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Cinema Demand in Germany

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Abstract. This paper examines the German cinema market using time series data covering the period 1950–2002. Applying estimation techniques such as OLS, 2SLS and SUR, we identify interrelations between the number of seats, the average real prices and the demand for movies per capita. Furthermore, we test for the long-run relationship between demand, prices and real income and estimate the elasticity of demand with respect to these variables.

Key words: cinema demand, cinema supply, cointegration analysis, SUR

JEL–Classification: C22, C23, L82

1. Introduction

This paper analyzes the demand for cinema attendance in Germany between 1950 and 2002 using time series data. While cinema attendance strongly increased after World War II in the early 1950s, there has been a remarkable reduction since then, even though ticket sales have increased by around 11% over the 1990s (see SPIO, 2003). However, the performance of the "good old days" of the 1950s has never been reached again. In contrast with other European countries, the growth in cinema attendance has grown stronger over the 1990s, as the number of sold tickets per capita rose by 47% from 1.68 in 1990 to 2.47 in 2002 (see Media Salles, 2003).[1]

A great deal of the empirical literature on cinema demand uses micro-level data to analyze the impact of various determinants on the performance of movies (see e.g. Smith and Smith, 1986; Sochay, 1994). While some articles examine the influence of film-specific determinants such as movie stars (Albert, 1998; Ravid, 1999; De Vany and Walls, 1999), film critics (Eliashberg and Shugan, 1997), and the popularity of directors (Bagella and Becchetti, 1999), some others also analyze the impact of financial variables such as budgets (De Vany, 2004) and marketing expenditures (Prag and Casavant, 1994). Jansen (2003) analyzes the performance of German motion pictures using, *inter alia*, information on public subsidies.[2]

So far, studies on cinema demand using highly aggregated data are relatively rare. Most analyses were conducted in the U.K. (see Browning and Sorell, 1954; Cameron, 1986, 1988, 1990, 1999; Hand, 2002; MacMillan and Smith, 2001) an exception being Fernández-Blanco and Baños-Pino (1997), who studied cinema

demand in Spain using cointegration analysis. To our knowledge, there has not been any econometric study of cinema demand in Germany using macro-data. This paper aims to fill this gap. We model the German cinema market using time series methods and simple OLS regressions in order to analyze the most important impacts on cinema demand and supply in Germany.

The paper is organized as follows. Section 2 summarizes the historical development of the German cinema market, in terms of cinema-specific variables such as admissions, number of seats and revenues. In Section 3, we provide a theoretical framework of cinema demand and supply, and generate a number of hypotheses, which are tested in Section 4 with data from the German cinema market. Finally, Section 5 concludes.

2. Historical Background

The German cinema market is characterized by an enormous increase in cinema admissions during the early 1950s and a remarkable reduction in demand since the late 1950s (see Figure 1). Since the population changed significantly over this time,[3] it is common to deflate the number of cinema admissions by the total population size. Considering per capita-attendance, cinema demand had its peak in 1956, when the average German went 15 times a year to the cinema. In contrast, Germans saw only one film a year on average in 1992 and cinema supply has decreased both in the number of seats and in the number of screens. Even the German reunification of 1990 did not lead to a considerable change in demand, although the population has risen by about 16 million people.

Hence, it is obvious that going to the cinema was a more important leisure activity in the early post-war era. One reason for this fall in popularity of cinematic

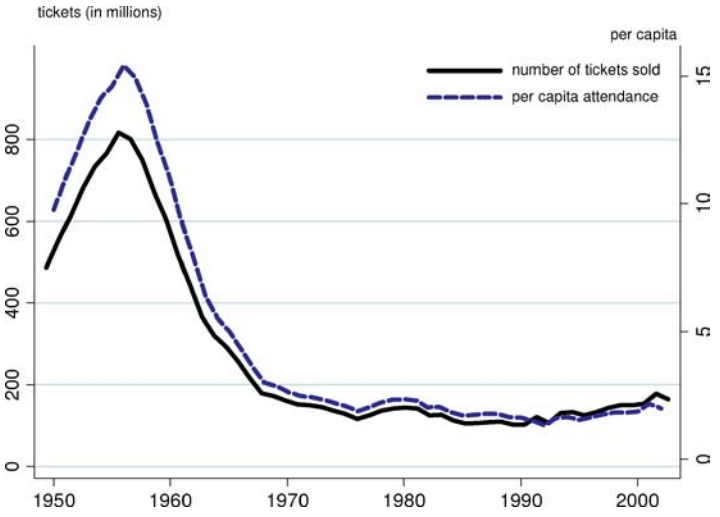


Figure 1. Cinema attendance in Germany (SPIO, 2003).

services could be the invention and rapid diffusion of television sets and video cassette recorders in the 1960s and the 1970s, respectively. The number of TV sets has been permanently increasing since the early 1960s and is currently at a level of about 35 million (see Federal Statistical Office, 2003). More impressively, the share of people aged 14 years and older who live in a household with at least one TV set, has converged towards 100% within the last decade (see Federal Statistical Office, 2003). A similar development can be observed for video recorders.[4] Therefore, TVs and VCRs are generally assumed to have a negative influence on cinema attendance.

