

CINEMA VISIT OR HOME THEATRE: THE THREAT OF VIDEO-ON-DEMAND FOR GERMAN CINEMAS

Helmut Wittenzellner, Rodrigo Carlos Valverde Bustamante

Stuttgart Media University, Nobelstr. 10, 70539 Stuttgart, Germany

Abstract

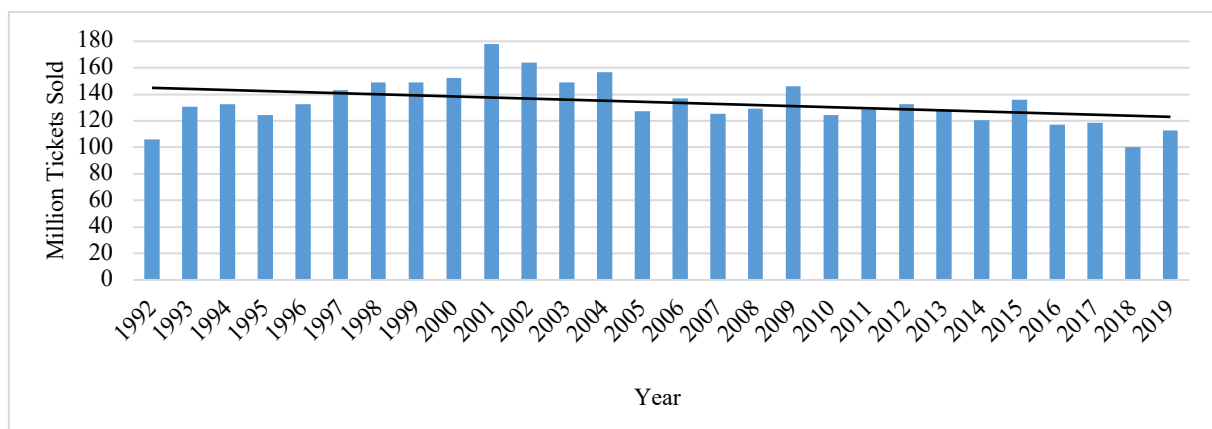
*German cinema attendance fell precipitously due to the pandemic, continuing a steady decrease that has plagued German cinema culture for more than a decade. A decline that creates uncertainty about the future of movie theatres and that cannot be solely attributed to the pandemic. Thus, begging the question, if the rise of Video-on-Demand can explain this phenomenon. Specifically, this study examines whether Video-on-Demand and the decline in cinema attendance in Germany may have a causal relationship beyond a correlation. Based on panel data collected by the German Federal Film Board from the 'Kinobesucher*innen' and 'Der Home-Video-Market' studies, a correlation coefficient and multiple linear regression analyses are conducted to determine the relationship between Video-on-Demand and cinema attendance. The causal effect of Video-on-Demand on cinema attendance is marginal. In order to complement the multiple linear regression analysis, a survey is developed to understand the audiences' reasons for and against a cinema visit. The results of the survey are reproduced and compared with the results obtained from two statistically significant multiple linear regression models. Although Germany has influenced and benefited from the seventh art since its inception, Germany is struggling to entice its citizens back to movie theaters. Demographic change and the shrinking theatrical distribution window are among the factors contributing to the daunting task facing German cinemas.*

Keywords: Cinema attendance, Video-on-Demand, Cinema audiences, German cinemas, Home theatre, Correlation, Multiple linear regression, Survey

1. INTRODUCTION

Despite COVID-19's limitations for two years (2020-2021), many cinema fans choose to watch movies at home rather than go to the cinema (Rothfuss 2022) [1]. Kreuzer (2010) writes that the half-life of the cinema film has become increasingly shorter, mainly due to film studios releasing movies almost simultaneously in cinemas and on VOD [2]. Furthermore, Wüpper (2022) reports that the 1232 German cinema companies have not been able to compensate for the massive decline in attendance in the first two COVID-19 years. Up to June 2022, only 33,2 million tickets were sold, that is 38 percent less than before the first six months of 2019 [3].

Figure 1: Cinema Attendance in Germany over 28 years (own depiction)



The line of best fit in Figure 1 captures the negative trend of cinema attendance in Germany. Until 2001 attendance was rapidly growing. From 2002 onwards the decrease has been slow but steady with a few good years above the 140 million-tickets-sold mark. Movie theatre attendance dropped to a staggering 100 million visits in 2018. An all-time low for this 28-year timeframe. As seen in Figure 1, movie theatre attendance decline has been present since before the first VOD revenue boom in Germany (between 2006 and 2008). Furthermore, the COVID-19 pandemic has significantly impacted the cinema industry, as movie theaters were closed or had limited capacity for extended periods of time. Nevertheless, considering the outlier character of the pandemic years, the data sample only consists of recollected data from 2007 to 2019, retrieved from FFA, Society for Consumer Research (GfK), Statistisches Bundesamt (Destatis) and Statista sources. 2007 marks the beginning of data collection on VOD revenue by the GfK and 2019 the start of the COVID-19 pandemic.

The future of cinema is currently shaped by several factors, including demographic changes, digitalization and VOD. It has been suggested that the latter two aspects are linked; some industry representatives fear the possibility of watching films online and the associated danger of piracy will accelerate the problems demographic change has brought for cinemas. It is feared that cinema audiences may disappear at some point in the future (Prommer 2015) [4]. As more people have access to VOD services such as Netflix, Amazon Prime Video and Disney+, as well as the availability of new releases on VOD platforms, the German population is conceivably choosing to watch movies at home instead of going to the cinema. This trend is not unique to Germany and it is being observed in many countries around Europe and the world. It is though plausible that there is a causal link between the increase in VOD revenue and declining cinema attendance in Germany. It is also worth considering that while VOD services may influence the decline of cinema attendance in Germany, it's not the sole reason. The decline in cinema attendance is complex and multi-faceted, with a range of contributing factors such as the shortening of the theatrical release windows, the cost of movie tickets and the general economic climate.

Video-on-Demand, together with cinema-specific and sociodemographic-factors bring new challenges and opportunities for cinemas to try and revert the negative trend in attendance. Cinemas are rereleasing blockbusters like *Avatar*, as well as successful and well-known arthouse films such as *Reservoir Dogs*. On the second weekend of September 2022 there was the so-called “Kinofest”. Nationwide, all movie theaters had an entrance fee of EUR 5 for each film screening. It is imperative to note that small cinema operators in particular suffered critical revenue losses during the pandemic. In addition to the strong competition provided by VOD services, smaller cinemas are unable to operate economically. Metropol, a long-established cinema in Stuttgart ended its operation the last day of December 2020 (Haasis 2020) [5].

Figure 2: Cinema and home video: Market development in Germany over 15 years

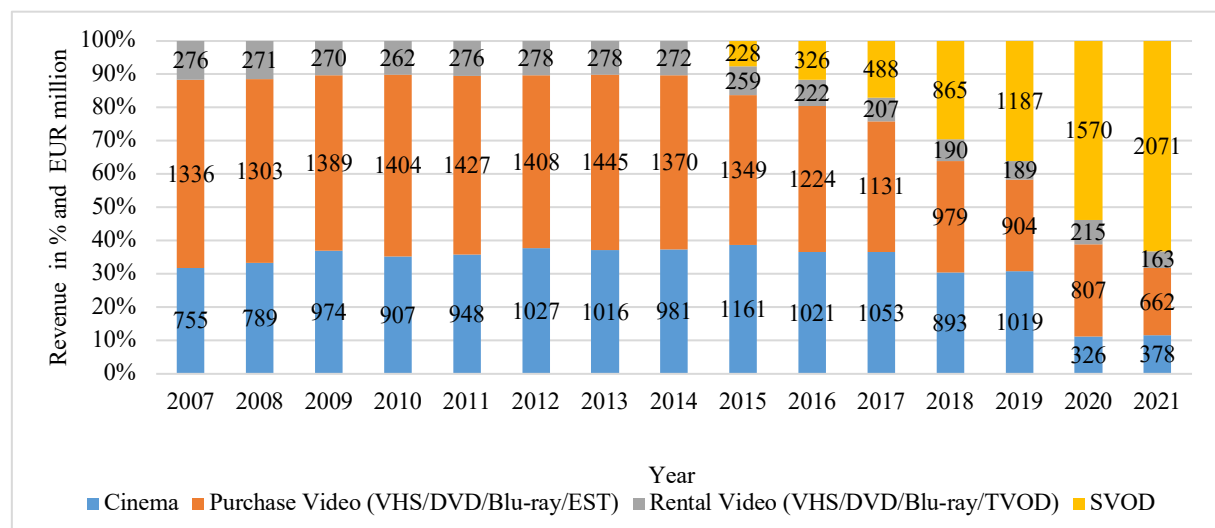


Figure 2 illustrates that Subscription-based Video-on-Demand (SVOD) grew significantly since 2015 in the cinema and home video market. In 2019, it surpassed cinema revenue, with EUR 1 187 billion, representing a third of the market. During the COVID-19 pandemic, it accounted for more than half the market (GfK 2022) [6].

