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Working Paper

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Diskussionsbeiträge aus dem Fachbereich Wirtschaftswissenschaften der Universität Duisburg-Essen, Standort Essen, No. 125

Provided in cooperation with:
Universität Duisburg-Essen (UDE)

Suggested citation: Dewenter, Ralf; Westermann, Michael (2003) : Cinema demand in Germany, Diskussionsbeiträge aus dem Fachbereich Wirtschaftswissenschaften der Universität Duisburg-Essen, Standort Essen, No. 125, http://hdl.handle.net/10419/40935

DISKUSSIONSBEITRÄGE
AUS DEM
FACHBEREICH WIRTSCHAFTSWISSENSCHAFTEN
DER
UNIVERSITÄT DUISBURG–ESSEN
Standort Essen

Nr. 125
Januar 2003

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Zusammenfassung

In der vorliegenden Arbeit untersuchen wir den deutschen Kinomarkt anhand von Jahresdaten der letzten 49 Jahre. Unter Verwendung dieser Daten ermitteln wir, ob und welchen Einfluß der Eintrittspreis, das Pro–Kopf–Einkommen, sozio–demographische Faktoren, sowie alternative Freizeitaktivitäten, wie Theater– oder Opernbesuche bzw. die Entwicklung und Verbreitung substitutionaler Produkte wie Fernseher und Videorekorder auf die Kinonachfrage haben. Dabei kommen verschiedene ökonometrische Verfahren, wie OLS, 2SLS und SURE zur Anwendung. Im weiteren Verlauf werden andere theoretische Ansätze der Nachfrage vorgestellt, anhand derer wir untersuchen können, ob es sich beim Kinobesuch um einen Gewöhnungsprozess handelt oder sogar um eine Aktivität, welche sich mit den Modellen des rationalen Suchtverhaltens beschreiben lässt.

Abstract

In the present paper we examine the German cinema market using time series data of 49 years. Applying estimation techniques such as OLS, 2SLS and SUR, we identify interrelations between the number of screens, the average real prices and the demand for movies per inhabitant. Furthermore, we test for the long run relationship and evaluate the elasticities of demand with respect to real price and income. Moreover, we analyse if cinema can be defined as an addictive good which can be explained with a myopic habit or rational addiction approach.

JEL-Classification: C22, C32, L82

Keywords: Cinema, Demand, Supply, Habit Formation, Cointegration Analysis, Seemingly Unrelated Regression

1 Introduction

This paper studies the cinema market in Germany using time series data of 49 years from 1950 to 1999. This time span is characterized by a strong increase in cinema attendance during the early fifties and a remarkable reduction in demand since the late 1950s, so that the primetime of cinema demand had never been reached again. The reduction of cinema attendance touched rock bottom at the end of the eighties and has slightly increased since the beginning of the nineties. This development can be observed in nearly all European countries as shows the number of attendances per inhabitant in these countries. This number rose by 20% from 2.05 in 1990 up to 2.46 in 1999. At the same time one can observe a nonuniform change in attendance numbers. The average number of attendances in the European countries varies in the nineties. In 1999 it is highest for Island with a value of 8.18 and lowest for the Netherlands with a value of 1.18. In Germany this number increased within the last decade of the last century by approximately 11%. This only moderate increase is somewhat surprising because of the German re-unification which can be seen as a very (German)-specific development and results in an increase of potential demand by nearly 16 million people.

A number of studies with respect to cinema demand was carried out, but mostly on British markets (see Browning and Sorell (1954), Cameron (1986), (1988), (1990) and (1994), and MacMillan and Smith (2001)). Studies regarding other countries are rare, refrained of Fernández-Blanco and Baños-Pino (1997) investigating Spanish cinema demand using cointegration techniques. None of theses studies refer to German attendance using econometric modelling. In this paper we model the German cinema market using time series analysis methods and simple OLS regressions to analyse the impacts of prices, income, socio-demographic factors, the invention of multiplexes and

the impact of substitutional products like television, theatre and opera attendance on the demand for movies. Due to the unfortunately short time span for which data on multiplexes is available it seems reasonable to consider this fact in an extra part of our study.

The paper is organized as follows. In the next section we examine the historical development of the German cinema market, regarding the development of cinema specific variables like admissions, number of screens/seats, revenues etc. Section 3 introduces the theoretical framework of our analysis. It is followed by section four, where we use data of the German cinema market to test the theoretical assumptions presented formerly. The paper ends with a summary of the most important findings of our analysis and a further outlook.

2 Historical Development

The German cinema market is characterized by an enormous increase of cinema admission during the early fifties and a remarkable reduction in demand since the late 1950s (see **Figure A.1**). With respect to the changing population during this time span[1] it is common to observe an alternative quantity reflecting the demand for cinema services while deflating the number of cinema admissions with the total population size. Measured in per capita-attendance, the primetime of cinema demand was in 1956, reporting that each German inhabitant on average went to the cinema 15 times a year, whereas in 1992 every inhabitant saw only one film on average and, as a result cinema supply decreased in both, in the number of seats as well as in the number of screens.

[1]Within our sample period the total population rose from nearly 50 million in 1950 by 25% up to 63 millions in 1990 and thereafter taking into account the population of the former GDR there was a moderate increase from 80 million up to 82 million in 1999.

It is important to mention that even such a historical event like the German re-unification in 1991 has not led to a considerably increasing demand either, although it has increased the potential demand by about 16 million people.