Moreover, in the late 1950s, prior to the rapidly increasing number of TV sets, the role and functions of cinema changed. While, in the early 1950s, people went to the cinema not only for entertainment, but also for information and news, cinemas have become less important as a source of information due to the diffusion of TV sets in private households and public places (such as bars). Thus, although the number of TV sets was not that high in the early 1950s, more and more people are now being informed by TV.

Other factors may also have been responsible for the decrease in cinema demand. The disposable income per capita has increased enormously in nearly every developed country over the last 50 years (see Federal Statistical Office, 2003). Therefore, many people can also afford other forms of entertainment such as theater, opera, sports events or other leisure activities. For these reasons it is not immediately clear whether the decrease in cinema attendance has been caused mainly by the diffusion of home entertainment such as TVs or VCRs.

Furthermore, the expected effect that TV and VCR have on cinema demand is ambiguous. Following MacMillan and Smith (2001) watching TV may be a close substitute for going to the movies, since cinema appears to suffer from competitive disadvantages relative to TV, due to the smaller variety of services supplied by cinemas. On the other hand, Fernández-Blanco and Baños-Pino (1997) found that the influence of TV on cinema attendance does not only depend on the distribution of TVs but also on the quality of the programmes offered. Since the emergence of private television in Germany in the mid 1980s, the number of channels has increased significantly. However, the number of commercials has also increased enormously so that the "quality" of watching TV may have decreased.

The decline in ticket sales described above has also led to a large decline in gross revenues between the late 1950s and the mid 1970s. Real gross revenues have decreased by about 70% from nearly 1.8 billion Euros in 1976. Apart from a short period of recovery, this trend persisted into the beginning of the 1990s when revenues increased slightly (see Figure 2). Around this time a structural change took place within the cinema market in German cities. More and more multiplexes were built, gradually replacing the traditional single-screen cinemas (see SPIO, 2003).

The novelty of these multiplexes is not only that they have a decreased seats–screen ratio, but also a large number of catering facilities, i.e. restaurants, bars and cafés.

Figure 2. Gross real revenues (SPIO, 2003).

Consequently, the multiplex cinema firms obtain profits from three different (yet interrelated) sources – ticket sales, food and beverage revenues, and advertising revenues. Thus, despite the fact that average attendance has fallen, revenues have increased, particularly within the past 10 years.

Beside the increasing cinema demand, there has also been a slight increase in supply during the last 10 years, as measured by the number of screens and by the number of seats. However, the number of screens has risen more rapidly, probably due to the invention of multiplexes. In 2002, there were 1,844 cinemas in Germany, and the market share of multiplexes measured by screens (revenues) was about 26% (45%) (see Cinema, 2003).

Nowadays, cinema is quite a different good from what it was in the 1950s or even in the 1960s or 1970s. Today, people only go to the movies for entertainment reasons, and they almost exclusively watch "blockbusters". For example, the top 10 movies in Germany in 2002 were exclusively U.S.A. blockbusters with at least 3.3 million attendances (see Cinema, 2003). In contrast, the most successful German movie in 2002 ("Bibi Blocksberg") has been seen by about 2 million people. These facts lead us to assume a structural break in cinema demand.

While the market share of domestic movies in German cinemas has decreased from about 47% in the late 1950s, to nearly 16% in 2001, the market share of American movies has increased from about 30% (in the late 1950s) to about 70–80% nowadays (see SPIO, 2003; Eurostat, 2003).

3. Theoretical Framework

3.1. CINEMA DEMAND

The demand for cinema services is commonly measured by cinema attendance in annual frequency (ATT). In order to take into account the rapidly changing population

(in size as well as structure) the observations are deflated by the population size to obtain a measure of cinema admissions per capita (ATTR). The individual demand function for cinema may then be written as follows:

$$\text{ATTR} = f(P, P_{\text{other}}, Y, Z). \quad (1)$$

According to Equation (1), the quantity of cinema services demanded in period t is a function of their price (P), the price of substitutes or complements like theater, opera, or other leisure activities (P_{other}), income (Y), and a set of variables that indicates variations in consumers' preferences or general circumstances (Z).

Hypothesis 1: *Cinema demand is positively related to income and prices of substitutes. Furthermore, it decreases with the ticket price, the price of complements and the invention/diffusion of TVs and VCRs.*

Especially in recent years, there has been a high variation of ticket prices (and cinema demand) across different weekdays, seasons and categories, but these variations typically vanish with the use of aggregated data (see e.g. Hand, 2002; Einav, 2003). Therefore, the price elasticity of cinema admission should not be overinterpreted in our case.

Even though cinema demand is assumed to be positively related to income, the exact value of the income elasticity of demand cannot be predicted. In the case that cinema is a luxury good, elasticity will be greater than one.[5] Alternatively, in the case that going to the cinema is a normal leisure activity, income elasticity will be positive but less than unity. However, with rising income the variety of other affordable options increases as well. Therefore, increasing opportunity costs of going to the cinema, due to its time intensiveness, may induce a reduction in consumption or at least a slower increase, and – simultaneously – an expansion of rival activities. This fact is evident regarding the decline in cinema attendance during the late 1950s despite an increase in real per capita income.