This study considers Video-on-Demand as the combination of SVOD, Transactional Video-on-Demand (TVOD), and Electronic Sell-Through (EST). Statistics on paid-VOD market volume and share do not include exclusive sport events providers, such as DAZN or Premium Video-on-Demand (PVOD).

In order to draw the study conclusions, the following hypotheses are proposed:

- Hypothesis 1: Attendance at cinemas is negatively correlated with and affected by Video-on-Demand revenue.
- Hypothesis 2: The main cinema-specific factor that has a negative effect on cinema attendance is the ticket price.
- Hypothesis 3: The immersive and special experience is the primary reason (for survey respondents) to watch films at movie theatres.

2. FILM DISTRIBUTION CHAIN

In the global market, a substantial number of films are financed and produced by the distributors themselves. This is the case with the “Big Five”, the major Hollywood studios. NBCUniversal, Paramount Global, Warner Bros. Entertainment, Walt Disney Studios and Sony Pictures (Bake et al., n.d.) [7]. According to Loetzer (2014, p. 19) for feature films, sequential exploitation or release windows have been established to maximize profit. [8]. Cinemas, EST/TVOD/DVD/Blu-ray, pay-TV, SVOD and free-TV are the five stages of traditional distribution.

FFA-funded productions are subject to an exploitation sequence prescribed by the Film Promotion Act (FFG): §§ 53 - 58 FFG. The Film Promotion Act contains blocking periods in order to guarantee cinemas an exclusive exploitation period. Films that have been produced and/or marketed with FFA funding must obey the blocking periods. After the previous window expires, the next one is activated (Bake et al., n.d.) [9]. In line with the FFA reports (2022a), German films are released on DVD/Blu-ray on an average of 5,8 months after the cinema premiere, followed by TVOD and EST exploitation 6,3 months after theatrical release. On the twelfth month, pay-TV enters the exploitation chain. SVOD availability begins on the thirteenth month. Finally, movies generally debut on free-TV and free VOD media libraries between 18 months and 28,1 months after the date of their first theatrical release [10]. A theatrical release and home video release may be separated by as little as four to five months, in case of an exceptional reduction. A new German Film Law, from January 1, 2022 until the end of 2023, states that films funded by the FFA may replace their regular theatrical release with a VOD premiere if a nationwide cinema debut cannot be accomplished due to an unavoidable casualty like the COVID-19 pandemic (Die Bundesregierung 2022) [11].

Holden (2021) explains that as of July 2021, the distribution for major studio films changed as a result of the COVID-19 pandemic and new digitalisation trends. The first window to be activated after theatrical release is EST, on average 4 months after theatrical release. “Big Five” films are available on TVOD/DVD/Blu-ray roughly 4,3 months after the cinema premiere. On the sixth month Hollywood films enter pay-TV exploitation, followed by SVOD availability on the ninth month after theatrical release. Free-TV exploitation begins 28,8 months after the first screening day at cinemas. Some major studios, such as Walt Disney Studios or NBCUniversal have cut the exclusive theatrical window from 90 days to 45 days with the belief to drive subscriber growth to their own VOD platforms. NBCUniversal films had a 17-day theatrical window before being released on PVOD. Nevertheless, the theatrical window was extended to 31 days if the film earned at least USD 50 million in its opening weekend [12]. Regardless, in Germany, *Wonder Woman 1984* from Warner Bros. Pictures had its VOD premiere on Sky (WOW) four months before its theatrical release (Sky 2021) [13]. This shortening of the theatrical window is not only result of the COVID-19 restrictions, the trend can be found before the pandemic.

For instance, in 2018, *Avengers: Infinity War* was available on VOD four months after theatrical release. There is also “Day and Date” distribution, where films come out in cinemas the same date as on other media platforms. An example for this is 2014's film *The Interview* from Sony Pictures.

Ulin (2009, p. 71) asserts that distributors are attempting to bring worldwide cinema and home video releases closer together with the aim to destabilise the market share of illegal exploitation and subsequently encourage consumers to pay for products offered legally by the distributors themselves. Moreover, this distribution strategy focuses publicity on theatrical releases and converting awaited films into global events, with the goal of benefitting international distribution in all stages [14]. Considering that the individual exploitation windows are substitutes between themselves, it is essential to grant each window exclusive status and set the transitions between the individual windows properly to maximize earnings and avoid cannibalization effects (Popp, Parke & Kaumanns 2008) [15]. As a result, distribution windows are expected to become case-based, depending on the films' economic development and success (Holden 2021) [16]. How large distribution windows should be and how it can be harmonised internationally is the subject of controversial discussion in the film and cinema industries.

It is nonetheless difficult to quantify the impact of the exploitation windows' shift on cinema attendance. A quantitative analysis of exploitation windows can be derived from examining the attendance patterns of domestic and non-domestic films since German films and international films differ in terms of the regulations and blocking periods for each distribution window. However, this remains an assumption. In Chapter 3 the impact that VOD and quantifiable factors have on cinema attendance is analyzed.

3. DATA ANALYSIS

3.1. Variables selection

The variables for the multiple linear regression and correlation analyses are selected based on the following argumentation. The dependent variable for the MLR analysis is cinema attendance (CA).

Cinema-specific variables:

- Attendance of domestic films (A_{DF}).
- Attendance of non-domestic films (A_{NF}).
- Average ticket price (TP).
- Cinema halls (H).

Average ticket price and cinema halls are selected due to its relevance in the following studies. Dewenter and Westermann (2005, p. 21) concluded that there is a long-run relationship between income, ticket prices and cinema attendance in their working paper ‘Cinema demand in Germany’ [17]. Furthermore, as noted by Dessy and Gambaro (2009) in ‘Demand for Movies in Europe and the Effects of Multiplex Diffusion: A Panel Approach’, price is quite significant, with an elasticity of -0,26 [18]. Wagner and Parlow (2018) in ‘Eine Analyse des Einflusses von Netflix und Filesharing auf die Kinoindustrie’, using a Difference-in-Differences analysis, found that the number of cinemas halls and share of domestic films and international blockbusters positively impact cinema attendance [19]. Moreover, MacMillan and Smith (2001), in ‘Explaining Post-War Cinema Attendance in Great Britain’, emphasize that cinema supply, in the form of seats or halls, should also be included in a demand model, stating that consumers always respond to supply and adjust their demand [20].

Sociodemographic variables:

- Internet users (I).
- Population number in Germany (P).
- Household consumption expenditure on leisure, entertainment and culture (E).
- Attendance per-age group

- Attendance 10 – 19 years (A_a)
- Attendance 20 – 29 years (A_b)
- Attendance 30 – 39 years (A_c)
- Attendance 40 – 49 years (A_d)
- Attendance 50 – 59 years (A_e)
- Attendance 60+ years (A_f)
- Unemployment figures (U).
- Visitors' average age (AV).

As of 2019, there are 62,9 million internet users in Germany, as opposed to 40,8 million in 2007. Rabe (2021) claims that as the internet becomes increasingly ubiquitous, so does the potential for VOD [21]. The variable population is selected based on the assumption that the growing population of a prosperous European country positively correlates with and influences cinema attendance. For instance, in 2019, France reached a population of 65,1 million, compared with 61,9 million in 2007 (Statista Research Department 2022a) [22]. According to O'Neill (2022), France recorded 213,2 million movie ticket sales in 2019, its second-best year since 2007 when 178,5 million tickets were sold. [23].

Wagner and Parlow (2018) discovered that average income positively influences cinema attendance, and that unemployment rate has a negative effect on cinema attendance. This study substitutes these variables. Unemployment figures is used instead of unemployment rate because of its ratio scale [24]. As for the household consumption expenditure on leisure, entertainment, and culture, accounted for 10 percent or EUR 255 of the average income (Destatis 2023a) [25]. This variable (E) represents more accurately how average income is spent on cinema.

Regarding attendance demographics, Prommer (2015, p. 85) states, that in 1999 61 percent of the cinema audience was under the age of 30, by 2019 this percentage fell to 34 percent. In particular, young people between the ages of 20 and 29 are less likely to attend the cinema [26]. Contrastingly, in 1999, eight percent of the cinemagoers were over 50 years of age. As of 2019, the proportion of 50+ year-old cinema attendees amounted 31 percent of the total number of tickets sold in Germany (FFA 2020a) [27].

Video-on-Demand variable:

- VOD revenue (V_R).

The cinema-specific variables, attendance per-age group and visitors' average age are retrieved from the FFA 'Kinobesucher*innen' studies (FFA 2009a, 2012a, 2015a, 2018a, 2020a) [28]. The variable cinema halls is retrieved from the FFA 'Entwicklung der Kinostandorte, Spielstätten und Kinosäle' reports (FFA 2009b, 2012b, 2015b, 2018b, 2020b) [29]. The data for internet users (Davies 2022), unemployment figures (Davies 2023) and population (Statista Research Department 2022b) in Germany come from Statista [30]. The variable household consumption expenditure on leisure, entertainment and culture is retrieved from the Statistisches Bundesamt (Destatis 2022) [31]. Lastly, VOD revenue is retrieved from the GfK studies 'Der Home-Video-Market' (GfK 2014, 2016, 2018, 2020) [32].