***** Insert Figure A.1 about here *****

It is obvious that going to the cinema was of greater importance as a leisure activity in the early post-war-era than it has been (and is) nowadays. One reason for the lowered importance of cinematic services could be well-founded in the invention and rapid diffusion of television sets (TVs) and video cassette recorders (VCRs) in the 1960s and the 1970s respectively. The number of TV sets has been permanently increasing since the early 1960s and is nowadays at a value of 35 millions. Another measure captures this development much better. It measures the proportion of persons aged 14 years and older, that live in a household with one TV set. This measure converges within the last decade towards 100%. A similar development can be seen when observing video recorders. The percentage of persons aged 14 years and older, living in a household possessing a VCR increased within the last ten years up to 73%. So these increasing numbers are generally assumed to have a negative influence on the development of cinema attendance. But one has to keep other facts in mind. During the last 50 years disposable per capita income went through an enormous increase in nearly every developed country. This fact increases the variety of other forms of entertainment possibilities such as going to the theatre/opera watching a football game or other things. For these reasons it seems questionable if the decrease in cinema attendance is related that strongly to the diffusion of home entertainment such as TV or VCR.

Moreover the expected effect of these techniques on cinema demand is ambiguous. As stated in MacMillan and Smith (2001), watching television is

said to be a close substitute for cinema-going because cinema seems to suffer from competitive disadvantages relative to TV because of its lower variety of cinematic services supplied. On the other hand Fernández-Blanco and Baños-Pino (1997) stated that the influence of TV on cinema admission depends not only on the distribution of TVs but also on the quality of the supplied programmes. Since the emergence of private television in Germany in the mid-eighties, the number of channels offered has increased significantly. But in cooperation with this development one can observe an enormous increase in broadcasting time too. So instead of watching a movie on television one is confronted with broadcasting spots more and more.

However, the development described above implicated a strong decrease of gross revenues from the late fifties until the mid seventies. There was a decline by about 70% of real gross revenues from nearly 3.300 millions DM in 1976. Aside from a short period of recovery this level was held until the beginning of the 1990s. Since then one can observe a slight increase of the revenues (see **Figure A.2**). At this time a structural change on movie markets took place in German cities. Instead of traditional movie theatres more and more multiplexes were built and have replaced one-canvas-cinemas bit by bit. The innovation of those multiplexes is founded in the introduction of the supply of a high number of cinema halls obliged with catering facilities like restaurants, bars and cafes. Consequently, the multiplex cinema firm can record profits out of three different but interrelated sources – the ticket sales, the revenues out of drinks and meals and the revenues out of advertising. Thus, even if attendance has decreased on average, revenues increased, particularly within the past ten years.

***** Insert Figure A.2 about here *****

In addition one can observe a slight increase in supply during the last 10 years whether measured by the number of screens or the number of seats whereby the number of screens is rising more rapidly than the number of seats. This seems to be a necessary recovery because there has been a huge reduction in both numbers by nearly 55% (screens) and 80% (seats) respectively since the 1960s. Among others this development intensifies the trend to reduce the number of seats offered for each screen due to the changing importance of cinema as a leisure activity. This number went through a reduction of nearly 50% during the years from 1970 to 1990[2]. Today its value amounts approximately 190. In connection with this development one can recognize a widening of cinema supply by *decreasing* the number of seats offered for each screen and accompanying *increasing* the number of screens (multiplexes) and the frequency of shows for each of them.

***** Insert Figure A.3 about here *****

3 Empirical Specification

3.1 Theoretical Framework

Cinema Demand

As usual the demand for cinema services is measured with the observations on cinema attendance in an annual frequency (ATT). Apparently this number is no exact measure of demand because it does not capture the unsatisfied excess demand. In order to deal with the rapidly changing population in its size as well as in its structure these observations are deflated by numbers

[2]The maximum level of the number of seats per screen was round 400 seats per screen during the sixties and during the nineties it was about 200.

representing the population size to obtain a measure of cinema admission per inhabitant ($ATTR$). The individual demand function for cinema may then be written as follows:

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

According to this function the quantity demanded of a commodity (for example cinema services) in period t is a function of its own price (P), the price of substitutes or complementary goods like theatre, opera or other leisure activities (P_{other}), income (Y) and a set of variables that represent the expected effect of other factors which may reflect any changes in the consumer's preferences or general circumstances (Z).

One would expect that cinema demand is positively related to income and prices of substitutionary goods. Furthermore it is said to be negatively influenced by the ticket price, the price of complementary goods and the invention/diffusion of TVs and VCRs. In addition to these assumed relations there are several more which are worth to be carefully studied. The first one deals with the price elasticity of cinema demand. Unfortunately the elasticity of cinema admission with respect to price variations may not be overinterpreted in our case because price variations can not be captured exactly when using annual data. The same is true for observations on cinema demand. Especially in the last years there has been a high variation of ticket prices across different days and categories but these variations vanish with the use of aggregated data[3].

The second consideration deals with the elasticity of cinema demand with respect to income. As stated in Fernández-Blanco and Baños-Pino (1997),

[3]At first sight we find a very high variation in the number of cinema admissions when using monthly data for five years during 1995 and 2000. Clearly one can register a cyclical movement which touches rock bottom during the summer months and finds its peak in winter. A similar variation can be observed for ticket prices inside one year.

cinema is said to be a luxury good, if its income elasticity is greater than one. In their study they found some evidence for this hypothesis[4] so that the product cinema can be assumed to be of the same quality as for example arts or higher performing arts. Unfortunately the assumed effect of income on cinema admission is not that clear, which leads to the fact that any assumed effect may be reasonable *a priori*. Clearly as income rises cinema demand will, too as long as going to cinema is seen as a normal leisure activity or yet as a luxury product. But with rising income the variety of other possible activities emerges, so that increasing opportunity costs of going to cinema due to its time intensiveness may lead to a reduction of consumption or at least an increasing at diminishing rates, and – simultaneously – an expansion of rival opportunities for the use of time. This fact is evident regarding the decline in cinema attendance during the late 1950s accompanied by an increase in real per capita income.

The effect of other prices like visiting the theatre, opera or an exhibition on cinema attendance depends on the fact wether this activity is seen as a substitutional or complementary one, leading to a positiv respectively negative effect. As described before 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.