The effect of prices for other goods such as theater, opera or exhibitions on cinema attendance depends on whether the respective activity is seen as a substitute or complement. As described earlier, the assumed effects are not clear in advance. People with general cultural interests are more likely to go to the cinema than, for example, people who are interested only in higher performing arts.

Other factors are measured by variables representing the emergence of competing products, such as TVs and VCRs. As noted before, the assumed effects of these competing techniques are ambiguous. It may seem reasonable to consider watching TV as less preferable than cinema because of its inferior audio-visual conditions and a lack of atmosphere (Cameron, 1988). On the other hand, it may also seem reasonable to consider watching TV as superior to cinema because watching TV may offer more comfort, convenience, and privacy (Fernández-Blanco and Baños-Pino, 1997). Furthermore, watching TV carries no marginal or transportation costs. Possibly these advantages outweigh the disadvantages and lead to a clear substitution of television for cinema consumption.

Hypothesis 2: *Quality has a positive impact on cinema demand and therefore on attendance per capita.*

Economic theory suggests that quality is also a significant determinant of demand for cinema attendance. However, with the given data it is not possible to measure film quality variations. Cameron (1990) therefore suggests taking into account the range of films available at a point in time as a dimension of quality, and to include the number of cinema(s) (screens) as a proxy for the quality component. In contrast, we think that this variable is only a crude measure for quality, since an adjustment of screens is only possible with a time lag of about one or two years. For this reason we have used the number of German movies produced per year to proxy variations in quality or at least to measure the degree of product differentiation.[6] Nevertheless, we have included the number of seats to control for supply side effects.

3.2. CINEMA SUPPLY

Cinema supply is measured by both the number of screens and the number of seats (see Figure 3). However, we think that the latter is a more appropriate measure since it (i) describes supply in terms of capacity and (ii) is closely related to per capita numbers. On the other hand, the number of seats is a measure of potential rather than of effective supply, since it also includes a buffer to absorb peaks in demand. Moreover, the number of seats provides information about the quality of the films offered but can be seen as a proxy variable. The supply function for cinema

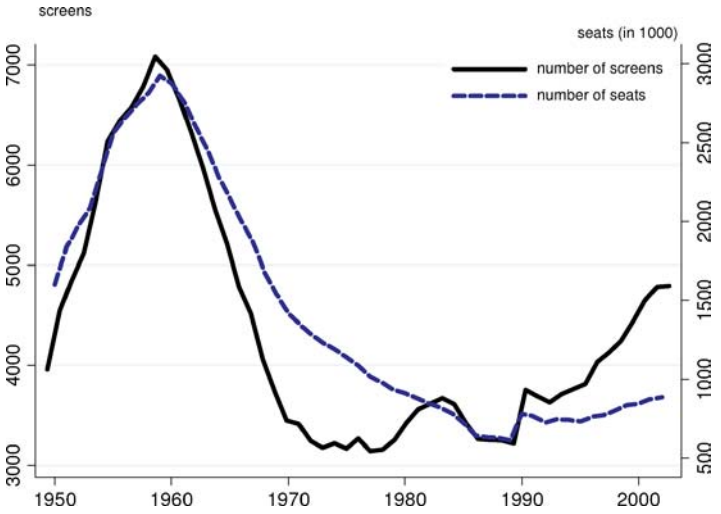


Figure 3. Cinema supply in Germany (SPIO, 2003).

services may be written as follows:

$$\text{SEAT} = g(Y, \text{ATTR}_{t-l}, Z). \quad (2)$$

According to this function the quantity of cinema services supplied in period t (SEAT) is a function of real disposable income per capita (Y), past cinema admission (ATTR_{t-l}) and a set of additional variables (Z).

The impact of disposable income on cinema demand mentioned above also seems to apply to cinema supply. With an increase in income other leisure activities become increasingly attractive. Hence, a fall in demand and, therefore, also in supply may be possible.

Hypothesis 3: *Cinema supply increases with average income as well as past admission numbers.*

It may be expected that the decision to close or (re)-open a cinema may be delayed by the time required to distinguish between a temporal or a permanent change in demand (see MacMillan and Smith, 2001). There are of course other adjustment possibilities prior to the closure of cinemas. Because of the uncertainty of time needed for this decision, the adjustment of the number of seats in response to a change in demand cannot be specified exactly. To account for adjustment processes, we assume a lag of at least one or two periods.

The influence of the other factors is ambiguous, especially when considering the invention/diffusion of TVs and VCRs, so that the assumptions made for the demand side also hold for the supply side. This seems reasonable, particularly because of the interdependence of supply and demand. So even if TV and VCR technology do not influence the number of seats supplied directly, they naturally do so via their influence on demand. A further variable that we take into account is the extent to which cinema services are used. We assume that this overall performance is a relevant factor for the determination of the number of supplied seats.