3.2. Correlation coefficient measures

Correlation represents a linear relationship between two continuous variables and can be expressed as a Pearson product-moment correlation. Moreover, Myers and Well (2003, p. 560) clarify that Spearman's correlation coefficient rho, ρ , is primarily interpretable in analogy to the usual Pearson coefficient [33]. In most cases, normally distributed data is correlated using the Pearson correlation coefficient. Data with relevant outliers or nonnormally distributed continuous data can be analyzed with Spearman's rank correlations. This is because the Pearson's correlation coefficient can be changed considerably by the presence of a few outliers (Schober, Boer & Schwarte 2018) [34].

There are four assumptions to satisfy before performing a Pearson's correlation test:

1. x - y values are measured continuously and independently from each other.

2. Both variables are normally distributed.
3. The variables are linearly associated.
4. There are not outliers in the data.

Participants in the FFA and GfK studies are randomly selected, there are not multiple observations from the same participant. Furthermore, the variables are measured in a ratio scale. In addition, since 2007, there is data available for each pair of x - y values, thus the first assumption is confirmed.

Bradburn (2021) proposes the Shapiro-Wilk test to deduce whether data has been sampled from a normal distribution [35]. The test uses a null hypothesis:

- Null hypothesis ($W > W_\alpha$): The 13-point sample is normally distributed.
- Alternative hypothesis ($W < W_\alpha$): The null hypothesis is rejected, there is significant evidence of nonnormally distributed data.

The critical value for $n = 13$ at a significance level of $\alpha = 5$ percent is taken from the table Quantiles of the Shapiro-Wilk test for normality and reads as follows, $W_\alpha = 0,866$. As a quotient, W indicates the ratio of two variance estimators:

$$W = \frac{(\sum_{i=1}^n a_i x_i)^2}{\sum_{i=1}^n (x_i - \bar{x})^2} \quad (1)$$

The coefficients a_i come from the table Coefficients a_i for the normality Shapiro-Wilk test (Shapiro & Wilk 1965) [37]. W is computed with Excel. The results are:

- For the variable CA : $W = 0,98 > W_\alpha = 0,866$.
- For the variable V_R : $W = 0,786 < W_\alpha = 0,866$.

The null hypothesis is accepted for cinema attendance, but rejected for VOD revenue. Hence, the second assumption is violated, the VOD revenue data does not have a normal distribution. Therefore, Spearman's correlation is used.

3.3. Spearman's correlation coefficient

Spearman's correlation coefficient is, in essence, a Pearson's correlation coefficient calculated based on the ranks of each variable's value instead of their actual values. The equation that takes advantage of the characteristics of ranks is:

$$\rho = 1 - \frac{6 \sum D_i^2}{n(n^2 - 1)} \quad (2)$$

where D_i is the difference between the x and y ranks and n is the number of pairs (Myers & Well 2003) [38]. As a first step, the variables for cinema attendance, VOD revenue are each ranked. The next step is to determine the difference between the x and y ranks, and count the number of pairs. The difference of each rank is then squared:

- $\sum D_i^2 = 604$.
- $n = 13$.

By inserting the values of $\sum D_i^2$ and n in the second equation, Spearman's ρ equals - 0,6593. This Spearman's correlation coefficient indicates a strong negative correlation between cinema attendance and VOD revenue. Thus, the question of statistical significance of this Spearman's correlation coefficient arises. A hypothesis test is used:

- Null hypothesis: If P-value $> 0,05$; there is no association between cinema attendance and VOD revenue.

- Alternative hypothesis: If P-value < 0,05 ; There is a significant association between cinema attendance and VOD revenue.

The Spearman's correlation coefficient and P-value is calculated with Excel. In this regard, Hypothesis 1 is partially confirmed. Cinema attendance and VOD revenue have a P-value of 0,014, and a statistically significant strong negative correlation ($\rho = -0,6593$).

Moreover, average ticket price has a strong negative correlation of $\rho = -0,6593$ with cinema attendance, and has statistical significance with the same P-value of 0,014. The Spearman's correlation coefficient for the variables cinema halls and cinema attendance does not have statistical significance with a P-value of 0,071. The variables attendance domestic films and cinema attendance have a statistically significant Spearman's correlation coefficient, indicating a moderately strong positive correlation ($\rho = 0,5934$). Attendance non-domestic films has a statistically significant strong positive correlation of $\rho = 0,7802$ with cinema attendance.

The Spearman's correlation coefficients between cinema attendance and the variables household consumption expenditure on leisure, entertainment and culture, internet users, visitors' average age and population have statistical significance and strong negative Spearman's correlation coefficients. The assumption that a growing population positively correlates ($\rho = -0,621$, P-value = 0,024) with cinema attendance is thus rejected. The Spearman's correlation coefficient with unemployment figures is $\rho = 0,6264$, P-value = 0,022.

Lastly, cinema attendance strongly correlates with the four attendance age groups 10 to 19 years old, 20 to 29 years old, 30 to 39 years old, and 40 to 49 years old. The variable attendance 40-49 years and cinema attendance have the strongest positive Spearman's ρ of 0,8216 and a P-value of 0,001. The Spearman's correlation coefficients for both age groups 50 to 59 and 60+ years old do not have statistical significance (P-values of 0,188 and 0,529).

3.4. Multiple linear regression analysis

The multiple linear regression analysis allows to explicitly control for many independent variables that simultaneously affect the dependent variable, cinema attendance. An MLR model can fit two to k independent variables. By adding independent variables the values of slope estimators β_k change (Wooldridge 2002) [38]. The equation with two independent variables is defined as:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \mu. \quad (3)$$

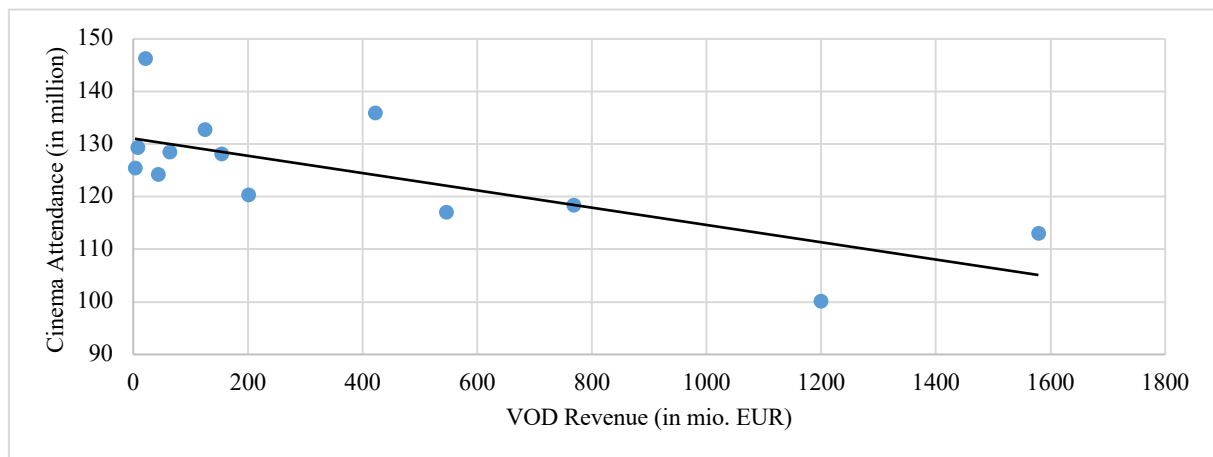
Wooldridge (2002, pp. 22-106) explains that the parameters β_k measure the change in y with respect to x_k . The error term, μ , contains unobserved variables that affect y . As long as β_0 is included in the equation it can be assumed that the average value of μ is zero. The equation for multiple linear regression can be written as:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \dots + \beta_k x_k + \mu \quad [39]. \quad (4)$$

To reduce bias and ensure that the results of the regression analysis are meaningfully interpreted, there are five Gauss-Markov assumptions that need to be addressed (Datatab Team 2023) [40]:

1. Linear relationship between the dependent and independent variables.
2. Zero conditional mean of error.
3. Normally distributed error.
4. No multicollinearity.
5. Homoscedasticity.

Figure 3: Linearity: Cinema Attendance against VOD Revenue



For the first assumption, to check if the variables have a linear relationship one needs to plot the independent variable, for example, VOD revenue, on the x-axis, and dependent variable, cinema attendance, on the y-axis. The scatterplot is used to find the straight-line equation that fits the data points best. Figure 3 illustrates less clustering around the line of best fit, indicating a weak linear relationship.

The second Gauss-Markov assumption of this study supposes that the error will have an expected value of zero whatever the independent variables are. Just as Wooldridge, Shuangyuan (2021) indicates that when the intercept is included in the regression model, the intercept coefficient β_0 can absorb the non-zero μ [41]. For this assumption to be validated the P-value of β_0 must be smaller than $\alpha = 0,05$.