The measurement of the other factors is represented by using variables representing the emergence of competitive products like TVs and VCRs and – as a special feature in the German case – a dummy variable for the German re-unification. As noted earlier the assumed effects of these competing techniques is ambiguous. It may seem reasonable to identify television viewing as inferior to cinema viewing because of its worse audio-visual conditions and a

[4]The estimated elasticity of cinema demand with respect to income was found to be of value 1.2645.

lack of atmosphere (Cameron 1988). On the other hand it may seem reasonable to identify television viewing as superior to cinema viewing because it offers more competitive advantages relative to cinema while regarding factors like comfort, convenience, privacy, and the fact that watching television provides the possibility for other activities beside it (Fernández-Blanco and Baños-Pino 1997). Furthermore does watching television involve no marginal costs or transportation costs. It appears possible that these advantages outweigh its disadvantages and lead to a clear substitution of television for cinema consumption.

Furthermore economic theory suggests that also the quality of the product has to be a significant determinant of demand for cinema attendance. But with the given data it is not possible to measure temporal film quality variations. Cameron (1990) therefore mentioned that it seems reasonable to take into account the range of films available at a point in time as a dimension of quality. He suggests to include the number of cinemas (screens) as a proxy for the quality component.

Cinema Supply

As a measure of the supply side it seems reasonable to take into account both, the number of screens and the number of seats. But since every screen is related to a number of seats and because the consumer cannot distinguish between individual seats in one canvas we assume in harmony with the relevant literature that the number of screens is the appropriate measure of supply. Nevertheless there are a few problems in measuring cinema supply with this variable. Firstly, quite similar to the measurement of demand, the number of screens is rather a measure of potential supply than effective supply. That means that the number of screens consists of two components, one working for the actual demand and the other as a kind of buffer to absorb peaks in

demand. Secondly the number of screens does not lead to further information about the quality of the offered films but can be seen only as a proxy variable for this feature. However, the supply function for cinema services may be written as follows:

$$SCREEN = g(Y, ATTR_{t-l}, Z). \tag{2}$$

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

What we mentioned earlier concerning the impact of disposable income on cinema demand seems to be valid for cinema supply too. With rising income there will be an increasing attractiveness of other leisure activities hence a decline in demand and therefore in supply too may be possible.

Furthermore we would expect that cinema supply is positively related to past admission. Because of the interaction of cinema demand and supply – as for example explained in MacMillan and Smith (2001) – it is important to take into account a lag-structure for adjustment processes due to changes in demand or supply respectively. It might 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. In addition there are of course other adjustment possibilities prior to closure of cinemas. Because of the uncertainty of time needed for this decision, the adjustment of the number of screens in response to a change in demand can not be specified exactly. Like MacMillan and Smith (2001) we assume a lag of at least one or two periods.

The importance of the other factors is as ambiguous as mentioned earlier, especially when considering the invention/diffusion of TVs and VCRs, so that the assumptions made for the demand side hold for the supply side too. This

seems reasonable particularly because of the interdependence of supply and demand. So even if the TV and VCR technique does not influence the number of supplied screens directly, it of course does via its influence on demand.

Another variable that we take into account is the extend to which cinema services are claimed. We assume that this overall performance (LOAD) is a relevant factor for the determination of the number of supplied screens, and moreover that it is positively related to it, though we must take account of a kind of recognition lag too as stated before in case of past admission.

Theory of Rational Addiction

The rational addiction approach of Becker and Murphy (1988) has become a standard model in the analysis of addictive goods. Data of different drugs have been used to test the model empirically, like cigarettes (see Chaloupka (1991) or Becker et al. (1994)), alcohol (see Grossman et al. (1995), Waters and Sloan (1995) or Bentzen et al. (1999)), caffeine (Olekalns and Bardsley (1996)), opium (see van Ours (1995) or Liu et al. (1999)), or cocaine (see Grossman and Chaloupka (1998)), and most of them found support for the Becker Murphy model (BMM).

But also other goods without any biological dependency have been analysed with respect to rational addiction. As Becker and Murphy stated, one can be addicted to most every product or activity. Therefore, studies on consumer behavior regarding gambling (Mobilia (1993)), calorie consumption (Cawley (1999)), or arts (Villani (1992)) have been carried out. Also cinema consumption (Cameron (1999)) has been the center of an empirical study on addictive behavior. The author tested the BMM using aggregated data on cinema attendance in Great Britain. Summarizing the main results of his study, he found only a weak support for rational addiction. For this reason, it would be interesting to find out if the same results hold for the German

market. Therefore, we next turn to the question of rational addictive behavior. Following the theory of rational addiction a consumer is said to be addicted to a consumption good, e.g. cinema, if an increase in past consumption causes present consumption to rise. This behavior is usually assumed to involve reinforcement and tolerance. Reinforcement means, that an increase in past consumption increases the longing for present consumption and has the important implication that the level of consumption during different time periods are complements. On the other hand, tolerance means that the satisfaction from a given amount of consumption is lower when past consumption is greater.

3.2 Empirical Methodology

We start our analysis with the specification of several approaches for cinema demand. At the beginning we follow the guideline of Fernández-Blanco and Baños-Pino (1997) in order to examine, whether their results for Spain also hold for the German cinema market. Then we extend this approach gradually with respect to myopic or rational addicted behavior.

In order to prevent the risk of spurious regression we tested the order of integration of the variables. As usual for macroeconomic time series we find all of the relevant variables to be integrated of first order (see **Table B.2**). Thus, simple OLS regressions are appropriate methods to determine the main factors of the demand for cinema.

Next we try to find, if there exists a cointegrating relation between cinema attendance, ticket prices and real disposable income. Therefor we apply to Johansen cointegration test. If the existent is evident, we are able to analyse the long run relationship between these variables. In the case of cointegration, simple OLS regression is appropriate to analyse the long run context and is

said to be 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 of this, OLS may be used to fit a cointegrating relationship, even if it belongs to a system of simultaneous relationships. In addition to these results, we are able to test, whether an error correction process is significant. This process gives us information about whether the variables tend to reach their long run equilibrium values and about the percentage of correction of last years disequilibrium.

