms used[9] are unable to estimate all parameters simultaneously. Hence, we select starting values and estimate only some of the parameters, while keeping others fixed at their starting values. Iteratively, we alternate fixed and estimated parameters, replacing the starting values with the estimated parameters of previous iterations. This way, we are able to obtain

[8] Beckert and Mazzarotto (2006) consider a 20-minute ride to the next cinema as the upper bound for a competitive effect. Assuming that the route from one cinema to the next is straight, and assuming that the average traveling speed is 50 km/h (the statutory inner-city speed limit in Germany), this yields a maximum distance of 18 km. Since the road is unlikely to be a long straightaway and hurdles like traffic lights cause the inner-city average speed to be way below 50 km/h, a 20-minute ride actually covers a shorter distance.

[9] The "nls" package of the statistics software R features the Gauss-Newton, Golub-Pereyra, and NL2SOL algorithms with Gauss-Newton as default. Our results are robust with respect to the different algorithms.

the set of parameters, presented in Table 4, that seem to fit our monopoly data best. Since the degrees of freedom and hence the significance levels depend on how many parameters are kept fixed, we do not give the significance levels of the parameters here.

Parameter	Value	Parameter	Value	Parameter	Value
α_1	−15.815	α_3	−19.774	α_5	1121.659
α_2	0.378	α_4	1.44	α_6	0.022
Residual sum of squares: 11.36					

Table 4: NLS estimations of the monopoly model parameters[10]

As expected, the admission price has a negative influence on demand. The resulting average price elasticity of demand at p^* and the price elasticity at sample means are both about −1. Thus, we can conclude that the capacity of a cinema is usually not a binding restriction, which is in line with real observations.[11]

Interestingly, the number of inhabitants, N, does not seem to have an influence on the price. The parameter α_6, the exponent of N, is almost zero. This means that the multiplicative coefficient of N, α_5, yields an almost constant term, because it is multiplied by a factor almost equal to 1. This can be explained by the fact that a higher market size is usually connected with higher capacities, so that the ratio of inhabitants to capacity is almost constant for all markets.[12]

Since our data set shows a correlation coefficient of 0.35 between the number of inhabitants and per capita income, our individual coefficient estimations might be affected by multicollinearity. To ensure that our estimates do not suffer from multicollinearity problems, we compute the condition number of our coefficient matrix as proposed by Belsley et al. (1980). We find that the condition number is smaller than the critical value, so that the level of multicollinearity is acceptable.

By inserting the estimated values for α_1 to α_6 as presented in Table 4 into the pricing rule (6), we obtain the *calibrated pricing rule*, referred to as (c6) in the following. In order to identify competitive effects, we use (c6) to compute hypothetical monopoly prices for the oligopoly

[10] The parameter estimates are robust to jackknife resampling. Graphical inspection shows that the residuals are homoskedastic.
[11] The average load in 2005 was just 12.3%, with only slight differences between multiplexes (12.6–12.8%) and smaller sites (11.1–11.9%) (Schultz and Beigel (2006)).
[12] See section 3, page 7.

areas described in Table 3. Then we pool the data sets of monopoly and oligopoly areas. A potential competitive price effect on oligopoly markets would now be revealed if observed prices and hypothetical monopoly prices significantly differed on these markets. To test this, we use a regression model of the form

$$p_{\text{obs}} = \hat{\beta}_1 \cdot p_{\text{hyp}} + \beta_2 \cdot D_{\text{DUO}} + \beta_2 \cdot D_{\text{TRI}} + \beta_4 \cdot D_{\text{QUAD}} + \varepsilon ,$$

where p_{obs} denotes the observed price, while D_{DUO} to D_{QUAD} are dummy variables for markets with two, three, and four cinema operators, respectively.[13] If the observation is an oligopoly, p_{hyp} denotes the hypothetical monopoly price. If it is a monopoly, p_{hyp} denotes the estimated price, implicitly obtained in the NLS estimation described above. Table 5 shows the regression results.

Parameter	Value	Standard Error	p-value
β_1	0.99945	0.01035	$< 2 \cdot 10^{-16}$
β_2	−0.06339	0.14523	0.664
β_3	0.04699	0.22850	0.838
β_4	−0.31366	0.28867	0.282

Table 5: Estimated effect of competition

As expected, the parameter of the hypothetical monopoly price, β_1, is highly significant at the 0.1% level and its value is almost equal to one. The influence of the dummy variables β_2, β_3, and β_4, however, is insignificant in all cases. Therefore, the observed prices on oligopoly markets are sufficiently explained by the hypothetical prices derived from (c6). Since there is no significant price effect of oligopoly markets, we can conclude that the observed prices on oligopoly markets are on the same level as the prices on monopoly markets.

