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Did the Days of Culture Nurture the Expenditure on Motion Pictures?

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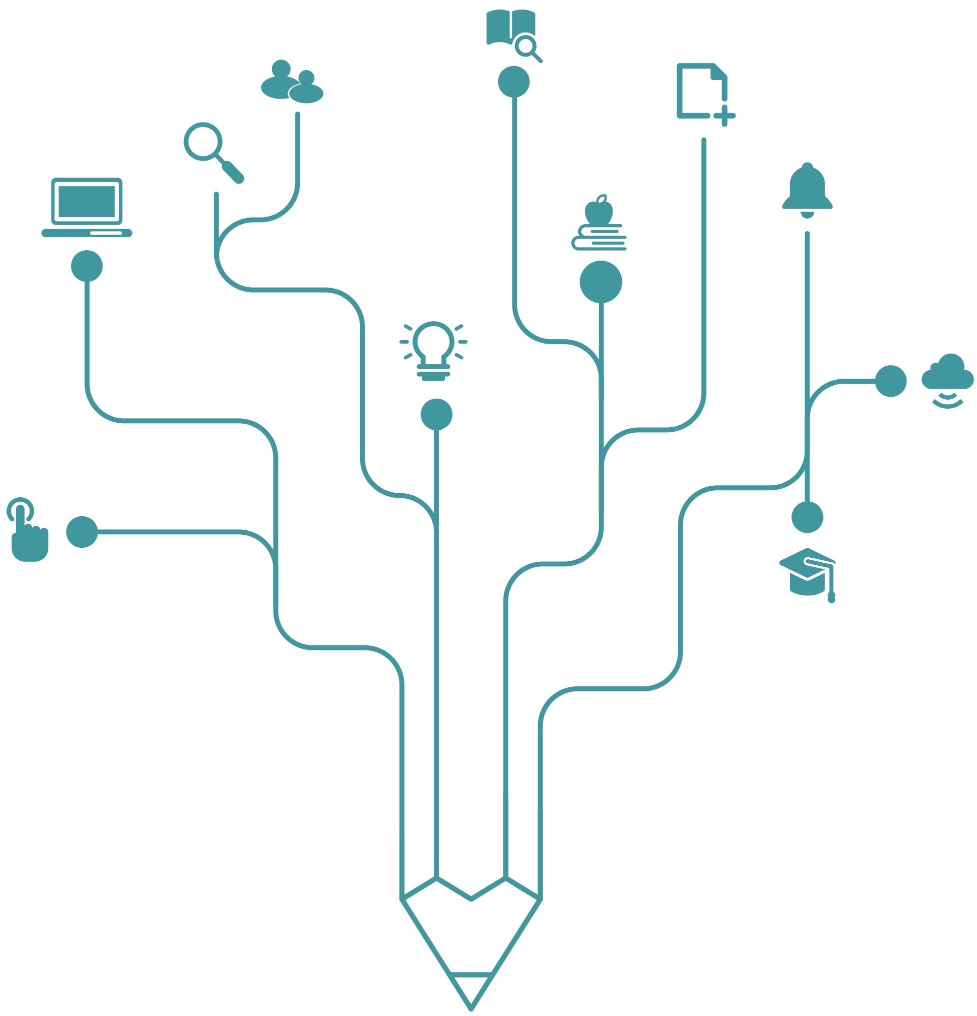

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Abstract

In Korea, since 2014, the last Wednesday of every month has been designated as "Day of Culture (DoC)" on which discounts about half the normal price are applied to movies. This study empirically analyzes the differences in the number of audience and their expenditure before and after the introduction of the DoC. To this end, we construct panel data using daily movie screening data by 16 regions in the country. Estimation results applying difference in differences models reveal that the DoC has a statistically significant positive effect on both revenue and audience with the average treatment effect of 34.0 percent and 43.7 percent, respectively. Moreover, no evidence of cannibalization in the sense that no statistically significant decreases in revenue and audience on last Tuesday and Thursday of a month after the introduction of the DoC is found. Overall, estimation results suggest that the DoC creates the new demand for movies and expands opportunities for cultural enjoyment without any budgetary subsidy.

Keywords: Movies, Cinema demand, Movie ticket discount, Cannibalization, Difference in differences

JEL classification: L82, Z18, I38, H80

Did the Days of Culture Nurture the Expenditure on Motion Pictures?

I. Introduction

One of the most direct methods of policy support for the cultural industry is to reduce consumer spending. In Korea, since 2014, the last Wednesday of every month has been designated as "Day of Culture (DoC)" and discounts are applied to various exhibitions and performances. In the case of movies, the ticket price for screenings between 5pm and 9pm is discounted to 5,000 Korean Won (KRW), which is about half of the normal price. Interestingly, offering the discount is entirely voluntary on the part of theaters, and there is no government financial support for the discounts.

Although apparent increases in demand on the DoC have been observed since the introduction of the program, there were a few criticisms about the effectiveness of the policy. First, some concern that the effect is limited because the participation rate is low due to low awareness of the DoC. Second, it was pointed out in the political arena that incentives for suppliers to participate were insufficient as there was no financial support from the government for theaters participating in the system. Third, there is an opinion that even though demand increased on cultural days, this is only a substitution effect that was created by moviegoers adjusting their viewing dates to receive discounts. First two concerns are about the magnitude of the effectiveness while the last concern is on the existence of the effect.