To verify the third assumption, an analysis of the residuals is performed by graphing the standard residual quantiles against the corresponding theoretical quantiles in a Q-Q plot. Feldman (2018) mentions it is expected that the plotted points will lie near the straight line at a 45-degree angle if the error is normally distributed [42]. The standard residual quantiles can be defined as the standard residuals with its positive values changed to negative and vice versa. Standard residuals are calculated by dividing the raw residual by the standard deviation of the entire set of raw residuals. The raw residuals are the differences between the predicted and observed values of cinema attendance (Zhu 2022) [43]. The raw residuals are calculated with Excel's regression tool. To determine the normal theoretical quantiles, first, the standard residuals are ranked. For each rank the value of 0,5 is subtracted. Then, the difference is divided by $n = 13$. The following Excel equation illustrates how the normal theoretical quantiles are calculated:

$$\text{NORM.S.INV}\left(\frac{(\text{Rank}-0,5)}{n}\right). \quad (5)$$

The fourth Gauss-Markov assumption is violated if multicollinearity is present in the MLR. Multicollinearity implies that two or more independent variables strongly correlate with each other. Wu (2020) recommends using the Variance Inflation Factor (VIF) formula, with which multicollinearities between independent variables within a MLR model are investigated [44]:

$$VIF_i = \frac{SE_i^2 SD_i^2 (n-1)}{SE_{Regression}^2}, \quad (6)$$

with $SE_{Regression}$ being the standard error from the MLR and SE_i being the standard errors of each slope coefficient. Moreover, SD_i is the standard deviation of each set of the independent variables. All in all, multicollinearity is present if $VIF_i > 10$.

For the fifth assumption, when heteroscedasticity is present, the MLR coefficients are no longer the "Best Linear Unbiased Estimates" (Walther 2020) [45]. Heteroscedasticity is the presence of unequal scatter across the set of standardized estimated residuals. On the one hand, an homoscedastic graph illustrates that the variance of the MLR model residuals is constant over its predicted values. On the

other hand, a scatterplot with heteroscedastic data typically shows a cone shape (Glen 2021) [46]. To create the scatterplot, the standard residuals are plotted against the standardized estimated residuals. Frost (2023) explains how to determine the standardized estimated residuals in Excel. First, the sample mean and standard deviation of the predicted values of cinema attendance are calculated. Then, the mean is subtracted from the predicted values of cinema attendance. Lastly, the difference is divided by the standard deviation [47].

3.5. Multiple linear regression results

In order to find a MLR model that explains the effect of VOD revenue on cinema attendance, the remaining 15 independent variables are combined without repetition in several MLR models. Combination without repetition means picking k independent variables from a set of n regressors without putting back the selected variables before picking the next one. In other words, any of the 15 variables can be selected once for each combination. Furthermore, the order in which the objects are selected is irrelevant. (Hemmerich 2023) [48]. From these remaining explanatory variables only three can be drawn and combined without repetition. Having more than 4 regressors in the MLR casts statistically insignificant P-values for all independent variables. With $k = 3$ and $n = 15$, the binomial coefficient is $\binom{n}{k} = 455$, which means 455 different MLR models are tested. The computation of the MLR and Gauss-Markov assumptions are executed with Excel and cross validated with the statistical software DATAtab. Following Simonton's (2005) method, forward stepwise selection is used to identify a statistically significant MLR model with reduced bias [49]:

- The first step is to select regression models where the coefficients β_0 to β_k show statistical significance with their respective P-values being smaller than $\alpha = 0,05$.
- The second step is to validate the models according to the five Gauss-Markov assumptions.

In consequence, two MLR models are accordant to this forward stepwise selection.

The first MLR model shows that the variables VOD revenue, cinema halls and attendance 40-49 years explain 90,7671 percent of the variance from the variable cinema attendance.

The first MLR model is obtained:

$$CA = -250,6268 - 0,0133 \cdot V_R + 4,5436 \cdot A_d + 0,0593 \cdot H$$

The statistical significance from the model is tested using Significance F:

- Null hypothesis: if Significance F $> \alpha$, then the regression model is statistically insignificant
- Alternative hypothesis: if Significance F $< \alpha$, then the regression model is statistically significant.

Thus, the null hypothesis is rejected, the first MLR model has statistical significance with Significance F = 0,00005 $< \alpha = 0,05$.

Regarding the coefficients, if the variable VOD revenue changes by one unit, the variable cinema attendance declines by -0,0133. The coefficient for attendance 40-49 years is $\beta_2 = 4,5436$ and for cinema halls $\beta_3 = 0,0593$. The P-value for the coefficient of VOD revenue is 0,003, for cinema halls 0,009, and for attendance 40-49 years 0,0092. Furthermore, there is no violation of the second Gauss-Markov with the intercept $\beta_0 = -250,6268$ and a P-value of 0,0263. Therefore the beta coefficients are statistically significant.

The second MLR model exhibits that the variables VOD revenue, attendance domestic films and attendance 30-39 years explain 86,984 percent of the variance from the variable cinema attendance. Furthermore, the second MLR model has statistical significance at a level of five percent with Significance F = 0,0003.

The second MLR model is:

$$CA = 45,6843 - 0,0077 \cdot V_R + 0,6797 \cdot A_{DF} + 2,979 \cdot A_c$$

The VOD revenue's slope parameter β_1 falls to -0,0077 when comparing the coefficient to the one in the first MLR model, thus indicating if the variable VOD revenue changes by one unit, the value of cinema attendance changes by -0,0077. The coefficient for attendance domestic films is $\beta_2 = 0,6797$ and for attendance 30-39 years $\beta_3 = 2,979$. In terms of statistical significance, the P-value for the coefficient of VOD revenue is 0,0463, the attendance domestic films coefficient has a P-value of 0,0141. The P-value of attendance 30-39 years is 0,0088. The beta coefficients are statistically significant at the five percent level due to their the P-values being less than $\alpha = 0,05$.

In Chapter 5, the MLR analysis results are discussed in context of the survey results.

4. SECONDARY DATA ANALYSIS

4.1. Survey

A survey is created to complement and compare the results of the two MLR models with the results of this survey. To validate the quality of the survey data, it is necessary to evaluate the response rate first. The data needs to be complete, with no missing responses. Besides, the data must be documented consistently and accurately. Moreover, the design of the questionnaire, including the questions, response options, and instructions, needs to be assessed. This is to ensure clarity, accuracy and appropriateness for the research questions being studied. It is also pertinent to consider ethical and legal issues related to the collection and use of survey data.

The target population of this empirical survey includes individuals from all age groups, occupations, countries of origin, and levels of economic prosperity, the only requirement being that they reside in Germany. Therefore, the survey population consists of all individuals who have the opportunity to participate during the survey period (Kromrey 2013) [50]. It is only when all relevant characteristics of the participants correspond to those of the cinemagoing population in Germany that the survey meets the representativeness criteria (Berekoven, Eckert & Ellenrieder 2006) [51]. Franzen (2014) suggests that in order to demonstrate high levels of reliability, more than three response options should be provided. Similarly, a number above nine answer categories is avoided in order to reduce the cognitive demand on respondents [52]. The framework questions take into account frequency and attitudes towards cinemagoing and VOD usage, as well as age. In the first block of questions, there are two multiple choice questions with a single selection option. The frequency of cinema visits and VOD usage are compared with this first question block. In the second block of questions, scales of agreement are rated on a 5-point Likert scale, which includes the options "Strongly agree", "Agree", "Neutral", "Disagree" and "Strongly disagree". These are cinema- and VOD-specific questions examining the factors influencing the decision for or against a cinema visit.

In accordance to the insights provided by Chapter 2 and the MLR analysis results, the following hypotheses are included:

- Hypothesis 4: The ever-shrinking theatrical window is expected to be the most important VOD-specific factor influencing a decision against visiting cinemas.
- Hypothesis 5: In agreement with the first regression model and the causal effect of cinema attendance in the 40- to 49-year-old age group, the lowest frequency of cinema visits will be found among this age group.
- Hypothesis 6: Conforming to the second regression model and the causal effect of cinema attendance in the 30- to 39-year-old age group, the second lowest frequency of cinema visits will be found among this age group.
- Hypothesis 7: In accordance with the second MLR model, the respondents choose German films as a decisive factor when visiting a cinema, especially in the 30- to 39- year-old age group.

4.2. Reproduction of the survey results

An overall number of 169 people participated in the online survey, with 158 participants completing the questionnaire to the end. Thus, there is a drop-out rate of approximately 6,51 percent. To reproduce the data, only the questionnaires that are filled out to the end are used.