There are several explanations for this, one of which is collusive behavior among the cinema operators on oligopoly markets. Another explanation is that competition among cinema operators is weak or even impossible due to transportation costs. In this case, each cinema operator would act as a local monopolist. In order to rule out this explanation, we will analyze the effects of distance in the next section of this paper.

[13] As a robustness check, D_{DUO}, D_{TRI}, and D_{QUAD} were replaced by $D_{\text{OLIGOPOLY}} = D_{\text{DUO}} + D_{\text{TRI}} + D_{\text{QUAD}}$. Furthermore, instead of dummies, the number of cinema operators was used. Both alternative specifications yield the same qualitative result as the one presented in Table 5.

5. The Effects of Distance and Additional Capacity

Davis (2005) measures the effect of market concentration on admission prices for US cinemas. He finds that alternative or additional supply in the same geographic area influences ticket prices negatively. The negative effect decreases (in absolute terms) with increasing distance from the cinema. He uses the number of screens to measure supply and differentiates between screens owned by the same company and screens owned by other (*rival*) companies. To take account of the distance between cinema locations, he uses 15 categories, starting with the number of screens at distances 0–0.5 miles, 0.5–1 mile, and so on, incrementing in 1-mile steps until 10 miles and then incrementing in 5-mile steps until he reaches a maximum linear distance of 30 miles from the location. We will use a similar approach and estimate the dependence of the price on market size and supply.

Based on each cinema location *i*, the additional supply was determined by measuring the number of seats, *CAP*, available at other locations within the same area *j*.[14] Own and rival seats were distinguished and categorized by their distance. Since using 15 categories – as in Davis (2005) – would have resulted in lack of data variation (as most values would have been zero), we used only three categories: 0–1 km (*very close*), 1–5 km (*close*), and 5–20 km (*distant*) linear distance from the cinema. To control for market-specific effects, the model specification includes the number of inhabitants, *INHAB*, in the area as a measure for market size, and the annual per capita income, *INC*, as a measure for consumer income, as suggested by Newmark (2006). Although one might expect a positive influence of a cinema's market power on its charged price, measures of market concentration have been omitted from the specification to avoid endogeneity problems (Evans et al. (1993), Newmark (2006)). Controlling for quality is appealing, too: Cinema size might have been used as a quality indicator as well as the range of available films or the number of screens (Cameron (1990)). While multiplex cinemas perhaps offer a large variety of different movies, smaller cinemas might be more homelike. Customers might perceive either the one or the other as superior quality. Hence, the expected effect is ambiguous, and the sign of the coefficient would have been interesting to observe. Different quality, however, is a variable controlled by the single firm; thus it is endogenous as well (Newmark (2006)) and is omitted from our specification. Furthermore, the effect of quality differences should be minimal in our case, since the sample was selected with the homogeneity of the good in mind. Last but not least, cost differences might be an explanation for price differences. This is closely related to the quality issues

[14] Note that the object of observation now is the cinema location, whereas in the previous section it was the geographical market.

mentioned above. For instance, a downtown cinema might have to pay a higher rent than a greenfield cinema. However, costs resulting from strategic decisions like location and quality choice must be seen as endogenous and have to be omitted from the specification (Newmark (2006)).

We use OLS to estimate the model

$$P_{i,j} = , _0 + \gamma_1 INHAB_j + \gamma_2 INC_j + \gamma_3 CAP_i + \varepsilon_{ij},$$

where *i*,*j* represent the *i*-th cinema that operates in the *j*-th area. We expect the coefficient of *INHAB* to be positive, because – ceteris paribus – an increase in the number of inhabitants implies an increase in market size, which implies an increase in demand. The expected effect of *INC* is ambiguous, because an increase in income might either increase demand or enable consumers to pursue more expensive leisure activities, which would decrease cinema demand.

CAP_i in general is the capacity of all other cinema locations within the same area. We refine CAP_i by disentangling it regarding distance and/or ownership (specifications 1–3). In general, all *CAP* coefficients should be negative, because increased supply ceteris paribus causes lower prices. If transportation costs were important, we would expect – in absolute terms – smaller coefficients for distant (close) capacity than for close (very close) capacity. To form an expectation for the effect of ownership, we need to take a closer look at the data. Having no rival capacity means that the observation is a monopoly market. If there is rival capacity, the observation will be an oligopoly market. However, some monopoly owners have several locations within the same area. Hence, we would expect own capacity to represent the ceteris paribus price-lowering effect of increased supply. Rival capacity should also incorporate this effect. In addition, the rival capacity coefficient should also contain the price-lowering effect of competition in oligopoly markets. Hence, we expect the coefficient of rival capacity to be more negative than the coefficient of own capacity. Table 6 shows estimation and test results.