Hypothesis 4: *Cinema demand is negatively related to the invention/diffusion of TVs and VCRs. Moreover, the number of seats is positively related to cinema demand, however with a recognition lag.*

4. Empirical Findings

4.1. DATA

To test the theoretical hypotheses empirically, we have assembled annual aggregate data on the German cinema industry. Unless otherwise noted, all of the cinema-specific variables were obtained from the *Filmstatistisches Jahrbuch* published by the Spitzenorganisation der Filmwirtschaft (see SPIO, 2003). Cinema demand (ATTR) is captured by the number of tickets sold (ATT) divided by the total population (POP). Cinema supply is measured by the number of seats (SEAT). Moreover,

P is the average real ticket price and LOAD is the ratio of the number of tickets sold to the number of seats available in each year.

All monetary variables have been deflated by the cost of living price index. This variable, as well the population numbers (POP), the income variable (Y), and the prices for alternative leisure activities (P_{other}) (price index for cultural activities) were obtained from the *German Statistical Yearbook* published by the Federal Statistical Office of Germany (Federal Statistical Office, 2003).

Furthermore, a dummy variable (VID), which is equal to one for 1970 to 2002 and zero prior to 1970, was used to capture the invention of VCRs.[7] To analyze the influence of TV programmes we used the number of registered TV sets (TV)[8] and the market share of private TV stations (PRIV). Both variables were also obtained from the Federal Statistical Office of Germany (Federal Statistical Office, 2003).

Moreover, GMOV is the number of German movies that were released in a specific year. This figure was obtained from the *Filmstatistisches Jahrbuch* (see SPIO, 2003). A dummy variable (UNION) which is set to one for 1990 to 2002 is used to capture the effect of German reunification. Table AI in the Appendix provides descriptive statistics on all variables used in this study except the dummies. Table AII summarizes correlation coefficients of some of the exogenous variables.

4.2. RESULTS

We start our analysis with the specification of several approaches for cinema demand. At the beginning we follow Fernández-Blanco and Baños-Pino (1997) in order to examine whether their results for Spain also hold for the German cinema market. Subsequently, we gradually extend this approach by considering quality aspects.

4.2.1. *Cointegration Analysis*

In order to avoid spurious regressions, we tested the order of integration of the variables. As typical for a time series, we found all of the relevant variables to be integrated by first order (see Table AIII in the Appendix). Thus, simple OLS regressions are appropriate methods for determining the main factors that influence demand for cinema if a cointegrating relation exists. Therefore, we applied Johansen cointegration tests to analyze the relation between cinema attendance, prices, and income. In the case of cointegration, simple OLS regressions are appropriate to analyze the long-run context. They are superconsistent because the estimated parameters approach their true values faster than they would in the case of regressing stationary data (see Stock, 1987). As a consequence, OLS may be used to fit a cointegrating relationship even if it belongs to a system of simultaneous relationships.

Regarding cinema admission, prices, and disposable income per capita, we find all relevant test statistics indicate that at least one cointegrating relation exists (see Table AIV in the Appendix) at the 99% level of confidence. Like Fernández-Blanco

and Baños-Pino (1997), we found cinema demand to be elastic with respect to price and income. Thus, cinema may indeed be seen as a luxury good. Surprisingly, we found price and income elasticity to be extremely high, namely −2.25 and 4.48 respectively.

In a further step, we used an error correction model to distinguish short- from long-run relationships. Like Fernández-Blanco and Baños-Pino (1997), we found evidence for the existence of a cointegrating relation. The percentage correction of the disequilibrium is about 12.5% for recent years (see Table AV, in the Appendix). To test for the validity of this specification, we used empirical distribution tests, such as Anderson–Darling, Watson, or Cramer–von Mises statistics (see D'Agostino and Stephens, 1986; Tietjen, 1986). None of the statistics rejects the hypotheses of normality and zero-autocorrelation of the regression residuals.

4.2.2. *Demand Equations*

Using a first ad hoc specification, we estimated the effects of price and income on cinema admission (see Table AVI in the Appendix). In contrast to the long run relationship reported previously, elasticities have decreased significantly, but demand is still price elastic. To determine a possible structural break due to the German reunification, a Chow forecast test was applied. Neither the test statistic nor the recursive estimates for the respective parameters (for the constant, price and income) indicate a structural break due to the reunification. However, the recursive estimation of the real ticket price indicates that a structural break occurred in the mid-1960s, since the parameter level permanently changed. Therefore, our assumption that a structural change in consumption behavior occurred, as cinemas have lost their informational role, appears to be correct. Nevertheless, the options for dealing with this problem are rather limited due to the small sample used for this study.

To capture the effect that competing goods have on demand, we have sequentially included the variables VID, PRIV, and TV (see Table I). In addition to OLS regressions, we used 2SLS in order to handle the problem of endogeneity when including contemporary prices. The results support the hypothesis that the market share of commercial television channels is negatively related to cinema demand. The reported coefficients are consistent across different methods and are statistically significant at the 1% level of significance. However, the invention of VCRs and the number of registered TV sets are not always statistically significant.