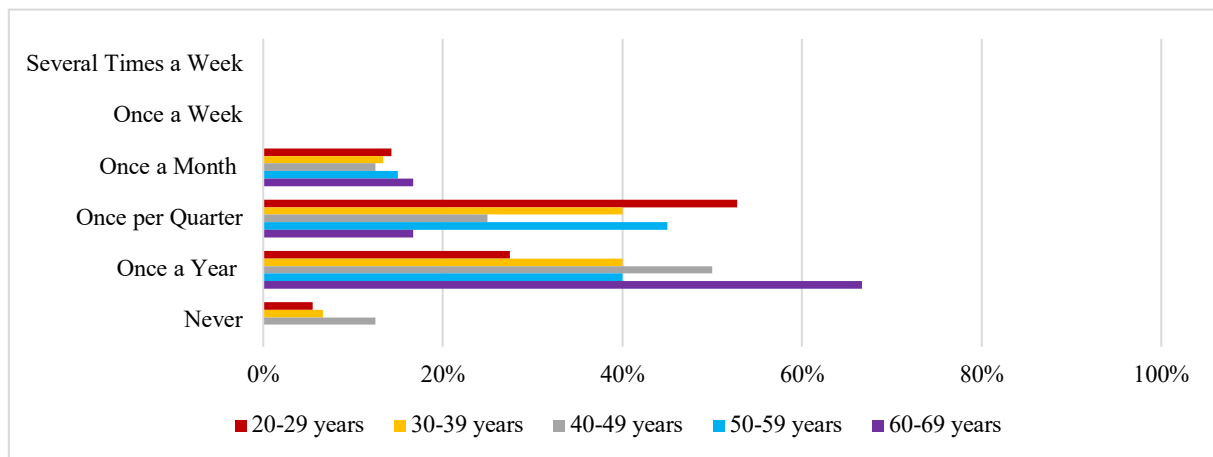
In terms of age distribution, there is a discrepancy between the survey data and the FFA panel data. Only the age groups 30 to 39 and 50 to 59 are representative. The percentage of respondents in the age group 50 to 59 years old approximates that of reality (16 percent) with 14 percent. In 2019, cinema attendance for the age group 30 to 39 years old accounted for 18 percent of total attendance. The percentage of respondents in this age group is 19 percent. 58 percent of the surveyed are in the 20- to 29- year-old age group.

In relation to the factors that attract cinema audiences, a total of 83,6 percent of respondents agree (both agreement scales added) that the main reason to attend cinemas is for the immersive experience. There is only a 6,3 percent disaccord (both disagreement scales added) with this reason. Respecting the theme or story of a film, 81 percent of respondents agree that this is the second most important reason for watching a film in cinemas, while 6,3 percent dispute this reason. There are 69,6 percent of respondents who go to the cinema as part of a social activity, whereas 14,6 percent of respondents find this reason to be unimportant. Among the respondents, 54,4 percent watch the film in the cinema if it is part of a film series or a sequel, while 27,2 percent principally do not attend cinemas to watch the parts of movie franchises. The percentage of respondents attending a movie theatre if the film has been nominated or won an award is 44,9 percent, while 32,3 percent find this factor irrelevant. The remaining 22,8 percent are undecided. There are 32,3 percent of respondents who attend cinemas because of the film's actors, 33,5 percent are not interested in thespians, and 34,2 percent remain neutral. 27,9 percent of respondents attend cinemas to enjoy concessions, while 41,1 percent believe this factor is irrelevant. In addition, 31 percent of the respondents indicate neutrality.

With respect to the reasons against a movie theatre visit, 50,6 percent of those surveyed generally agree that the ticket price is a factor that discourages from visiting theatres, while 25,3 percent substantially disagree. Distance to movie theatres in Germany is considered a demotivating factor by 29,8 percent of the respondents. Nevertheless, 50,6 percent of respondents regard this factor as irrelevant. The factor "Prefer other leisure activities" shows that 39,2 percent of respondents rather spend their free time with other forms of entertainment. However, 27,9 percent do not consider this factor to be important. Lastly, 65,2 percent of respondents regard cinema programs as uninteresting, while 13,3 percent disagree with this assessment. As to the VOD-related reasons, 43,67 percent of respondents prefer to wait for films to be released on VOD rather than watch the same film in a movie theatre. There are 33,54 percent of respondents who disagree with this as a reason ("The rapid availability of films on VOD") not to visit a movie theater. For 34,18 percent of respondents, watching series is preferred to going to the cinema, while for 36,08 percent, this factor is irrelevant. As a result of its large library of films, 64,56 percent of respondents prefer to watch VOD, while 22,78 percent do not consider this factor relevant. 73,42 percent of respondents prefer to watch VOD at home because it is more comfortable and practical than watching a film in a movie theatre. However, 17,09 percent of respondents do not consider this factor to be significant. For 56,96 percent of the respondents, watching VOD at home is more cost-effective than attending a cinema, for 20,89 percent of the respondents this factor is irrelevant.

With respect to German and foreign films, 68,99 percent of the total respondents disagree that German films are a compelling reason for visiting cinemas. On the contrary, there are only 1,9 percent of the total respondents who are convinced to go to the cinema to watch German productions. For 29,11 percent of the total respondents, foreign film productions are a reason to visit cinemas. Nevertheless, the provenance of the film is not relevant for 37,34 percent of respondents. As for the age group 30 to 39, 70 percent of its respondents disagree that German films are a compelling reason for visiting cinemas, while only 3,33 percent of the surveyed are motivated to visit cinemas if the film screened is German.

Figure 4: Cinema attendance in age groups



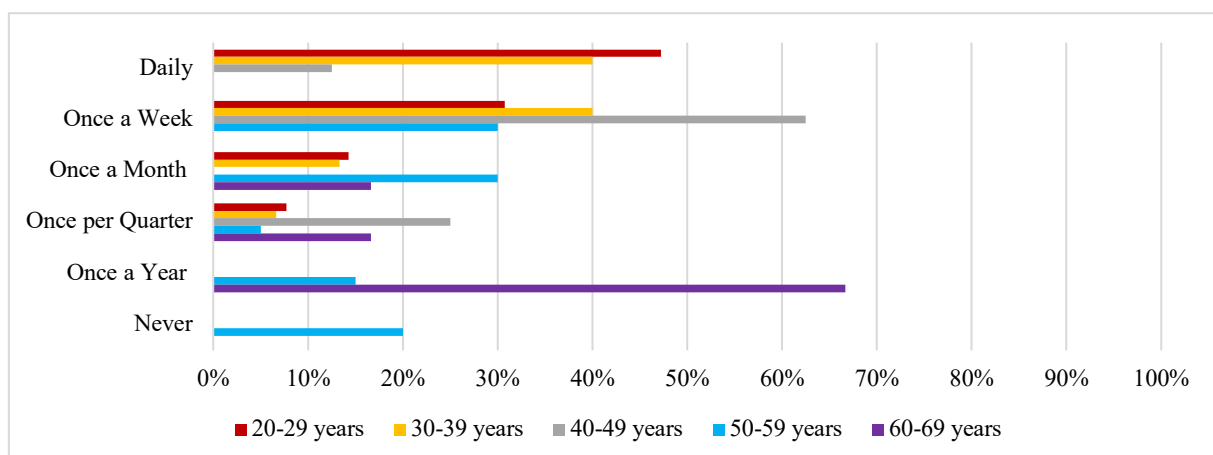
The age group 10 to 19 years old is left out of the reproduction, the one respondent from this age group watches films on VOD once a month and attends cinemas once a year. In Figure 4, it can be seen that the highest proportion of frequent cinemagoers (once a month) is 15 percent for those aged 50 to 59 years and 16,7 percent for those aged 60+ years. With 14,3 percent, the 20- to 29- year-old age group comes above the average of the entire survey population of 13,9 percent regular cinemagoers. The smallest proportions of frequent moviegoers are 13,3 percent in the 30- to 39- year-old age group, and 12,5 percent in the 40- to 49- year-old age group.

35,9 percent of respondents in the 30- to 39- year-old age group and 25 percent in the 40- to 49- year-old age group attend cinemas once per quarter. The majority (52,75 percent) of occasional cinemagoers are between the ages of 20 and 29. Frequent cinemagoers have the highest rate in the survey population with 45,6 percent.

It is noted that 35,4 percent of the respondents are sporadic (once a year) cinema attendees. A total of 66,7 percent of respondents in the 60+ year-old age group sporadically attend cinemas, followed by 50 percent in the 40 to 49 year-old age group. There is a 40 percent once-a-year visitor rate in the 30 to 39 year-old age group.

The average percentage of total respondents who never attend the cinema is 5,1 percent. There are not any respondents above the age of 50 in this frequency category. Among those between the ages of 40 and 49, 12,5 percent belong to the non-cinemagoers, followed by 6,7 percent non-moviegoers in the 30 and 39 year-old age group.

Figure 5: VOD usage in age groups



There is a trend in Figure 5 which indicates that the younger the age group, the more often films are watched on VOD. Among respondents aged 50 to 59 years, 20 percent never watch films on VOD, making them the only age group to do so. Comparatively, among the eight respondents aged 40 to 49 years, 12,5 percent watches VOD daily, 62,5 percent once a week, and 25 percent once a quarter. This results in the age group 40 to 49 years old having the third highest VOD usage frequency. There is a high level of VOD usage among the 30 respondents between the ages of 30 and 39, with 40 percent of them watching films daily on VOD, 40 percent weekly, 13,3 percent monthly, and 6,7 percent yearly. Respondents between the ages of 20 and 29 are the ones who watch the most often films on VOD and also attend cinemas with the highest frequency. However, these observation may be biased because the majority of respondents are aged 20 to 29.