Ramsey's RESET test shows that we do not have to reject our model specifications as incorrect. However, as in Davis (2005), the adjusted R^2 signals that we explain only a little of the observed variance. This might be because of the omitted variables or because of other (unknown) market-specific factors driving the demand for cinema. Since we are not interested in a detailed exploration of the demand function or the price formula, but in the competition effects, the low R^2 is acceptable in this case.

Variable	Specification 1	Specification 2	Specification 3
Intercept	6.683*** (0.4928)	6.713*** (0.4338)	6.691*** (0.4346)
INHAB	2.884e−06*** (7.532e−07)	2.923e−06*** (6.829e−07)	2.967e−06*** (6.807e−07)
INC	9.295e−06 (2.952e−05)	7.525e−06 (2.826e−05)	8.612e−06 (2.808e−05)
CAP (own; 0–1 km)	−1.993e−04 . (1.174e−04)		
CAP (own; 1–5 km)	−2.615e−04 . (1.541e−04)		
CAP (own; 5–20 km)	−1.241e−04 (1.518e−04)		
CAP (rival; 0–1 km)	−1.450e−04 (1.298e−04)		
CAP (rival; 1–5 km)	−2.124e−04** (7.424e−05)		
CAP (rival; 5–20 km)	−2.105e−04*** (5.278e−05)		
CAP (pooled; 0–1 km)		−1.787e−04* (7.680e−05)	
CAP (pooled; 1–5 km)		−2.172e−04** (6.287e−05)	
CAP (pooled; 5–20 km)		−2.130e−04*** (5.130e−05)	
CAP (own; pooled)			−2.015e−04*** (5.054e−05)
CAP (rival; pooled)			−2.162e−04*** (5.316e−05)
R^2	0.1744	0.1703	0.1689
Adj. R^2	0.1077	0.1296	0.1366
F (p-value)	0.01225	0.001682	0.0007055
RESET (p-value)	0.1367	0.1414	0.122
Breusch-Pagan (p-value)	0.1714	0.05667	0.02396

Significance codes: *** $p \leq 0001$; ** $0.001 < p \leq 0.01$; * $0.01 < p \leq 0.05$; else $0.05 < p \leq 0.1$.
Standard deviation given in parenthesis.

Table 6: Influence of distance and ownership on ticket price[15]

As expected, under all specifications the coefficient of *INHAB* is significantly positive, the coefficient of *INC* is positive, but insignificant, and the coefficients of *CAP* are negative. As the marginal effect of one additional seat is small, we will get more demonstrative values by multiplying the coefficients of Table 6 by 1000. Imagine the values given in the following as the price effect of a cinema with 1000-seat capacity in the category considered.

[15] The Breusch-Pagan test showed that homoskedasticity of the error terms must be rejected for specifications 2 and 3. Hence, the standard deviation has been calculated using White's heteroskedasticity-consistent errors.

Under specification 1, *CAP* is distinguished by the owner as well as by the distance from the cinema, which results in six different *CAP* variables. All variables have the expected sign, but only the coefficients for close (for distant) rival capacity are significant at the 1% (the 0.1%) level. Note that the two coefficients are almost equal (−0.21€), and note further that the weakly significant coefficients of very close and close own capacities are of the same magnitude as well.

Specification 2 distinguishes distance categories only. If transportation costs played a role, we would expect the coefficients to decrease (in absolute terms) with distance. Our estimation results (−0.18€, −0.22€, and −0.21€) indicate, however, that distance has no effect on the price. This contradicts the results of Davis (2005), who finds the negative effect to be decreasing (in absolute terms) with increasing distance. It seems that transportation costs are so small that they do not matter or customers ignore them. In this case, the local-monopolist hypothesis does not hold.

Specification 3 pools all distance categories, thus distinguishing only own and rival seats. The regression yields significant coefficients of similar value for both own (−0.20€) and rival (−0.22€) capacity. This is contrary to our expectations, but in line with the results of Davis (2005). The coefficients of specification 2 are almost equal, so that it does not seem to make a difference for prices who owns the additional capacity. As mentioned above, rival capacity only exists on oligopoly markets, while some monopolists operate more than one cinema in an area. Hence, the coefficient of own capacity should be smaller in absolute terms than the coefficient of rival capacity, as the latter should reduce the monopoly price markup.

6. Conclusions

In section 4, we tried to find a price-concentration relationship by applying the monopoly model on our data set. We did not find a significant effect of the number of operators on the observed admission price. One possible explanation for such a result might have been the existence of local monopolies, caused by transportation costs. In this case, we would expect to find significantly lower prices for rival cinemas in close neighborhood, with the price effect decreasing (in absolute terms) for more distant rival locations. However, in section 5 we do not find any hint on such an effect. Within an area, transportation costs do not seem to play a

significant role for market power. Nevertheless, transportation costs might of course influence the total demand on the market.[16]

Another explanation for the observed results might be collusive behaviour of the cinema operators. The empirical test of our theoretical model from section 2 does not show any significant difference between prices on monopoly and oligopoly markets, which might be seen as a hint of an implicit or explicit agreement to charge monopoly prices. This interpretation is supported by our findings from section 5, in which we find coefficients of the same size for own and rival capacity. If there were competition, we would expect a greater coefficient (in absolute terms) for rival capacity, because it incorporates the effects both of increased supply and of competition, while own capacity only incorporates the effect of increased supply.