As an extension of our analysis we try to take into account other relevant variables. Especially we are interested, if there is evidence for a kind of habit formation with regard to cinema attendance. One can distinguish at least two different approaches when analysing habit formation. The first one, called myopic habit assumes that utility of current consumption is only related to past consumption and a set of other variables. Among others a good is then defined as addictive if an increase in past consumption raises current consumption and if an increase in current prices will reduce current consumption. Another approach defines a good as addictive if its current consumption depends on past as well as future consumption.

We tested different specifications of rational addictive behavior. Two of them presented by Chaloupka (1991) and one introduced by Becker, Grossman and Murphy (1994). The specifications are as follows:

Chaloupka

$$ATTR_t = \alpha_0 + \alpha_1 P_t + \alpha_2 P_{t-1} + \alpha_3 P_{t+1} + \alpha_4 ATTR_{t-1} + \alpha_5 ATTR_{t+1} \tag{3}$$

and

$$ATTR_t = \beta_0 + \beta_1 P_t + \beta_2 P_{t+1} + \beta_3 ATTR_{t+1} + \beta_4 STOCK_t \tag{4}$$

Becker

$$ATTR_t = \gamma_0 + \gamma_1 ATTR_{t-1} + \gamma_2 ATTR_{t+1} + \gamma_3 P_t \tag{5}$$

These approaches offer the advantage, that solving these difference equations leads to values of the characteristic roots that measure the response of current consumption on a variation in future or past consumption and can be interpreted as behavioral parameters. Furthermore it is possible to measure the long-run relationship between consumption and prices in form of elasticities (see Dewenter (2002)).

One disadvantage of these approaches might be the fact, that it does not consider the relationship between the number of screens and cinema attendance. As stated by MacMillan and Smith (2001) there might indeed be a response of cinema goers to changes in cinema supply. Therefor it might be reasonable to deal with this connection although this may induce problems of identification for both equations, that of demand and of supply. MacMillan and Smith consider about this situation while using vector autoregression technique (VAR). Apart from their approach we also take care about the interdependence of both variables but try to find specifications that permit identification of the demand equation as well as the supply equation. Therefor we can 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 parameters of the system, accounting for heteroskedasticity, and contemporaneous correlation in the disturbances of different structural equations. The equations of

our approach are as follows:

$$ATTR_t = \alpha_1 + \alpha_2 P_{t-1} + \alpha_3 Y_t + \alpha_4 P_{other,t} + \alpha_5 SCREEN_{t-1} + \alpha_6 REUNION + \alpha_7 TV/VCR + u_t \quad (6)$$

$$SCREEN_t = \beta_1 + \beta_2 ATTR_{t-2} + \beta_3 LOAD_t + \beta_4 POP_t + \beta_5 REUNION + \beta_6 TV/VCR + v_t \quad (7)$$

4 Empirical Findings

4.1 Data

The following describes the different sources and properties of the data used in this study.

Cinema Demand (ATTR) is captured by the number of tickets sold in one year (ATT) divided by total population size (POP). Cinema supply is measured by the number of screens (SCREEN) and the number of seats (SEAT) respectively. In addition to this we use average ticket prices (P) and gross revenues (REV). All of this data are gathered from two German organizations called *German Federal Film Board* (FFA)[5] and *Spitzenorganisation der Filmwirtschaft* (SPIO)[6]. As explained earlier, we construct a number representing the overall performance (LOAD) while dividing the number of tickets sold by the number of seats available.

All monetary variables were deflated by the cost of living price index. This variable as well as the one covering the population numbers (POP), the income variable (Y) and the prices for alternative leisure activities (P_{other}), measured with the price index for cultural activities, was obtained from the

[5] http://www.ffa.de

[6] http://www.spio.de

German Statistical Yearbook published by the *Federal Statistical Office Germany*[7].

The invention and diffusion of TVs/VCRs is measured in different ways. Because data on these numbers is not available for our observed time span, we use a dummy variable (VID) to capture the effect of this technique. It is set equal to one since 1970. For TV we use the number of registered TV sets which we obtained also from the Federal Statistical Office[8]. Unfortunately this number is not available for the whole period but only since 1960. Another disadvantage of this number is, that it clearly does not cover the total number of TV sets at all, because in Germany there is an assumed high, but not specified amount of not registered TV sets, so that this measure will clearly underestimate the effect of TV. As another measure for the effect of TV we use a second dummy (PRIVATE) to capture the effect of the invention of privat television channels in the last two decades. It is set equal to one since 1984.

A last dummy is used to capture the effect of German re-unification in the year 1991 (REUNION).

4.2 Results

Cointegration Analysis

Regarding the variables cinema admission, prices and disposable per capita income we find all relevant test statistics indicating the existence of a cointegrating relation between these (see **Table B.3**) and the critical values of this test indicate, that there exists at least one cointegrating relationship with confidence 99%. Like Fernández-Blanco and Baños-Pino (1997) we find cin-

[7] Statistisches Bundesamt, http://www.destatis.de

[8] http://www.bma.de/index.cfm?0B768C3FCC8C42319370BDB70998C44D

ema demand to be elastic with respect to prices and income so that cinema indeed may be seen as a luxury good. Unfortunately and quite inexplicable we find the values of price and income elasticity to be extremely high namely -2.25 and 4.48 respectively.

Turning to a first specification of equation 2, we estimated the effects of prices and income on cinema admission (see **Table B.4**). To capture the effect of competing goods on demand we include in our estimation the variables VID, PRIVATE, and TV following one after another in sequence. For our estimation we use OLS regression and in a second step 2SLS in order to capture the problem of endogeneity when using actual prices. We find strong evidence that the invention of private television channels and TV sets as well are negatively related to cinema demand. The reported coefficients are consistent throughout the estimation methods, vary from -0.2242 up to -0.6750, and are statistically significant at the 1% level. The invention of VCR shows a negative sign but is not significant. Again we find that the impact of prices on cinema demand is as expected negative and cinema demand is elastic with respect to its price and to income, even if the estimated income elasticities are notably smaller. A bit surprisingly we found no influence of the German re-unification resulting in nonuniform insignificant estimated coefficients. This might be explained with the use of per capita attendance or even past admission which captures the population effect to some degree.