The impact of prices on cinema demand is negative as expected, and cinema demand is elastic with respect to price and income, even though the estimated income elasticities are notably smaller. Rather surprisingly, the results show no influence of German reunification, resulting in non-uniform insignificant estimated coefficients. This may be explained by the use of attendance per capita or even past admission as variables to capture the population effect to some degree. Moreover, Jarque–Bera tests (JB) and Durbin–Watson statistics (DW) provide evidence for normality of the residuals and positive autocorrelation, respectively. The results

Table I. Regression results – Demand I.

	Dependent Variable is ATTR					
	I		II		III	
	OLS	IV	OLS	IV	OLS	IV
CONST	0.63	−0.19	0.03	−1.31	7.89***	4.20
	(0.40)	(−0.13)	(0.02)	(−1.02)	(4.25)	(1.21)
P	−2.59***	−2.83***	−2.87***	−3.19***	−1.07**	−1.95**
	(−8.16)	(−8.37)	(−10.08)	(−10.74)	(−2.55)	(−2.55)
Y	0.56**	0.71***	0.69***	0.93***	0.12	0.38
	(2.10)	(2.82)	(3.09)	(4.07)	(0.46)	(1.04)
UNION	−0.01	−0.001	0.44***	0.48***	0.18	0.10
	(−0.14)	(−0.01)	(3.54)	(4.83)	(1.61)	(0.70)
VID	−0.16	−0.12				
	(−1.15)	(−0.96)				
PRIV			−0.02***	−0.02***		
			(−4.59)	(−4.66)		
TV					−0.65***	−0.34
					(−3.41)	(−1.27)
$\bar{R}^2$	0.94	0.94	0.95	0.95	0.93	0.92
JB	1.28	1.28	0.05	0.05	0.04	0.04
Prob.	(0.52)	(0.52)	(0.97)	(0.97)	(0.98)	(0.98)
DW	0.35	0.35	0.55	0.55	0.36	0.36
ChowF	1.16	1.19	1.61	1.19	7.03	7.46
Prob.	(0.34)	(0.32)	(0.13)	(0.32)	(0.00)	(0.00)
Obs	53	53	53	53	43	43

Notes. All variables are in log-form, except dummy variables. Robust covariance matrices are calculated using the Newey–West estimator. *T* ratios are given in parentheses. The price is instrumented by $P(t-2)$. ***/**/* indicate significance at the 1%/5%/10% level of confidence.

of Chow forecast tests to identify a possible structural break due to the German reunification are ambiguous. The null hypothesis of no structural break can only be rejected in model III, (Table I).

To analyze the impact of quality on cinema attendance, we have included a further variable GMOV, which is the number of German movies produced in a specific year, and have re-run the previous regressions. GMOV is instrumented by its first lag to avoid endogeneity problems. Furthermore, we dropped TV because of the high correlation with VID (0.72) and PRIV (0.82).

As one can see from Table II, GMOV has a positive and significant impact on cinema demand in each of the equations. Apparently, Germans have a positive attitude towards German movies (or, more exactly, quality has a positive impact on

Table II. Regression results – Demand II.

	Dependent variable is ATTR					
	I		II		III	
	OLS	IV	OLS	IV	OLS	IV
CONST	−2.07*	−2.69**	−2.01*	−4.00***	−2.52**	−3.14***
	(−1.89)	(−2.66)	(−1.79)	(−3.42)	(−2.65)	(3.10)
P	−2.53***	−2.72***	−2.95***	−3.42***	−2.64***	−2.83***
	(−8.19)	(−6.58)	(−13.94)	(−12.09)	(−8.18)	(−6.98)
Y	0.74***	0.85***	0.82***	1.17***	0.99***	0.94***
	(4.31)	(4.08)	(5.00)	(6.06)	(5.21)	(4.65)
UNION	−0.02	−0.01	0.38***	0.43***	0.35***	0.37***
	(−0.24)	(−0.12)	(2.95)	(3.40)	(3.18)	(3.14)
GMOV	0.36***	0.35***	0.29***	0.29***	0.52***	0.34***
	(4.77)	(5.11)	(3.90)	(4.69)	(5.38)	(3.61)
VID	−0.29**	−0.26*			−0.26**	−0.23**
	(−2.20)	(−1.96)			(−2.34)	(−2.18)
PRIV			−0.02***	−0.02***	−0.01***	−0.01***
			(−4.56)	(−4.76)	(−4.56)	(−4.01)
$\bar{R}^2$	0.97	0.97	0.97	0.96	0.97	0.97
JB	1.56	1.66	1.03	1.67	1.27	1.25
Prob.	(0.45)	(0.43)	(0.59)	(0.43)	(0.52)	(0.53)
DW	0.95	1.02	1.03	1.34	1.38	0.36
ChowF	1.19	1.26	1.86	1.27	1.88	1.83
Prob.	(0.32)	(0.28)	(0.08)	(0.27)	(0.07)	(0.08)
Obs	52	52	52	52	52	52

Notes: All variables are in log-form, except dummy variables. Robust covariance matrices are calculated using the Newey–West estimator. *T* ratios are given in parentheses. The price is instrumented by P(t-2) and GMOV by GMOV($t-1$). ***/**/* indicate significance at the 1%/5%/10% level of confidence.

cinema demand). Moreover, and in contrast to our previous regressions, all other variables are statistically significant, and the results are robust against different specifications.[9] Demand is elastic with respect to price, and income elasticity is about unity. Again, testing for a structural break leads to ambiguous results. However, the small sample restricts the possibilities of resolving this ambiguity.