From a theoretical point of view, there are some hints that collusion on prices in the movie theater industry might be feasible: First, prices are easily and inexpensively observable; hence deviation of one operator would be detected easily. Second, capacity is fixed in the short run, and long-run capacity changes can be observed easily and at low cost as well. Third, punishment threats might be very effective, because most cinema operators are large multiplex chains that compete on a lot of local markets. Deviation in one market might be punished on many other markets.

One important shortcoming of our study is that cinema revenue does not consist of box-office revenues only. One other source of revenues is advertisement in movie theaters. In 2007, a total of €106.2 million was spent for such commercial activities in Germany (Berauer (2008)). From this perspective, a cinema operates on a two-sided market. On the one hand it sells tickets; on the other hand it sells advertising space. The value of its advertising space depends on the number of customers that visit the location, that is, the number of tickets sold. By reducing the ticket price below the one-market optimum, more tickets will be sold and more revenues from advertising will be generated. To develop and test a model of the cinema market as a two-sided market is the task of future research.

Our simple theoretical model ignores revenues from selling complementary goods like popcorn, drinks, and ice cream. The interesting point in this case is that selling these goods

[16] Travel costs will most likely only differ in the time needed to reach the location. For instance, bus tickets are usually equally priced for all possible routes within a city area. Car users experience marginal costs of each additional kilometer traveled, but empirically car use is rather inelastic to the price, so a few kilometers more or less might not influence the consumer's decision making significantly.

causes variable costs, but unlike admission prices, the receipts do not have to be shared with the distributor. Hence, cinema operators might charge lower entry fees to attract more customers, increasing receipts in, e.g., popcorn sales, or in other words, shifting turnover away from the shared box-office receipts to the nonshared complementary goods. In addition, price competition or collusion might take place with these goods as well. A recent theoretical contribution by Chen (2009) investigates this issue.

Finally, price discrimination is common in movie theaters. Prices differ by day of the week, time of day, age, and employment status (e.g., through student rebates). Furthermore, second-degree price discrimination (five for the price of four, or even flat rates) is very common.

Empirical testing of a comprehensive model including advertising and complementary goods revenues and allowing for price discrimination might be the goal of future research.

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Appendix: Dataset

City	*Site*	*Owner*	*P*	*Cap*	*Inhab*	*Inc*	*own 0-1*	*own 1-5*	*own 5-20*	*riv 0-1*	*riv 1-5*	*riv 5-20*	*cown 0-1*	*cown 1-5*	*cown 5-20*	*criv 0-1*	*criv 1-5*	*criv 5-20*
Aalen	Kinopark	Schweizer	8.00	1543	78700	18451	0	0	0	0	0	0	0	0	0	0	0	0
Bamberg	Cinestar	GU	7.50	1539	111500	18019	0	0	0	0	0	0	0	0	0	0	0	0
Bayreuth	Cineplex	Cineplex	7.50	1209	97000	17395	0	0	0	0	0	0	0	0	0	0	0	0
Bergen auf Ruegen	Kino Bergen a.R.	Ruegen-center Kino-Betriebs GmbH	7.90	734	69700	13992	0	0	0	0	0	0	0	0	0	0	0	0
Bitburg	Skala-Kino-Center	Riewer	7.00	447	14500	15767	0	0	0	0	0	0	0	0	0	0	0	0
Branden-	Union	Union	6.50	1300	75800	14392	0	1	0	0	0	0	0	500	0	0	0	0
burg /	Union	Union	6.50	500	75800	14392	0	1	0	0	0	0	0	1300	0	0	0	0
Braun-schweig	Cinemaxx	CinemaxX	7.50	2573	246000	16518	0	0	0	0	0	0	0	0	0	0	0	0
Celle	Kammer Lichtspiele	Kammer Lichtspiele Celle	7.00	1003	105000	17107	0	0	0	0	0	0	0	0	0	0	0	0
Cottbus	UCI Kinowelt	UCI	7.50	2200	175580	14974	0	0	0	0	0	0	0	0	0	0	0	0
Ebers-walde	MovieMagic	Movie Magic Entertain-ment GmbH	7.00	710	58000	14885	0	0	0	0	0	0	0	0	0	0	0	0
Eisen-huetten-stadt	Cinestar	GU	6.90	730	44000	14602	0	0	0	0	0	0	0	0	0	0	0	0
Emden	Cinestar	GU	6.00	930	71000	15680	0	0	0	0	0	0	0	0	0	0	0	0
Flensburg	Kinoplex	KPE Multiplex-theater	7.90	1998	127000	14714	0	0	0	0	0	0	0	0	0	0	0	0
Frankfurt Oder	Cinestar	GU	7.00	1400	78700	14504	0	0	0	0	0	0	0	0	0	0	0	0
Freiburg	Cinemaxx	CinemaxX	7.40	2210	215000	16962	0	0	0	0	0	0	0	0	0	0	0	0
Goep-pingen+ Eis-lingen	Staufen-Movieplex	Huttenlocher & Soehne	7.00	951	78000	19492	0	0	0	0	0	0	0	0	0	0	0	0
Goettingen	Cinemaxx	Cinemaxx	7.50	1709	160000	16259	0	0	0	0	0	0	0	0	0	0	0	0