***** Insert Table B.4 about here *****

The next step of our analysis was to test, whether an error correction mechanism was significant. In harmony to Fernández-Blanco and Baños-Pino (1997) we found evidence for the existence of it valued -0.1124, which states that the percentage of correction of last years disequilibrium amounts 11.24% (see **Table B.5**). To test for the validity of this specification, we use

empirical distribution tests, like Anderson-Darling, Watson, or Cramer-von Mises as described in D'Agostino and Stephens (1986) or Tietjen (1986). They do not reject the hypotheses of normality and zero-autocorrelation of the regression residuals so that we find our specification to be appropriate.

Myopic approach and rational addiction

Next we turned to the question whether the demand for cinema can be described in sense of a myopic behavior. When taking into account past attendance per capita we found this value to be strongly, significant and positively related to current attendance (see **Table B.6**). Thus we suppose that there is a habit effect cinemagoers will follow.

***** Insert Table B.6 about here *****

Surprisingly, the supply of cinema complexes, measured in number of screens, seem to have an negative effect on admissions captured by a sometimes significant negative elasticity depending on whether VID, PRIVATE or TV is used. Obviously there is no logical explanation for such a negative effect and this suggests that the model is misspecified in some way.

As another consequence of this specification, the influence of disposable income is namely positive but insignificant. The effect of other prices is ambiguous. Even if the estimated coefficients are negative and significant when including VCR and private television channels, this effect vanishes with the use of the number of TV sets. All of the observed competing techniques do not indicate a distinct influence on cinema admission.

Next, we tested the hypothesis that the habit effect inherent in cinema demand (found before) can be described as a rational addiction in the sense of Becker and Murphy (1988). Though we tested all of the three above mentioned forms of the their model (BMM), first by using OLS regressions,

followed by 2SLS, because of the endogeneity of past and future consumption in the model (see **Table B.7**). The first specification (Becker) shows only weak evidence for the BMM. Thus, real price and past and future consumption is statistically significant at the 1% level (with one exeption), future consumption seems to have a stronger influence on current consumption than past consumption. But this outcome is not consistent with the BMM. Also the short and long-run elasticities can not be calculated at all.

***** Insert Table B.7 about here *****

The results from the Chaloupka I specification are also ambiguous. Even if the signs of all price and consumption variables are as expected positive or negative respectively, all prices are not significant at all common levels. Even the size of the price coefficients are unusual high. Because the BMM predicts that the sum of the coefficients of future and past prices has to be less than the coefficient of contemporary prices. Again both, future and past consumption is statistically significant at the 1% level.

To approximate the addictive stock used in the Chaloupka specification II we constructed a variable consisting of the average attendance of the last four years. Although, this is only a rough approximation it is the only variable, that is available. Unfortunately, price coefficients are either insignificant or carry the "wrong" sign. Therefore, this model does not support the BMM at any rate.

Summarizing none of the different specifications support for foresighted behaviour of the moviegoers, in strong dependence of the BMM on a acceptable level. Not only the insignificance of the price variable but also the values of future and past consumption negate the existence of rational behavior in the sense of Becker and Murphy. Even the introduction of other variables like income, video dummies or TV registrations did not improve the results. So,

similar to the British cinema market (see Cameron 1999) we cannot support the assumption of rational addiction to movies with respect to the German attendance. Nevertheless both, future and past consumption seems to have an influence on current cinema demand, therefore, some kind of habituation effect can not be neglected, however. One possible reason for this outcome could be the usage of highly aggregate data, therefore even if rational behavior is present regarding a single person, this result must not necessarily be indicated by data concerning the whole demand for cinemas within a country. Also the frequency of the data is problematic, as we used yearly data that is surely only a imprecise measure. Thus an improvement of this study can be achieved by the application of disaggregated and/or high frequency data.

Simultaneous equation specification

As mentioned above we assume in harmony with for example MacMillan and Smith (2001) that there might be an interaction cinema goers to changes in cinema supply and the same is true for cinema supply. In the following we will present the results of our simultaneous equation representation presented in equation (6) and (7)[9].

We observe a high, statistically significant negative influence of prices on cinema attendance with exception when using the number of TV sets, whereas the influence of disposable per capita income vanishes throughout. According to these results, the elasticity of cinema demand with respect to its price varies from -2.34 up to 0.09, which in limitation is not significant[10].

The impact of other prices on cinema admission is, in harmony with the

[9] The results don't show any evidence for an influence of the German re-unification, though the estimates were repeated without regarding this dummy variable

[10] In our specification we used delayed ticket prices on order to prevent the risk of endogeneity of actual prices. The results so not change throughout, when using actual prices

theoretical considerations, ambiguous, though not always significant. Interestingly one can observe in contrast to our former findings an positive influence of past numbers of screens on actual attendance which is significant at all common levels. Though we find our statement of misspecification confirmed.

***** Insert Table B.8 about here *****

When turning to supply we find all included variables to have the expected influence mostly at a level of confidence of 1%. This result holds regardless of which variable of VCRs, private television channels or number of TV sets is included.

Attendance seems to be an important factor for the number of offered screen, when regarding a lag of two periods. This is plausible for the former explained reasons of taking into account a time to built/decide.

Furthermore we find, that the size of the population at a whole seems to be of great importance when determine the number of screens. It is statistically significant and positive for all of our specifications at a level of confidence of 1%. Likewise are the results when concerning about the loading of the cinemas.

***** Insert Table B.9 about here *****

The effect of other leisure activities is ambiguous, because of their unclear effect, which varies for one reason with the kind of TV/VCR-variable been used. Secondly the effect depends on whether regarding the supply or demand side.