4.2.3. *Simultaneous Equation Specification*

One disadvantage of previous regressions is that they neglect the relationship between the number of seats and cinema admissions. As MacMillan and Smith (2001)

point out, consumers may react to changes in cinema supply. Hence, this interdependence should be taken into account, even though this may induce problems of identification for both demand and supply equations. MacMillan and Smith (2001) use the vector autoregression techniques (VAR) for this purpose. Apart from their approach, we also try to find specifications that allow for the identification of demand equation and supply equations. Therefore, we use estimation techniques for simultaneous equation models refrained on Two–Stage Least Squares (2SLS) or Seemingly Unrelated Regression (SUR). The 2SLS approach may be used to estimate any identified equation of a complete structural model one after the other (see Johnston and DiNardo, 1997) while the SUR technique estimates the system's parameters, accounting for heteroskedasticity and contemporaneous correlation in the disturbances of different structural equations.

Table III. Simultaneous equation estimation – Demand.

	Dependent variable is ATTR					
	I		II		III	
	2SLS	SURE	2SLS	SURE	2SLS	SURE
CONST	−6.72***	−4.11***	−5.27***	−3.47***	−6.73***	−4.11***
	(−3.87)	(−4.09)	(−3.13)	(−3.44)	(−3.98)	(−4.09)
P_{t-1}	−2.62***	−2.72***	−2.40***	−2.53***	−2.72***	−2.76***
	(−9.19)	(−9.25)	(−9.12)	(−8.91)	(−9.75)	(−9.45)
Y	0.44**	0.70**	0.25	0.58**	0.32*	0.60**
	(2.36)	(2.85)	(1.29)	(2.08)	(1.69)	(2.25)
P_{other}	0.39**	0.39**	0.75***	0.55**	0.81***	0.59**
	(2.17)	(2.45)	(2.70)	(2.14)	(2.94)	(2.40)
SEAT	0.48***	0.60***	0.47***	0.49***	0.57***	0.60***
	(3.91)	(5.18)	(3.93)	(4.40)	(4.43)	(5.14)
GMOV	0.33***	0.37***	0.37***	0.39***	0.34***	0.37***
	(5.36)	(6.18)	(6.24)	(6.62)	(5.63)	(6.26)
VID	0.24**	0.11***			0.23**	0.09**
	(2.11)	(2.35)			(2.04)	(2.24)
PRIV			−0.01**	−0.001	−0.01*	−0.01
			(−2.05)	(−1.17)	(−1.96)	(−1.04)
$\bar{R}^2$	0.98	0.98	0.98	0.98	0.98	0.98
DW	1.00	1.25	1.20	1.19	1.34	1.31
Obs	51	51	51	51	51	51

Notes: All variables are in log-form, except dummy variables. Robust covariance matrices are calculated using the Newey–West estimator. T ratios are given in parentheses. The price is instrumented by $P(t-2)$. ***/**/* indicate significance at the 1%/5%/10% level of confidence.

Next we present the results of our simultaneous equation model.[10] Table III reports estimations for the demand side equation. It is obvious that (independently from specification and methods) demand is highly elastic with respect to ticket prices and statistically significant.[11] According to these results, demand elasticity ranges from −2.40 to −2.76. Moreover, real income elasticity is also statistically significant in most of the equations. However, in comparison to single demand equations income elasticity is rather low, meaning that cinema cannot be identified as a luxury good.

The prices of other cultural goods are positively related to cinema demand. Thus, we conclude that movies and other leisure activities are substitutes. Both the number of seats and the number of German movies also have a positive impact on cinema demand. These results are relatively robust against variations in methods and specifications.

Table IV. Simultaneous equation estimation – Supply.

	Dependent variable is SEAT					
	I		II		III	
	2SLS	SURE	2SLS	SURE	2SLS	SURE
CONST	13.15***	5.63***	−5.16	−2.74	−7.50	−3.46*
	(4.42)	(4.45)	(−1.05)	(1.35)	(−1.55)	(−1.74)
$ATTR_{t-2}$	0.68***	0.69***	0.71***	0.70***	0.48***	0.49***
	(3.90)	(4.02)	(6.78)	(6.95)	(3.29)	(3.50)
$LOAD_{t-2}$	−0.18	−0.17	−0.03	0.02	0.15	0.16
	(−0.85)	(−0.83)	(−0.14)	(0.98)	(0.82)	(0.88)
Y	0.18	0.43**	−0.20	0.08	−0.04	0.24*
	(0.81)	(2.12)	(−1.18)	(0.61)	(−0.21)	(1.77)
POP	0.01	0.02	1.66***	1.77***	1.92***	1.96***
	(0.01)	(0.08)	(3.80)	(4.10)	(4.27)	(4.61)
VID	−0.11	−0.04			−0.21**	−0.09**
	(−0.91)	(−0.82)			(−2.15)	(−2.13)
PRIV			−0.01***	−0.01***	−0.02***	−0.01***
			(−4.42)	(−4.76)	(−4.95)	(−5.27)
$\bar{R}^2$	0.93	0.93	0.95	0.95	0.96	0.95
DW	1.20	1.25	0.40	1.19	1.34	1.31
Obs	51	51	51	51	51	51