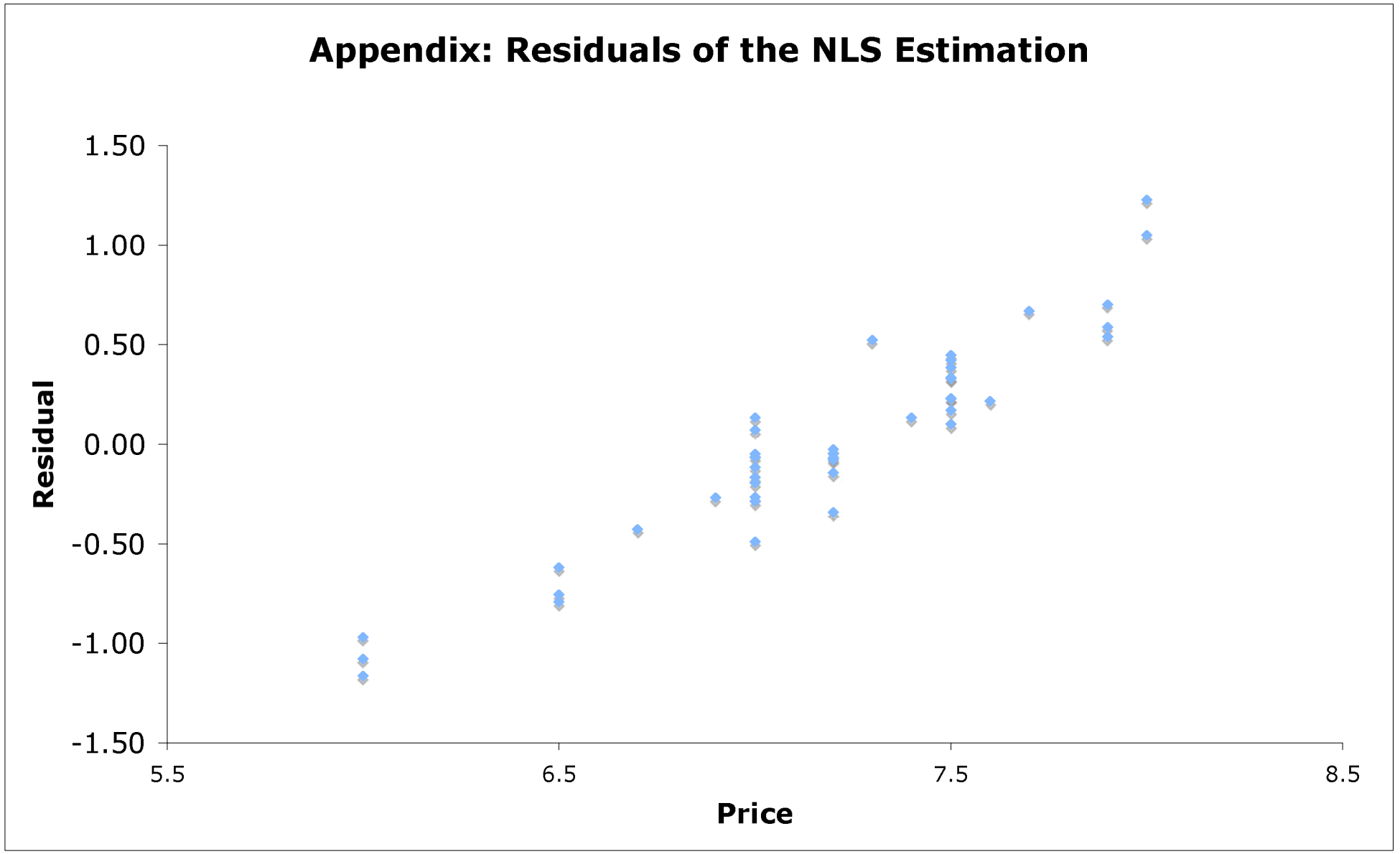
City	*Site*	*Owner*	*P*	*Cap*	*Inhab*	*Inc*	*own 0-1*	*own 1-5*	*own 5-20*	*riv 0-1*	*riv 1-5*	*riv 5-20*	*cown 0-1*	*cown 1-5*	*cown 5-20*	*criv 0-1*	*criv 1-5*	*criv 5-20*
Hildesheim	Thega Filmpalast	FTB - Film-theater-betriebs GmbH	7.50	1150	103000	17094	0	0	0	0	0	0	0	0	0	0	0	0
Hof	Central Kino	Gebr. Anders	7.00	902	70600	16818	0	0	0	0	0	0	0	0	0	0	0	0
Ingolstadt	Cinestar	GU	7.00	1783	162000	17517	0	0	0	0	0	0	0	0	0	0	0	0
Kempten	Colusseum-Center	Dietel	7.00	1100	94400	19182	0	0	0	0	0	0	0	0	0	0	0	0
Luebben	Cinestar	GU	7.00	450	42000	15752	0	0	0	0	0	0	0	0	0	0	0	0
Luebeck	Cinestar	GU	7.60	1467	212000	15553	1	0	0	0	0	0	0	0	0	0	0	0
Lueneburg	Cinestar	GU	7.50	1654	103000	16482	0	0	0	0	0	0	0	0	0	0	0	0
Muenster	Cineplex	Cineplex	6.70	2700	270000	19266	0	0	0	0	0	0	0	0	0	0	0	0
Neubran-denburg	Cinestar	GU	7.20	1750	86400	14810	0	0	0	0	0	0	0	0	0	0	0	0
Oldenburg	Cinemaxx	CinemaxX	7.50	1966	194000	16663	0	0	0	0	0	0	0	0	0	0	0	0
Passau	Cineplex	Cineplex	6.00	1395	71000	17964	0	0	0	0	0	0	0	0	0	0	0	0
Pforzheim	Cineplex	Cineplex	7.30	1306	119000	21804	0	0	0	0	0	0	0	0	0	0	0	0
Prenzlau	Union	Union	6.00	520	21500	14132	0	0	0	0	0	0	0	0	0	0	0	0
Rathenow	Union	Union	6.50	640	35700	14728	0	0	0	0	0	0	0	0	0	0	0	0
Rostock	Cinestar 1	GU	7.20	2165	267700	14278	0	0	2	0	0	0	0	0	1926	0	0	0
	Cinestar 2	GU	7.20	1090	267700	14278	0	1	1	0	0	0	0	836	2165	0	0	0
	Cinestar 3	GU	7.20	836	267700	14278	0	1	1	0	0	0	0	1090	2165	0	0	0
Siegen	Cinestar	GU	7.70	1836	187000	19583	0	0	0	0	0	0	0	0	0	0	0	0
Stendal	Union	Union	6.50	590	48000	13837	0	0	0	0	0	0	0	0	0	0	0	0
Stralsund	Cinestar	GU	7.20	1170	83700	14023	0	0	0	0	0	0	0	0	0	0	0	0
Tuttlingen	Scala	Scala	8.00	837	63000	20177	0	0	0	0	0	0	0	0	0	0	0	0
Wilhelms-haven	Kinoplex	KPE Multiplex-theater	7.90	1781	82200	15584	0	0	0	0	0	0	0	0	0	0	0	0
Wismar	Cinestar	GU	7.20	860	56300	14023	0	0	0	0	0	0	0	0	0	0	0	0
Wittenberg	Cinestar	GU	7.20	580	54000	14395	0	0	0	0	0	0	0	0	0	0	0	0
Wuppertal	Cinemaxx	CinemaxX	7.50	2733	360000	19450	0	0	0	0	0	0	0	0	0	0	0	0
Augsburg	Cinestar	GU	7.30	2338	423400	16639	0	0	0	0	1	3	0	0	0	0	2427	1922
	Cinemaxx	CinemaxX	7.30	2427	423400	16639	0	0	0	0	1	3	0	0	0	0	2338	1922
	Cineplex 1	Cineplex	7.00	712	423400	16639	0	0	0	0	0	2	0	0	0	0	0	4765
	Cineplex 2	Cineplex	7.00	834	423400	16639	0	0	0	0	0	2	0	0	0	0	0	4765
	Cineplex 3	Cineplex	6.00	376	423400	16639	0	0	0	0	0	2	0	0	0	0	0	4765