Firstly, we can not find support for the hypothesis, that the VCR technique tends to lower cinema demand. On the contrary, both products seem to be positively related indicated by an estimated coefficient of 0.42 which is significant at the 1% level of confidence. Though we might rather argue

that the tendency to posses a VCR makes it more likely to go to cinema. On the other hand cinema admission seems to be negatively related to the invention of the private television channels (PRIVATE) as well as the number of registered TV sets (TV). This is shown to be true because of the negative, statistical significant coefficients of -0.36 and -0.70 respectively. The opposite is true when regarding cinema supply: The variables change signs throughout and are mostly all significant with exception of the VCR dummy.

5 Summary

Summarizing one can state that we found a long run relationship between cinema attendance, real income and prices to be existent. This result is of course not surprising. But in the beginning of our analysis we did not expect to find such high values of for example price and income elasticities. Therefor we tried to made an enlargement to our analysis while presuming a habit effect cinemagoers will follow. This was confirmed because the results of these specifications seemed to be more realistic than the first ones. So if we do not consider about the addictive nature of demand it seems that our estimations of long run relationships will be biased. The important variables show the 'right' sign and we found a very strong relationship between past and current per capita attendance. In this context VCRs and TVs are not found to be a tight substitute for cinema attendance. One reason is, in all probability, the usage of a dummy variable signifying the invention but not the number of adoptions.

With our attempt to explain cinema demand with a habit formation approach we can state that none of the different specifications support for foresighted behavior of the moviegoers in the sense of Becker and Murphy. Hence we cannot support the assumption of rational addiction to movies with

respect to the German attendance although both, future and past consumption seems to have an influence on current cinema demand. But as a result it seems reasonable to look at cinema as an addictive good and therefor we find at least evidence for an non-myopic behavior of consumers.

We assume that one possible reason for these unsatisfactory outcomes could be the usage of highly aggregate data, hence even if addictive behavior may reflect rationality regarding a single person, this result must not necessarily be indicated by data concerning the whole demand for cinemas within a country and year.

Turning to our system specification we can state that it seems to be well specified an that it covers the main long run effects. Here we found that the invention of VCR did not decrease the demand for cinema but rather increase whereas we found like other studies the invention of TV to be negatively related with cinema attendance. Even here it is quite unsatisfactory to use only aggregated, annual data that is surely only a imprecise measure. Obviously we do not expect cinema supply to vary from month to month but within a period of let's say two years, however but for all we might assume that there are indeed relations that can be captured even better when using data of higher frequency, individual data or cross-sectional data.

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A Figures

Figure A.1: Cinema Attendance in Germany

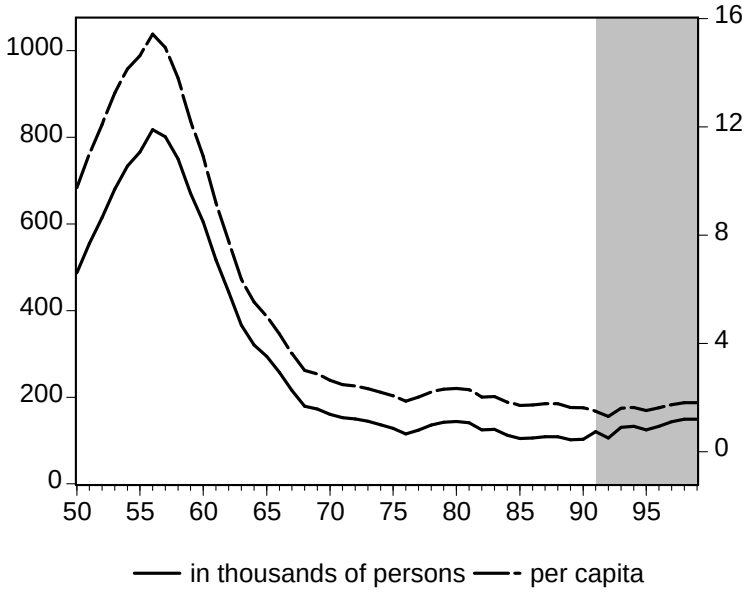


Figure A.2: Gross Real Revenues (in millions of DM)

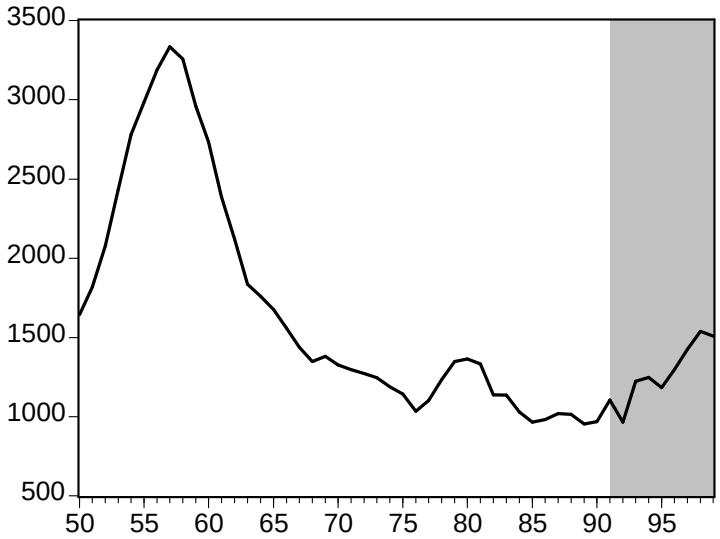
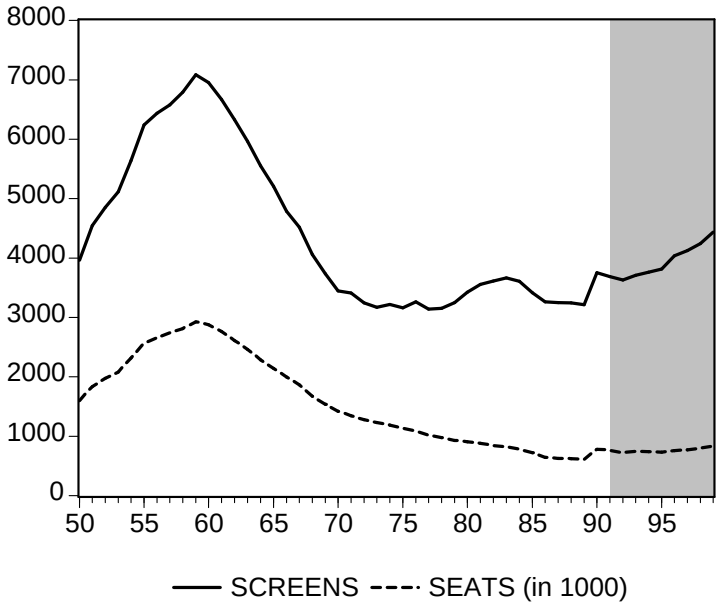