Notes: All variables are in log-form, except dummy variables. Robust covariance matrices are calculated using the Newey–West estimator. T ratios are given in parentheses. The price is instrumented by $P(t-2)$. ***/**/* indicate significance at the 1%/5%/10% level of confidence.

Interestingly, VID and PRIV tend to change signs or to become insignificant using simultaneous equations. In comparison to single demand equations, the influence of VCRs and the market share of commercial TV are not that clear. Nevertheless, it is important to bear in mind that VID is only a dummy variable, since we have not been able to observe video rentals for a sufficient period.

When turning to the supply equation we find ambiguous results (see Table IV). On the one hand, lagged attendance seems to be an important factor in the number of seats offered. This is plausible for the reasons explained before, i.e., taking into account the time required for decision-making and building. Population as a whole also seems to be of great importance when determining the number of seats, at least when neglecting specification I. Moreover, both the invention of the VCR and the market share of commercial TV seem to have a negative and significant effect on cinema supply, at least at the 5% level of confidence. The increasing supply of other leisure activities has seemingly led to a reduction in cinema supply.

Furthermore, cinema loading is statistically insignificant in all of the equations. A possible explanation is that LOAD is highly correlated with attendance (see Table IV). Thus, there is a problem of multicollinearity. Similarly, income is highly correlated with loadings and cinema attendance (see Table AII in the Appendix).

5. Conclusions

This paper has provided some empirical evidence on the German cinema market. Because of the lack of statistical analyses on the motion picture industry in Germany, we consider this study as a first approach to analyze this interesting topic.

Using cointegration analysis we found a long-run relationship between cinema attendance, real income, and prices. Although this result is not surprising, we did not expect to find such a strong impact, for example, of price and income. Adding further variables, such as (admittedly crude) proxies for quality or prices for other cultural goods and using simultaneous equations for cinema demand and supply has led to a reduction in the estimated elasticities. Nevertheless, in all our regressions cinema demand turns out to be price elastic. Income elasticities, in contrast, are reduced significantly when using different models. On the one hand, TV and other cultural activities have been identified as substitutes for cinema. On the other hand, the effect of VCRs is ambiguous. One reason may be that we used a dummy variable rather than the number of adoptions or video rentals.

While we hardly found any evidence for a structural break due to German reunification, there is evidence for a structural break in the mid 1960s. Therefore, the assumption that consumer behavior changed more in the post-war era than during the 1990s appears to be correct.

Considering cinema supply, we found strong evidence for a positive effect of attendance. According to the results, it seems to take about 2 years to open new cinemas after a permanent demand shock has been recognized. As expected, population

growth has a positive impact on cinema supply, and substitutes, such as TV and VCRs, have negative effects.

Admittedly, using annual data covering a time span of 53 years can only lead to a rough measurement of market relations. Therefore, future research in this direction using less aggregate or, even better, micro data would be a worthwhile undertaking.

Appendix

Table AI. Descriptive statistics.

Variable	Mean	Std. Dev.	Min.	Max.
ATT[a]	275.31	229.00	101.60	817.50
POP[b]	63,690.75	10,425.82	49,989.00	82,541.00
ATTR	4.79	4.54	1.31	15.42
Y	1,462.44	545.12	324.06	2,093.01
P	3.90	1.22	1.67	5.32
SCREEN	4,361.79	1,197.55	3,142.00	7,085.00
SEAT[c]	1,416.61	75,480.00	610.00	2,926.00
REV[d]	822.92	338.33	487.26	1,704.59
TV[e]	21,679.70	8,756.00	4,637.00	36,007.00
PRIV	7.38	12.13	0.00	33.30
GMOV	63.28	20.46	25.00	120.0

[a]in millions.
[b]in 1000.
[c]in 1000.
[d]millions of Euros.
[e]in 1000.

Table AII. Correlation matrix.

	P_{t-1}	Y	ATTR_{t-2}	SEAT_{t-2}	LOAD_{t-2}	GMOV	VID	PRIV
Y	0.97	1						
ATTR_{t-2}	−0.94	−0.91	1					
SEAT_{t-2}	−0.93	−0.91	0.91	1				
LOAD_{t-2}	−0.94	−0.91	0.96	0.83	1			
GMOV	−0.44	−0.48	0.56	0.36	0.64	1		
VID	0.94	0.92	−0.86	−0.91	−0.82	−0.32	1	
PRIV	0.52	0.48	−0.44	−0.54	−0.48	−0.25	0.45	1
POP	0.70	0.64	−0.63	−0.65	−0.69	−0.38	0.61	0.91

Table AIII. Test for orders of integration.