City	*Site*	*Owner*	*P*	*Cap*	*Inhab*	*Inc*	*own 0-1*	*own 1-5*	*own 5-20*	*riv 0-1*	*riv 1-5*	*riv 5-20*	*cown 0-1*	*cown 1-5*	*cown 5-20*	*criv 0-1*	*criv 1-5*	*criv 5-20*
Bremer-haven	Apollo Filmtheater	Apollo Film-theater	6.00	816	165000	18251	0	0	0	0	1	0	0	0	0	0	1132	0
	CineMotion	K-Motion	7.50	1132	165000	18251	0	0	0	0	1	0	0	0	0	0	816	0
Chemnitz	Cinestar 1	GU	6.90	2435	363900	15765	1	0	1	0	0	1	2302	0	846	0	0	350
	Cinestar 2	GU	6.50	2302	363900	15765	1	1	0	0	0	1	2435	846	0	0	0	350
	Cinestar 3	GU	6.90	846	363900	15765	0	1	1	0	0	1	0	2302	2435	0	0	350
	Apollo	Mueller	6.00	350	363900	15765	0	0	0	0	0	1	0	0	0	0	0	5538
Dresden	Cinemaxx	CinemaxX	7.00	2030	655000	15428	0	0	0	0	2	1	0	0	0	0	4400	2600
	Ufa	1. FSF Dresden	7.50	2670	655000	15428	0	0	0	0	3	0	0	0	0	0	6360	0
	UCI	UCI	7.20	2600	655000	15428	0	0	0	0	1	2	0	0	0	0	2670	3760
	Metropolis	Apel	7.00	1730	655000	15428	0	0	0	0	2	1	0	0	0	0	4730	2600
Friedrichs-hafen	Kino-Center	Lohner	7.00	539	88000	19015	0	0	0	0	1	0	0	0	0	0	1100	0
	Cineplex	Cineplex	7.00	1100	88000	19015	0	0	0	0	1	0	0	0	0	0	539	0
Halle	Cinemaxx 1	CinemaxX	7.00	2425	306300	14079	0	1	0	0	0	1	0	1655	0	0	0	1500
	Cinemaxx 2	CinemaxX	7.00	1655	306300	14079	0	1	0	0	0	1	0	2425	0	0	0	1500
	Domstadt-Kino	Vermiba C	7.00	1500	306300	14079	0	0	0	0	0	2	0	0	0	0	0	6300
Hannover	Cinemaxx	CinemaxX	7.50	2877	516000	17472	1	0	0	0	0	2	3297	0	0	0	0	2746
	Cinemaxx	CinemaxX	7.50	3297	516000	17472	1	0	0	0	0	2	2877	0	0	0	0	2746
	Cinestar	GU	7.30	2284	516000	17472	0	0	0	0	0	2	0	0	0	0	0	6636
	Utopia	Filmpalast Utopia	7.00	462	516000	17472	0	0	0	0	0	2	0	0	0	0	0	8458
Kaisers-lautern	Broadway	Broadway Entertainm.	7.50	1509	179000	15665	0	0	0	0	0	2	0	0	0	0	0	2814
	UCI Kinowelt	UCI	7.60	2128	179000	15665	0	0	0	0	1	1	0	0	0	0	686	1509
	Central-Filmpalast	Central Film-palast	6.50	686	179000	15665	0	0	0	0	1	1	0	0	0	0	2128	1509
Karlsruhe	Kinopolis	Kinopolis	7.50	726	424000	19117	0	0	0	1	1	0	0	0	0	601	2942	0
	Filmpalast ZKM	Filmpalast am ZKM	7.90	2942	424000	19117	0	0	0	0	2	0	0	0	0	0	1327	0
	Die Kurbel	Die Kurbel	7.50	601	424000	19117	0	0	0	1	1	0	0	0	0	726	2942	0
Kassel	Cinestar	GU	7.50	3390	323000	15953	0	0	0	1	0	0	0	0	0	1532	0	0
	Cineplex	Cineplex	7.50	1532	323000	15953	0	0	0	1	0	0	0	0	0	3390	0	0