5. DISCUSSION

Without further ado, Hypothesis 1, the main study question is accepted. Cinema attendance is negatively correlated with and affected by Video-on-Demand revenue. There exists a statistically significant strong negative correlation between VOD revenue and cinema attendance with Spearman's $\rho = -0,6593$. Furthermore, two MLR models tested successfully with predictive capacities of around 91 percent and 87 percent, respectively:

1. $CA = -250,6268 - 0,0133 \cdot V_R + 4,5436 \cdot A_d + 0,0593 \cdot H$
2. $CA = 45,6843 - 0,0077 \cdot V_R + 0,6797 \cdot A_{DF} + 2,979 \cdot A_c$

The coefficients of both MLR models are represented by elasticity. Elasticity provides the percentage change in cinema attendance in response to a percentage change in VOD revenue while holding the other independent variables constant. This provides a more precise and informative measure of the relationship between the variables, as it considers both the magnitude and direction of the change.

In the first regression model, VOD revenue has a negative impact on cinema attendance with an elasticity of -0,0133. Cinema attendance appears to be somewhat inelastic in relation to VOD revenue, as indicated by this relatively small coefficient. Comparatively, in the second model, VOD revenue shows an even smaller elasticity coefficient of -0,077. It is thus expected that an increase in VOD revenue will result in a small decrease in cinema attendance.

Moreover, the elasticity of 0,0593 shows that the variable cinema halls has a small positive effect on cinema attendance. Accordingly, when cinema capacity is reduced, there is a direct impact on the number of people attending the cinema. As fewer screens and therefore seats become available, the demand for cinema tickets decreases. According to Educated Guess, 57 percent of the decline between 2019 and 2020 was attributed to the reduction of cinema capacity (FFA 2022b) [53]. Nevertheless, the MLR data is from before the COVID-19 pandemic, highlighting the importance of increasing the number of cinema halls in Germany or at least preserving the amount of cinemas and its halls intact.

When compared to the second MLR model, the variable attendance in the age group 40 to 49 years old has the greatest positive effect on cinema attendance. It has an elasticity coefficient of 4,5436. Implicating that this age group plays a significant role in improving movie theatre attendance.

The attendance of domestic films displays an elasticity of 0,6797 in the second MLR model, therefore highlighting the importance of German films for cinema demand. Possibly indicating that German films are watched in cinemas due to the fact that VOD-availability for FFA-funded films takes longer time than VOD-availability for major studio movies. Furthermore, in Germany, domestic cinema attendance is one of the most reliable sources of revenue for cinemas, allowing them to generate a stable and predictable income.

The last statistically significant independent variable is the 30- to 39- year-old age group with an elasticity of 2,979, indicating its pivotal influence on total cinema attendance. Destatis (2023b) estimates that 12 percent of the German population is between the ages of 30 and 39, this age group represented approximately 11 percent of the population in 2007 and is expected to remain at 12 percent by 2025 [54]. Market share and attendance numbers from the 30- to 39- year-old age group have remained

relatively stable between 2007 and 2019, with 23,5 million visitors and 20,3 million respectively. The data from the Statistisches Bundesamt and FFA for the age group 40 to 49 years old bear resemblance to that of the 30- to 39- year-old age group. As of 2022, 12 percent of the population was between the ages 40 to 49. By 2025, this proportion is expected to increase to 13 percent (Destatis 2023b) [55]. Besides, approximately 19,2 million people from this age group attended cinemas in 2019, this number has remained relatively stable since 2007 (20,4 million cinema visitors). This suggests that the same demographic trends are happening across both age groups, indicating that the both age groups are likely to have similar interests and preferences, in terms of cinemagoing.

By using simple MLR models to approximate a complex real-life problem, bias is introduced into MLR analysis. The simpler the regression, the more bias it has introduced. Despite this, MLR has the advantage of making the output more understandable (Master's in Data Science 2023) [56]. On the one side, the fact that the data is not randomly sampled also introduces bias in the MLR models. On the other side, bias was ultimately reduced by the forward stepwise selection of the models. All in all, the regression model can still provide useful insights and predictions even with some level of bias.

In regard to Hypothesis 2, there is a strong negative correlation between average ticket price and cinema attendance, with a Spearman's correlation coefficient of $-0,6593$. Nevertheless, Hypothesis 2 cannot be supported, because ticket price does not exhibit a statistically significant elasticity in any of the 455 regression models examined. Furthermore, the cinema ticket price ranks fifth in the reasons against a cinema outing.

Hypothesis 3 is confirmed with the respondents naming the immersive and special experience the main reason to visit cinemas. The rejection of Hypothesis 4 stems from the fact that the ever-shrinking theatrical window or “the rapid availability of films on VOD” is only the fourth most cited VOD-related reason for skipping a cinema visit.

Based on the survey results, Hypothesis 5 is accepted for the age group 40 to 49, having the lowest cinema attendance frequency among the five age groups. For the age group 30 to 39, ranking third in the lowest cinema attendance frequency, Hypothesis 6 is invalid.

Hypothesis 7 is rejected for the whole survey population and the 30 to 39 year-old age group sample. German films are not a crucial reason to visit cinemas. The rejection of the seventh Hypothesis based on the survey results is contradictory to the second regression model and literary research. German films have been a stable source of income for cinemas for the last 15 years, fluctuating between 20 percent and 35 percent of the total revenue market share in Germany. Additionally, Negele (2015) remarks that compared to US productions, German films remain close to the pulse of the public and are sensitive to the concerns of the German audiences. Furthermore, as a meeting place and as a cultural venue, movie theatres are inseparable from German cinema [57].

The comfort of watching films at home is the primary reason not to watch films at a movie theatre, followed by the “uninteresting film program”, the extensive film library of VOD, and the affordability of VOD. The cinema ticket price completes the top five against a cinema visit. Regarding the survey's validity, even though the reasons for attending cinemas and the statistics on VOD usage frequency are consistent with the FFA and GfK studies, the survey provides an unrepresentative age distribution of the respondents, the results are therefore biased and are to be skeptically trusted. Despite yielding helpful observations, reproducing survey results should be viewed as a limited form of analysis that may not provide a full understanding of the data.

Considering the limitations of this study, future research might need to take different approaches. It would be beneficial to conduct additional survey-based studies to gain a better understanding of consumer behavior and preferences regarding movie-watching experiences in the age groups 30 to 39 and 40 to 49.

Moreover, the effects of shifting distribution windows on movie theatre attendance in Germany should be statistically analyzed in future research. Possibly with a time series data analysis, as a means of identifying the optimal distribution strategy and window length that could maximize cinema attendance and revenue. Considering that time series analysis is capable of handling multiple levels of complexity,

future studies might be able to incorporate more independent variables into their models, including weather conditions, holidays and special events, also movie reviews and ratings, competition from video games, and marketing and advertising campaigns for particular films.

6. CONCLUSIONS

The holistic nature of the present study provided both subjective and objective perspectives on the research question. Overall, combining literary research with multiple linear regression analysis and reproduction of survey results has both strengths and weaknesses.

First and foremost, there are disadvantages related to the complexity of data analysis and interpretation. Due the scope of the study and the increased time and resources required to collect and analyze panel data and to collect and reproduce the survey data, a complementary descriptive survey analysis was not conducted. Maintaining a balance between qualitative and quantitative approaches was challenging. Contradictory results arised between the two methods. This can be observed in the fact that survey respondents are uninterested in the nationality of the film as a factor in their decision to attend cinemas, even though the attendance of domestic (German) films was proven to have a positive effect on cinema attendance in the MLR analysis. Nevertheless, literary research validates the importance of German films in terms of cinema attendance. Furthermore, the unrepresentativeness and bias of the survey undermines the validity of its own results.

With respect to the MLR models, these indicate that the 30- to 39- year-old and 40- to 49- year-old age groups have the greatest elasticity on cinema demand. Besides, when combined, they represent 35 percent of the cinema attendance market share, thus having the highest attendance (as of 2019). Considering these two premises, and the fact that there will be a decline in young cinemagoers as the number of people under the age of 30 in Germany decreases, it is pertinent to further analyse the 30- to 39- year-old and 40- to 49- year-old age groups, in order to improve customer satisfaction, increase loyalty and attract new customers from these demographics.

Regarding causality, VOD revenue has only a marginal effect on German cinema attendance. Therefore, an increase in VOD revenue will result in a corresponding minor decrease in cinema attendance. It should be noted that even when VOD turnover is high, there is no guarantee that cinemagoing will be eliminated completely.

The declining interest of German audiences in cinematic entertainment can be attributed to the increasing consumption of VOD, the changing demographics, the amount of cinema halls and the lack of cinema program awareness. A further major topic is the fast availabilty of cinema films on VOD or rather, the reorganization of distribution windows. For the survey respondents, this factor has no pivotal influence on VOD's popularity or on avoiding cinemas. It is nevertheless possible that the shift in the VOD and theatrical windows, may impact cinema attendance in Germany. Furthermore, VOD market leaders and major film studios have started to release their films on VOD platforms, at the same time or shortly after they are released in theatres.

In conclusion, VOD has already changed the way movies are released. Nonetheless, the Film Promotion Act provides a middle ground between the pressure of major film studios to shorten the theatrical window and the economic and existential interests of cinema owners and operators. Thus, the formation of strategic partnerships between cinemas and film studios is essential to maintain distribution exclusivity and to create cinema awareness, ultimately winning German audiences back.