Figure A.3: Cinema Supply in Germany



B Tables

B.1 Data Description

Table B.1: Data Sources

Name	Data	Source
ATT	Cinema Attendance	SPIO[1]
ATTR	Attendance per capita	own calculation
SCREEN	Number of screens	SPIO
SEAT	Number of seats	SPIO
REV	Gross revenues	FFA[2]
P	Average Ticket Price	FFA, SPIO
LOAD	Commercial loading factor	own calculations
Y	Disposable Per Capita Income	GSO[3]
POP	Population	GSO
DEFL	Cost of Living Price Index	GSO
TV	Number of registered TV sets	Media Perspektiven, GSO

[1] Spitzenorganisation der Filmwirtschaft e.V. [2] German Federal Film Board [3] German Statistical Office

B.2 Empirical Results

Table B.2: Test for orders of integration

Variable	ADF[1]	PP[2]	Constant
ATTR	-3.7886	-3.7153	Yes
SCREEN	-3.8237	-3.7791	Yes
Y	-9.6369	-9.1451	Yes
P	-3.6065	-3.6871	Yes
REV	-4.6667	-4.7004	Yes
POP	-6.3186	-6.3218	Yes

Note: All variables are in log-form. 1% critical value at -3.5713, see MacKinnon (1991).

[1] Augmented Dickey-Fuller statistic. [2] Phillips-Perron statistic.

Table B.3: Johansen Cointegration Test

	Normalized coefficients[1]		
	ATTR	P	Y
	1.0000	-2.2552	4.4759
		(-1.95)	(4.85)
	No. of CEs		
	0	1	2
Eigenvalues	0.6280	0.2371	0.1550
Trace Statistic	68.5454	21.0745	8.0833
1% critical Value	41.07	24.60	12.97
Max. Eigenvalue Statistic	47.4709	12.9911	8.0833
1% critical Value	26.81	20.20	12.97

[1] Variables are in log-form. t-ratios in parentheses.

Table B.4: Regression Results – Demand

	Dependent Variable is ATTR					
	I		II		III	
	OLS	IV	OLS	IV	OLS	IV
CONST	4.6255*	4.8709*	4.5728*	4.7232*	9.3493*	8.5199*
	(8.83)	(9.42)	(13.17)	(13.86)	(9.60)	(7.79)
P	-2.5912*	-2.6898*	-2.8693*	-2.8849*	-0.9658**	-1.3189*
	(-8.36)	(-8.32)	(-8.70)	(-8.06)	(-2.66)	(-2.90)
Y	0.5436**	0.5178***	0.7162*	0.6804**	0.0577	0.1627
	(2.00)	(1.81)	(2.92)	(2.50)	(0.31)	(0.70)
REUNION	-0.0864	-0.0801	0.0785	0.0762	0.1112	0.0789
	(-0.99)	(-0.90)	(0.98)	(0.94)	(1.01)	(0.70)
VID	-0.1388	-0.0749	—	—	—	—
	(-1.05)	(-0.61)				
PRIVATE	—	—	-0.2395*	-0.2242*	—	—
			(-4.29)	(-4.04)		
TV	—	—	—	—	-0.6750*	-0.5511*
					(-3.84)	(-3.12)
$\bar{R}^2$	0.9525	0.9570	0.9595	0.9638	0.9519	0.9503
Obs	50	49	50	49	40	40

Notes: All variables are in log-form, except dummy variables. Robust covariance matrices are calculated using the Newey-West estimator. The t-ratio for each parameter appears in parentheses. Instrument used is P(t-1). */**/*** indicates significance at the 1%/5%/10% level of confidence.

Table B.5: Error Correction Estimates[1]

$$\Delta\text{ATTR} = \underset{(-2.17)}{-0.1124} \cdot \text{COINT} \underset{(4.30)}{+0.6058} \cdot \Delta\text{ATTR(t-1)} \underset{(-1.11)}{-0.2326} \cdot \Delta\text{P(t-1)} \underset{(-1.04)}{-0.1458} \cdot \Delta\text{Y(t-1)}$$

$$\bar{R}^2 = 0.3605, \text{Obs:}48$$

Method	Value	Adj. Value	Prob.
Cramer - von Mises	0.0554	0.0559	> 0.1
Watson	0.0494	0.0499	0.4279
Anderson - Darling	0.4189	0.4259	0.3151

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

Table B.6: Myopic Behavior

	Dependent Variable is ATTR[1]		
	I	II	III
CONST	6.2041*	7.4011*	2.6103
	(6.37)	(4.78)	(0.71)
P	-0.2739***	-0.3423***	-0.0370
	(-1.78)	(-1.75)	(-0.12)
Y	0.0643	0.0929	0.0749
	(0.60)	(0.87)	(0.42)
ATTR(t-1)	1.0590*	1.0185*	0.8765*
	(12.44)	(10.39)	(5.93)
SCREEN(t-1)	-0.4267*	-0.4095*	-0.0912
	(-3.08)	(-3.63)	(-0.33)
P_{other}	-0.5228**	-0.7828***	-0.1573
	(-2.49)	(-1.93)	(-0.43)
REUNION	0.0825	0.0819	0.619
	(1.66)	(1.55)	(1.08)
VID	-0.0203	—	—
	(-0.45)		
PRIVATE	—	-0.0488	—
		(-1.00)	
TV	—	—	-0.1263
			(-0.85)
$\bar{R}^2$	0.9934	0.9935	0.9822
Obs	49	49	40

Notes: All variables are in log-form, except dummy variables. Robust covariance matrices are calculated using the Newey-West estimator. The t-ratio for each parameter appears in parentheses. */**/*** indicates significance at the 1%/5%/10% level of confidence.