City	*Site*	*Owner*	*P*	*Cap*	*Inhab*	*Inc*	*own 0-1*	*own 1-5*	*own 5-20*	*riv 0-1*	*riv 1-5*	*riv 5-20*	*cown 0-1*	*cown 1-5*	*cown 5-20*	*criv 0-1*	*criv 1-5*	*criv 5-20*
Kiel	Neues Studio	AS! Entertainm.	6.50	480	277000	15148	0	0	0	0	2	0	0	0	0	0	3390	0
	Metro Schlosshof	metro Kino im Schlosshof	7.00	600	277000	15148	0	0	0	0	2	0	0	0	0	0	3270	0
	Cinemaxx	CinemaxX	7.50	2790	277000	15148	0	0	0	0	2	0	0	0	0	0	1080	0
Koblenz	Kino Lahnstein	Birkelbach Harig	5.00	203	226000	17474	0	0	0	0	0	3	0	0	0	0	0	3356
	Kinopolis	Kinopolis	7.70	1533	226000	17474	0	0	0	0	1	2	0	0	0	0	1237	798
	Apollo-Odeon	Filmtheater-betriebe Klein	7.00	1237	226000	17474	0	0	0	0	1	2	0	0	0	0	1533	798
	Metropol	FTB Weiler	6.50	595	226000	17474	0	0	0	0	0	3	0	0	0	0	0	2973
Leipzig	Cineplex	Cineplex	7.00	1800	504800	14528	0	0	0	0	0	3	0	0	0	0	0	5450
	Cinestar	GU	7.50	2400	504800	14528	0	0	0	0	1	2	0	0	0	0	830	4020
	Uci	UCI	7.20	2220	504800	14528	0	0	0	0	0	4	0	0	0	0	0	6530
	Regina	Bofimax	7.00	830	504800	14528	0	0	0	0	1	2	0	0	0	0	2400	4020
Magde-burg	Cinestar	GU	7.10	2200	315000	14071	0	0	0	0	0	1	0	0	0	0	0	2700
	Cinemaxx	CinemaxX	7.00	2700	315000	14071	0	0	0	0	0	1	0	0	0	0	0	2200
Paderborn	Kinoplex	KPE Multiplex-theater	7.90	1823	263000	16216	0	0	0	1	0	0	0	0	0	1780	0	0
	Cineplex	Cineplex	6.50	1780	263000	16216	0	0	0	1	0	0	0	0	0	1823	0	0
Regens-burg	Reginakino	Lerchl	6.50	348	201000	18631	0	0	0	0	1	0	0	0	0	0	2052	0
	Cinemaxx	CinemaxX	7.50	2052	201000	18631	0	0	0	0	1	0	0	0	0	0	348	0
Rosenheim	Citydome	Citydome	6.00	526	132000	18592	0	0	0	0	0	1	0	0	0	0	0	1428
	Aibvision	Aibvision Filmbetriebs GmbH	8.00	1428	132000	18592	0	0	0	0	0	1	0	0	0	0	0	526
Schwerin	Capitol	CAPITOL Kino	7.00	1200	113700	14960	0	0	0	0	1	0	0	0	0	0	1100	0
	Mega Movies	MegaMovies	7.00	1100	113700	14960	0	0	0	0	1	0	0	0	0	0	1200	0
Trier	Broadway	Filmtheater-Betriebs-GmbH	7.00	757	239000	15913	0	0	0	1	0	0	0	0	0	1790	0	0
	Cinemaxx	CinemaxX	7.50	1790	239000	15913	0	0	0	1	0	0	0	0	0	757	0	0
Ulm + Neu-Ulm	Xinedome	Union	8.00	1833	250000	19967	0	0	0	0	1	0	0	0	0	0	2487	0
	Cineplex	Cineplex	8.00	2487	250000	19967	0	0	0	0	1	0	0	0	0	0	1833	0
Villingen-Schwen-ningen	Cinestar	GU	6.50	1652	165000	19990	0	0	0	0	0	1	0	0	0	0	0	760
	BlueBoxx	Wiedemann Schonhardt	7.00	760	165000	19990	0	0	0	0	0	1	0	0	0	0	0	1652