Variable	ADF[1]	PP[2]	Constant
ATTR	−4.0967	−4.1016	Yes
SCREEN	−2.6576	−3.9005	Yes
Y	−6.3046	−9.8615	Yes
P	−3.8008	−3.8008	Yes
REV	−5.2734	−5.3840	Yes
POP	−6.5000	−6.5000	Yes

Note: All variables are in log–form. 1% critical value at −3.5654, see MacKinnon, 1991.
[1]Augmented Dickey–Fuller statistic.
[2]Phillips–Perron statistic.

Table AIV. Johansen cointegration test.

	Normalized coefficients[1]		
	ATTR	*P*	*Y*
	1.0000	−3.9521 (−2.87)	5.9704 (5.45)
	No. of CEs		
	0	1	2
Eigenvalues	0.5816	0.1752	0.1118
Trace Statistic	60.3018	15.8658	6.0443
1% Critical Value	35.65	20.04	6.65
Max. Eigenvalue Statistic	44.4360	9.8215	6.0443
1% Critical Value	25.52	18.63	6.65

[1]All variables are in log-form. T ratios in parentheses.

Table AV. Error correction estimates[1].

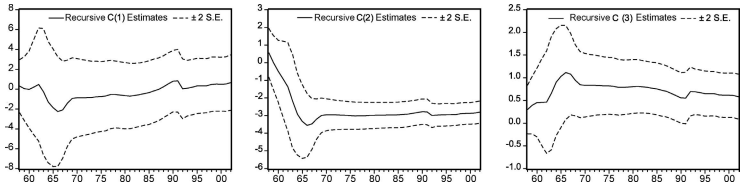
Method	Value	Adj. Value	Prob.
Cramer–von Mises	0.0500	0.0505	0.5033
Watson	0.0475	0.0480	0.5001
Anderson–Darling	0.3354	0.3406	0.4966

$$\Delta\text{ATTR} = \underset{(-2.43)}{-0.1252} \cdot \text{COINT} + \underset{(3.83)}{0.5373} \cdot \Delta\text{ATTR}(t-1)$$
$$\underset{(-1.33)}{-0.3274} \cdot \Delta P(t-1) - \underset{(-0.99)}{0.1327} \cdot \Delta Y(t-1)$$
$$\bar{R}^2 = 0.3301, \text{Obs} : 51$$

[1]All variables are in log-form. T ratios in parentheses.

Table AVI. Tests of parameter constancy over period 1950 to 1990.

Variable[1]	Coefficient	Std. error	*T* ratio
OLS regression – Dependent variable is ATTR			
C(1) CONST	0.6625	1.7583	0.3768
C(2) *P*	−2.8011***	0.3810	−7.3522
C(3) *Y*	0.5810*	0.3066	1.8951
Chow Forecast Test			
F statistic	1.0866	Prob.	0.3967
log *L R*	14.1683	Prob.	0.2238



[1]Variables are in log form. ***/**/* indicate significance at the 1%/5%/10% level of confidence.

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Notes

1. However, ticket sales vary heavily in Europe. While in Iceland there were 5.65 ticket sales per capita in 2002, the corresponding number for Finland was 1.43 (see Media Salles, 2003).
2. See Perino and Schulze (2005) for an analysis of the impact of public subsidies on the trade in movies.
3. Within our sample period, the total population rose by 25% from nearly 50 million in 1950 to 63 million in 1990 (see Federal Statistical Office, 2003).
4. For VCRs the percentage of persons aged 14 years and older living in a household with a VCR increased over the last ten years to 73%.
5. Fernández-Blanco and Baños-Pino (1997), for example, found an income elasticity of about 1.26.
6. Of course, we are aware that this variable is also only a crude measure for quality. Moreover, as stated by Ginsburgh and Weyers (1999), the concept of quality can hardly be used for horizontally differentiated goods such as movies or works of art. For this reason, the number of German movies is rather a measure for the degree of product differentiation than for quality. Unfortunately, we have no information on the total number of movies released per year, which would be a much better approximation.
7. Unfortunately, information on video rentals was not available for the whole sample.

8. Since under public law German radio and television stations are financed by fees charged from each owner of a radio or TV set, a statistic on "registered" TV sets exists. Unfortunately, this number was not available for the whole period, but only for the years since 1960. Another disadvantage of this variable is that it does not cover the total number of TV sets, because in Germany there is an assumed high, but not specified, number of non-registered TV sets, so that this measure will clearly underestimate the effect of TV.
9. Using TV as an exogenous variable leads to very similar results but also to insignificant coefficients for TV and PRIV.
10. Again, the results have not shown any evidence of an influence of UNION. Therefore, the estimates have been repeated without this dummy variable.
11. We used lagged ticket prices in order to avoid the risk of endogeneity of contemporary prices. The results did not change throughout, when using contemporary prices.

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