REFERENCES

1. Rothfuss, F 2022, 'Für 5 Euro fliegen mit Tom Cruise ', *Stuttgarter Nachrichten*, 9. September, p. 17.
2. Kreuzer, H 2010, *Digitale Film-Distribution*, Diplomica Verlag, Hamburg
3. Wüpper, T 2022, 'Kinos kommen kaum aus der Coronakrise ', *Stuttgarter Nachrichten*, 30. August, p. 10.
4. Prommer, E 2015, *Film und Kino: Die Faszination der laufenden Bilder*, Springer VS, Wiesbaden.
5. Haasis, B 2020, 'Stuttgart verliert sein Festivalkino', *Stuttgarter Zeitung*, 3 November, viewed 24 November 2022, <<https://www.stuttgarter-zeitung.de/inhalt/kinokrise-das-metropol-schliesst-stuttgart-verliert-sein-festival-und-premierenkino.1ff8f839-ca32-433b-b8bf-038fc479a59b.html>>
6. GfK on behalf of the FFA 2022, *Der Home-Video-Markt im Jahr 2021*, FFA – Filmförderungsanstalt, Berlin, p. 8, viewed 27 November 2022, <<https://www.ffa.de/marktdaten.html#video>>
7. Bake, H, Dorow, T, Paetsch, W, Sibbers D & Wiechert, M n.d., *Kinoleitfaden*, Die internationale Auswertungskette, FFA - Filmförderungsanstalt, viewed 10 December 2022 <<https://kinoleitfaden.de/kapitel/die-filmwirtschaft#subchapter7>>
8. Loetzer, N 2014, 'Neue Wege der Filmdistribution', Bachelor thesis, Hamburg University of Applied Sciences, Hamburg, viewed 17 October 2022, <<https://www.docsity.com/de/neue-wege-der-filmdistribution/8841800/>>
9. Bake, H, Dorow, T, Paetsch, W, Sibbers D & Wiechert, M n.d., *Kinoleitfaden*, Die internationale Auswertungskette, FFA - Filmförderungsanstalt, viewed 10 December 2022 <<https://kinoleitfaden.de/kapitel/die-filmwirtschaft#subchapter7>>
10. FFA 2022a, *Auswertungsfenster der Top 200 Kinofilme 2018 Sperrfristverkürzungen 2017-2021: Analyse zu durchschnittlichen Auswertungsfenstern von Kinofilmen sowie zu Anträgen und Bewilligungen von Sperrfristverkürzungen nach §§ 54, 55, 56 FFG 2017*, FFA – Filmförderungsanstalt Marktforschung und Statistik, Berlin, viewed 13 December 2022, <<https://www.ffa.de/marktdaten.html#publikationen>>
11. Die Bundesregierung 2022, *Filmförderungsgesetz*, press release, 20 May, Staatsministerin für Kultur und Medien, viewed 13 December 2022, <<https://www.bundesregierung.de/breg-de/bundesregierung/bundeskanzleramt/staatsministerin-fuer-kultur-und-medien/medien/filmfoerderung/filmfoerderungsgesetz>>
12. Holden, W 2021, *New film release windows emerging in the wake of the pandemic*, 5 August, S&P Global Market Intelligence, viewed 13 December 2022, <<https://www.spglobal.com/marketintelligence/en/news-insights/blog/new-film-release-windows-emerging-in-the-wake-of-the-pandemic>>
13. Sky 2021, „Wonder Woman 1984“ ab morgen noch vor Kinostart exklusiv bei Sky und Sky Ticket, 17 February, Sky Deutschland GmbH, viewed 13 December 2022, <https://info.sky.de/inhalt/de/medienzentrum_news_pr_17022021.jsp>
14. Ulin, J 2009, *The Business of Media Distribution: Monetizing Film, TV and Video Content in an Online World*, 1st edn, Focal Press, Burlington, Massachusetts.
15. Popp, W, Parke, L & Kaumanns, R 2008, 'Rechtmanagement in der digitalen Medienwelt', *Media Perspektiven*, vol. 9, pp. 453–466, viewed 13 December 2022, <chrome-extension://efaidnbmninnibpcapjpcglclefindmkaj/https://www.ard-media.de/fileadmin/user_upload/media-perspektiven/pdf/2008/09-2008_Popp.pdf>
16. Holden, W 2021, *New film release windows emerging in the wake of the pandemic*, 5 August, S&P Global Market Intelligence, viewed 13 December 2022,

- <<https://www.spglobal.com/marketintelligence/en/news-insights/blog/new-film-release-windows-emerging-in-the-wake-of-the-pandemic>>
17. Dewenter, R & Westermann, M 2005, 'Cinema Demand in Germany', *Journal of Cultural Economics*, vol. 29, 213-231, Springer, viewed 15 October 2022, <<https://doi.org/10.1007/s10824-005-6421-0>>
 18. Dessy O & Gambaro M 2009, 'Demand for Movies in Europe and the Effect of Multiplex Diffusion: A Panel Approach', Università Degli Studi di Milano, Milan, p.10, viewed 30 November 2022, <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1176542&rec=1&srcabs=940595&alg=7&pos=6,>
 19. Wagner, S & Parlow, A 2018 , 'Eine Analyse des Einflusses von Netflix und Filesharing auf die Kinoindustrie', University of Rostock, Rostock, pp. 14-45, viewed 15 October 2022, <<https://www.econstor.eu/handle/10419/177891>>
 20. MacMillan, P & Smith, I 2001, 'Explaining Post-War Cinema Attendance in Great Britain. *Journal of Cultural Economics*', vol. 25, pp. 91–108, viewed 29 December 2022, <<https://link.springer.com/article/10.1023/A:1007630400082>>
 21. Rabe, L 2021, *Umfrage zu Endgeräten für die Internetnutzung in Deutschland nach Alter 2020*, 10 November, Statista, viewed 20 December 2022, <<https://de.statista.com/statistik/daten/studie/1118965/umfrage/endgeraete-zur-internetnutzung-in-deutschland-nach-altersgruppen/>>
 22. Statista Research Department 2022a, *Number of annual entries in cinemas in France between 2007 and 2021*, 12 December, Statista, viewed 5 January 2023, <<https://www.statista.com/statistics/781773/attendance-cinema-rooms-la-france/>>
 23. O'Neill, A 2022, *Population of France from 1700 to 2020*, 21 June, Statista, viewed 5 January 2023, <<https://www.statista.com/statistics/1009279/total-population-france-1700-2020/>>
 24. Wagner, S & Parlow, A 2018 , 'Eine Analyse des Einflusses von Netflix und Filesharing auf die Kinoindustrie', University of Rostock, Rostock, p. 14, viewed 5 January 2022, <<https://www.econstor.eu/handle/10419/177891>>
 25. Destatis 2023a, *Mehr als ein Drittel (37 %) der monatlichen Konsumausgaben entfallen aufs Wohnen*, n.d., Statistisches Bundesamt, viewed 5 January 2023, <<https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Einkommen-Konsum-Lebensbedingungen/Konsumausgaben-Lebenshaltungskosten/aktuell.html>>
 26. Prommer, E 2015, *Film und Kino: Die Faszination der laufenden Bilder*, Springer VS, Wiesbaden.
 27. FFA 2020a, *Kinobesucher*innen 2019*, FFA – Filmförderungsanstalt, Berlin, p. 10, viewed 29 September 2022, <<https://www.ffa.de/marktdaten.html#studien>>
 28. FFA 2009a, *Der Kinobesucher 2008*, FFA – Filmförderungsanstalt, Berlin, p. 5, viewed 29 September 2022, <<https://www.ffa.de/marktdaten.html#studien>>
FFA 2012a, *Der Kinobesucher 2011*, FFA – Filmförderungsanstalt, Berlin, p. 5, viewed 29 September 2022, <<https://www.ffa.de/marktdaten.html#studien>>
FFA 2015a, *Der Kinobesucher 2014*, FFA – Filmförderungsanstalt, Berlin, p. 5, viewed 29 September 2022, <<https://www.ffa.de/marktdaten.html#studien>>
FFA 2018a, *Der Kinobesucher 2017*, FFA – Filmförderungsanstalt, Berlin, p. 6, viewed 29 September 2022, <<https://www.ffa.de/marktdaten.html#studien>>
FFA 2020a, *Kinobesucher*innen 2019*, FFA – Filmförderungsanstalt, Berlin, p. 5, viewed 29 September 2022, <<https://www.ffa.de/marktdaten.html#studien>>
 29. FFA 2009b, *Entwicklung der Kinostandorte, Spielstätten und Kinosäle 2007 bis 2009*, FFA – Filmförderungsanstalt, Berlin, viewed 6 December 2022, <<https://www.ffa.de/marktdaten.html>>