City	*Site*	*Owner*	*P*	*Cap*	*Inhab*	*Inc*	*own 0-1*	*own 1-5*	*own 5-20*	*riv 0-1*	*riv 1-5*	*riv 5-20*	*cown 0-1*	*cown 1-5*	*cown 5-20*	*criv 0-1*	*criv 1-5*	*criv 5-20*
Wolfsburg	Metropol	Metropol Theater	5.00	284	147000	17452	0	0	0	0	1	0	0	0	0	0	1636	0
	Cinemaxx	CinemaxX	7.50	1636	147000	17452	0	0	0	0	1	0	0	0	0	0	284	0
Wuerzburg	Cinemaxx	CinemaxX	7.30	1851	211000	17559	0	0	0	0	0	1	0	0	0	0	0	2400
	Cineworld	Cineworld	7.30	2400	211000	17559	0	0	0	0	0	1	0	0	0	0	0	1851

GU = Greater Union; UCI = United Cinemas Int. Multiplex GmbH
City = largest city in the area
Site = cinema location
Owner = owner of the site
P = admission price to a Saturday night, 8 p.m. blockbuster
Cap = sum of all seats at the site
Inhab = number of inhabitants in the area as of Dec. 31st 2007
Inc = average per capita income as of Dec. 31st 2005
own x-y = additional cinema sites by the same owner within x to y km linear distance
riv x-y = additional cinema sites by different owners within x to y km linear distance
cown, criv = seats at the additional cinema sites


Appendix: Residuals of the NLS Estimation
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
Residual
5.5
6.5
7.5
8.5
Price