[1] Estimation Method: Instrumental Variable. Instrument used is P(t-1).

Table B.7: Rational Addction Models

	Becker		Chaloupka I		Chaloupka II	
	OLS	IV	OLS	IV	OLS	IV
CONST	-0.7210*	-0.8205	-0.8312**	-0.8286	6940*	8.3185
	(-3.38)	(-1.26)	(-2.63)	(-0.63)	(4.51)	(1.60)
P(t)	0.0692*	0.0801	-0.0751	-0.0949	-0.3197	-0.3851
	(3.29)	(1.21)	(-0.32)	(-0.27)	(-1.22)	(-0.80)
P(t-1)	—	—	0.05890	0.0976	—	—
			(0.54)	(0.52)		
P(t+1)	—	—	0.09650	0.0794	-0.4728	-0.3820***
			(0.61)	(0.35)	(-2.26)	(-2.02)
ATTR(t-1)	0.5160*	0.5603*	0.5186*	0.5606*	—	—
	(38.17)	(5.01)	(33.34)	(3.43)		
ATTR(t+1)	0.5289*	0.4835*	0.5309**	0.4825*	0.6697*	0.6933*
	(36.18)	(5.07)	(35.37)	(3.94)	(7.17)	(2.86)
STOCK	—	—	—	—	-0.2925*	-0.2924
					(-2.87)	(-1.08)
REUNION	-0.0217	-0.0475	-0.0300	-0.1057	0.0152	-0.3227
	(-0.98)	(-0.52)	(-1.11)	(-0.70)	(0.08)	(-0.73)
$\bar{R}^2$	0.9901	0.9988	0.9991	0.9987	0.9926	0.9939
Obs	48	42	48	42	46	42

Notes: The t-ratio for each parameter appears in parentheses. Robust covariance matrices are calculated using the Newey-West estimator. Instruments used are: 4 lagged and 4 leading prices. The variable STOCK was created as the average number of per capita attendance of the past four periods (see Dewenter (2002)). */**/*** indicates significance at the 1%/5%/10% level of confidence.

Table B.8: Simultaneous Equation Estimation – Demand

	Dependent Variable is ATTR					
	I		II		III	
	2SLS	SURE	2SLS	SURE	2SLS	SURE
CONST	-2.9029	-3.6764	11.4391*	10.9372*	-6.0194	-6.1338
	(-0.83)	(-1.18)	(3.25)	(3.39)	(-1.08)	(-1.23)
P(t-1)	-2.2070*	-2.3401*	-2.0284*	-2.1251*	0.0874	-0.0340
	(-5.44)	(-7.22)	(-5.60)	(-7.33)	(0.22)	(-0.10)
Y	-0.0382	0.0893	0.1891	0.2878	0.2188	0.3231***
	(-0.12)	(0.41)	(0.65)	(1.45)	(1.04)	(1.72)
P_{other}	0.7121	0.8151***	-1.9868*	-1.9279*	0.8499	0.8230
	(1.42)	(1.77)	(-3.00)	(-3.13)	(1.43)	(1.54)
SCREEN(t-1)	0.5916*	0.6063*	0.3047***	0.3153**	1.0723*	1.0801*
	(2.79)	(3.17)	(1.93)	(2.22)	(3.95)	(4.45)
VID	0.4167*	0.4282*	—	—	—	—
	(2.78)	(3.08)				
PRIVATE	—	—	-0.3670*	-0.3645*	—	—
			(-4.22)	(-4.55)		
TV	—	—	—	—	-0.6991*	-0.6919*
					(-6.27)	(-6.85)
$\bar{R}^2$	0.9611	0.9624	0.9677	0.9690	0.9681	0.9678
Obs	48	49	48	49	40	40

Notes: All variables are in log-form, except dummy variables. Robust covariance matrices are calculated using the Newey-West estimator. The t-ratio for each parameter appears in parentheses. */**/*** indicates significance at the 1%/5%/10% level of confidence.

Table B.9: Simultaneous Equation Estimation – Supply

	Dependent Variable is SCREEN					
	I		II		III	
	2SLS	SURE	2SLS	SURE	2SLS	SURE
CONST	3.3431*	3.4459*	-1.6462	-1.6976	-2.2463*	-2.2147*
	(-2.78)	(-3.03)	(-1.44)	(-1.57)	(-2.73)	(-2.91)
ATTR(t-2)	0.3733*	0.3728*	0.4368*	0.4380*	0.5509*	0.5618*
	(9.05)	(9.55)	(20.75)	(21.99)	(11.22)	(12.46)
LOAD	0.0875**	0.0831**	0.0024	-0.0005	0.3188*	0.3336*
	(2.23)	(2.24)	(0.06)	(-0.02)	(7.38)	(8.35)
POP	0.9772*	0.9888*	0.8500*	0.8560*	0.5328*	0.5060*
	(8.88)	(9.50)	(8.37)	(8.91)	(5.10)	(5.33)
VID	-0.0388	-0.0428	—	—	—	—
	(-0.73)	(-0.85)				
PRIVATE	—	—	0.1101*	0.1102*	—	—
			(3.63)	(3.83)		
TV	—	—	—	—	0.2514*	0.2697*
					(3.40)	(3.99)
$\bar{R}^2$	0.9421	0.9420	0.9551	0.9551	0.9607	0.9606
Obs	48	48	48	48	40	40

Notes: All variables are in log-form, except dummy variables. Robust covariance matrices are calculated using the Newey-West estimator. The t-ratio for each parameter appears in parentheses. */**/*** indicates significance at the 1%/5%/10% level of confidence.