- FFA 2012b, *Entwicklung der Kinostandorte, Spielstätten und Kinosäle 2010 bis 2012*, FFA – Filmförderungsanstalt, Berlin, viewed 6 December 2022, <<https://www.ffa.de/marktdaten.html>>
- FFA 2015b, *Entwicklung der Kinostandorte, Spielstätten und Kinosäle 2013 bis 2015*, FFA – Filmförderungsanstalt, Berlin, viewed 6 December 2022, <<https://www.ffa.de/marktdaten.html>>
- FFA 2018b, *Entwicklung der Kinostandorte, Spielstätten und Kinosäle 2016 bis 2018*, FFA – Filmförderungsanstalt, Berlin, viewed 6 December 2022, <<https://www.ffa.de/marktdaten.html>>
- FFA 2020b, *Standorte, Spielstätten, Leinwände in den einzelnen Bundesländern – 3 Jahre im Vergleich*, FFA – Filmförderungsanstalt, Berlin, viewed 6 December 2022, <<https://www.ffa.de/marktdaten.html>>
30. Davies, K 2022, *Number of internet users in Germany 1997-2022*, 30 November, Statista, viewed 1 December 2022, <<https://www.statista.com/statistics/380522/number-of-internet-users-germany/>>
- Davies, K 2023, *Annual average unemployment figures for Germany 2005-2023*, 14 February, Statista, viewed 1 December 2022, <<https://www.statista.com/statistics/226994/annual-average-unemployment-figures-for-germany/#:~:text=Annual%20average%20unemployment%20figures%20in,for%20the%20whole%20of%202021>>
- Statista Research Department 2022b, *Population numbers in Germany 1990-2021*, 2 December, Statista, viewed 1 December 2022, <<https://www.statista.com/statistics/672608/development-population-numbers-germany/>>
31. Destatis 2022, *Volkswirtschaftliche Gesamtrechnungen: Private Konsumausgaben und Verfügbares Einkommen*, 3. Vierteljahr 2022, Statistisches Bundesamt, viewed 1 December 2022, <https://www.destatis.de/DE/Themen/Wirtschaft/Volkswirtschaftliche-Gesamtrechnungen-Inlandsprodukt/Publikationen/Downloads-Inlandsprodukt/konsumausgaben-pdf-5811109.pdf?__blob=publicationFile>
32. GfK on behalf of the FFA 2014, *Der Videomarkt 2013*, FFA – Filmförderungsanstalt, Berlin, p. 23, viewed 27 November 2022, <<https://www.ffa.de/marktdaten.html#video>>
- GfK on behalf of the FFA 2016, *DER HOME VIDEO MARKT 2015*, FFA – Filmförderungsanstalt, Berlin, p. 14, viewed 27 November 2022, <<https://www.ffa.de/marktdaten.html#video>>
- GfK on behalf of the FFA 2018, *Der Home Video Markt im Jahr 2017*, FFA – Filmförderungsanstalt, Berlin, p. 22, viewed 27 November 2022, <<https://www.ffa.de/marktdaten.html#video>>
- GfK on behalf of the FFA 2020, *Der Home-Video-Markt im Jahr 2019*, FFA – Filmförderungsanstalt, Berlin, p. 13, viewed 27 November 2022, <<https://www.ffa.de/marktdaten.html#video>>
33. Myers, JL & Well, AD 2003, *Research Design and Statistical Analysis*, 2nd edn, Lawrence Erlbaum Associates, Publishers, Mahwah, New Jersey.
34. Schober, P, Boer, C, Schwarte, LA 2018, 'Correlation Coefficients: Appropriate Use and Interpretation', *Anesthesia & Analgesia*, vol. 126, no. 5, pp. 1763-1768, viewed 16 October 2022, <https://journals.lww.com/anesthesia-analgesia/fulltext/2018/05000/correlation_coefficients__appropriate_use_and.50.aspx>
35. Bradhurn, S 2021, *How To Create A QQ Plot In Microsoft Excel*, Top Tip Bio, viewed 16 October 2022, <<https://toptipbio.com/qq-plot-excel/>>
36. Shapiro, SS & Wilk, MB 1965, 'An analysis of variance for normality (complete samples)', *Biometrika*, vol. 52, no 3/4, pp. 591-611, viewed 17 October 2022, <<http://www.lithoguru.com/scientist/statistics/Lecture16.pdf>>

37. Myers, JL & Well AD 2003, *Research Design and Statistical Analysis*, 2nd edn, Lawrence Erlbaum Associates, Publishers, Mahwah, New Jersey.
38. Wooldridge JM 2002, *Introductory Econometrics: A Modern Approach*, 5th edn, South-Western, Cengage Learning, Mason, Ohio.
39. Wooldridge JM 2002, *Introductory Econometrics: A Modern Approach*, 5th edn, South-Western, Cengage Learning, Mason, Ohio.
40. DATAtab Team 2023, *DATAtab: Online Statistics Calculator*, DATAtab e.U. Graz, Austria, viewed 1 December 2022, <<https://datatab.net/statistics-calculator/regression> >
41. Shuangyuan, W 2021, *Testing the Assumptions of Linear Regression*, 28 May, Towards Data Science, Medium, viewed 10 January 2023, <<https://towardsdatascience.com/testing-the-assumptions-of-linear-regression-f38857abc08a>>
42. Feldman, K 2018, *Standardized Residual*, 7 November, iSixSigma, viewed 15 November 2022, <<https://www.isixsigma.com/dictionary/standardized-residual/#:~:text=A%20raw%20residual%20is%20the,the%20total%20set%20of%20residuals.>>>
43. Zhu, A 2022, *Are the Error Terms Normally Distributed in a Linear Regression Model?*, 23 November, Towards Data Science, Medium, viewed 15 November 2022, <<https://towardsdatascience.com/are-the-error-terms-normally-distributed-in-a-linear-regression-model-15e6882298a4>>
44. Wu, S 2020, *Multicollinearity in Regression*, 19 May, Towards Data Science, Medium, viewed 15 November 2022, <<https://towardsdatascience.com/multi-collinearity-in-regression-fe7a2c1467ea>>
45. Walther, B 2020, *Multikollinearität in Excel erkennen (VIF-Werte)*, 24 April, Statistik am PC, viewed 16 November 2022, < <https://www.youtube.com/watch?v=TLJ7Z0KmS1w&t=55s> >
46. Glen, S 2021, *Standardized Values: Example*, n.d., StatisticsHowTo.com, viewed 15 November 2022, <<https://www.statisticshowto.com/standardized-values-examples/>>
47. Frost, J 2023, *Heteroscedasticity in Regression Analysis*, n.d., Statistics by Jim, viewed 15 November 2022, <<https://statisticsbyjim.com/regression/heteroscedasticity-regression/>>
48. Hemmerich, W 2023, *Kombination ohne Wiederholung*, n.d., MatheGuru, viewed 1 December 2022, <<https://matheguru.com/stochastik/kombination-ohne-wiederholung.html#:~:text=Bei%20der%20Kombination%20ohne%20Wiederholung,Lotto%20ist%20hierf%C3%BCr%20ein%20Beispiel>>
49. Simonton, D 2005, 'FILM AS ART VERSUS FILM AS BUSINESS: DIFFERENTIAL CORRELATES OF SCREEN PLAY CHARACTERISTICS', *EMPIRICAL STUDIES OF THE ART*, vol. 23, no. 2, pp. 93-117.
50. Kromrey, H 2013, *Empirische Sozialforschung: Modelle und Methoden der standardisierten Datenerhebung und Datenauswertung*, 10th edn, VS Verlag für Sozialwissenschaften, Wiesbaden
51. Berekoven, L, Eckert, W & Ellenrieder, P 2006, *Marktforschung: Methodische Grundlagen und praktische Anwendung*, 11th edn, Gabler Verlag, Wiesbaden.
52. Franzen, A 2014, *Antwortskalen in standardisierten Befragungen*, in *Handbuch Methoden der empirischen Sozialforschung*, Springer VS, Wiesbaden, viewed 1 January 2022, < https://link.springer.com/chapter/10.1007/978-3-531-18939-0_51 >
53. FFA 2022b, *Evaluierungsbericht zur Entwicklung des Abgabeaufkommens vor dem Hintergrund der wirtschaftlichen Situation des Filmmarktes in Deutschland gemäß § 171 Abs. 1 FFG*, Studie der FFA – Filmförderungsanstalt, Berlin, p. 42, viewed 27 January 2023, <<https://www.ffa.de/marktdaten.html#studien>>
54. Destatis 2023b, *Bevölkerung in Deutschland*, Statistisches Bundesamt, viewed 11 February 2023, <<https://service.destatis.de/bevoelkerungspyramide/index.html#!y=2023&a=30,39&g>>

55. Destatis 2023b, *Bevölkerung in Deutschland*, Statistisches Bundesamt, viewed 11 February 2023, <<https://service.destatis.de/bevoelkerungspyramide/index.html#!y=2023&a=40,49&g>>
56. Master's in Data Science 2023, *What is the Difference Between Bias and Variance?*, University of London, viewed 28 January 2023, <<https://www.mastersindatascience.org/learning/difference-between-bias-and-variance/>>
57. Negele, T 2015, 'Ist der deutsche Kinofilm wirklich ein Auslaufmodell? ', *Politik & Kultur*, 1 March, p.22, viewed 28 January 2023, <<https://www.kulturrat.de/publikationen/zeitung-pk/02-2015/>>