From these concerns and opinions, we can extract two empirical questions:

Q1. To what extend the number of film audience and their expenditure on movie tickets has increased with the introduction of the DoC?

Q2. If the DoC increased the number of film audience and/or their expenditure, are they newly created or simply depriving other days' demand?

To provide empirical evidences in responding to these questions, this study aims to analyze the quantitative differences in the number of audience and their expenditure before and after the introduction of the DoC. To this end, we deal with panel data using daily movie screening data by region. Korea's extensive daily box office data which covers more than 99 percent of theaters nationwide enables the analyses on daily movie ticket sales by region.

The analysis of this study is divided into two parts. First, using the difference in differences (DID) method, we examine whether demand and expenditure on the last Wednesday of every month before and after the introduction of DoC have revealed statistically significant increases. This work may provide answers to the first question above. Second, in a similar way, we examine whether there is a statistically significant change in demand and expenditure on Tuesday and Thursday of the last week of each month. Given the second question about, this part of work is to examine the "cannibalization effect" that causes significant decrease in demand and spending on the days adjacent to the DoC.

Estimation results find that the DoC has a statistically significant positive effect on both revenue and attendance with the average treatment effect of 34.0 percent and 43.7 percent, respectively. Moreover, no evidence of cannibalization in the sense that no statistically significant decreases in revenue and attendance on last Tuesday and Thursday of a month after the introduction of the DoC is found.

Consequently, estimation results of this study provide two policy implications. First, estimation results suggest that the discount program of the DoC creates the new demand for movies and expands opportunities for cultural enjoyment without any budgetary subsidy. Second, the increase in revenue due to newly created demand is an incentive for theaters to voluntarily participate in discount programs even without government support.

The rest of this paper is structured as follows. Section II introduces the Korean context regarding movie industry and policy intervention with the DoC and Section III describes data and estimation methodology. Section IV discusses the estimation results and Section V is devoted to concluding remarks.

II. Korean Context

2.1. Motion Pictures Market

According to Motion Picture Association (2020, p.13), Korea is the third largest box office market outside the US/Canada in 2019 with sales of 1.6 billion US dollars. The market has shown steady growth since the mid-2000s. As shown in Figure 1, except for a slight stagnation in the late 2000s, the number of new releases, screenings, sales, and admissions all tend to increase. Here, sales are purely total movie ticket sales, excluding concession sales. Another feature of Korean motion pictures market is its high attendance frequency of moviegoers. In 2017, the average number of cinema visits per capita (population aged between 5 and 79 years old) in Korea was 4.66, surpassing Iceland and the United States to rank first in the world (http://data.uis.unesco. org, accessed July 6, 2022).

[Insert Figure 1 about here]

Along with the rapid quantitative growth, market concentration of the Korean film market has intensified in two facets: allocation of screens and proportion of multi-screen theaters. First, if we look at the average share of screenings per day in 2019, the movie with the highest share accounted for an average of 35.8 percent of the total number of screenings per day. The 2nd and 3rd place films accounted for 20.0 percent and 13.4 percent, respectively, indicating that only three films accounted for about 70 percent of the total number of screenings in theaters nationwide on a single day in 2019. Over the past five years, the proportions of the 2nd and 3rd place films have increased or decreased by around 1-2 percent. However, the compound annual growth rate (CAGR) of the top-ranked films between 2015 and 2019 was 3.53 percent, which clearly shows the concentration of demand for hotselling films (Korea Film Council, 2020, p.47).

Second, the oligopolistic status of multi-screen theaters in Korean film market is stronger than in other countries. The multi-screen theaters refer to the direct and consigned management branches of 4 major multiplex companies, namely CJ CGV, Lotte Cinema, Megabox, and Cine Q and all theaters with 7 or more screens nationwide. In 2019, the concentration ratio (CR) of top companies was 49.5 for CR_1 and 97.2 for CR_3, and the Herfindahl-Hirschman Index (HHI) was 3,641 (Korea Film Council, 2020, p.43). As shown in Figure 2, Korean multi-screen theaters occupy more than 90 percent of the total screens. This is a remarkable figure compared to the US and Japan showing 80 percent, the UK about 3 quarters, and France staying at only 30-40 percent. In 2019, based on the number of theaters, the proportion of multi-screen theaters was 79.3 percent, with an audience share of 97.2 percent and a sales share of 98.1 percent (Korea Film Council, 2020, p.84).

[Insert Figure 2 about here]

The pricing of movie tickets is done at the discretion of the movie theater. Theaters adopt an incomplete form of uniform pricing that differentiates them according to time of day and day of the week. The characteristics of the film, such as the length of the movie or the production cost, do not affect the price, which is typical as discussed in Orbach and Einav (2007) and Ho et al. (2018). Before March 2016, CJ CGV, a market dominator that other major competitors follow the pricing policy, differentiated between 6,000 and 9,000 Korean Won (KRW) on weekdays (Monday through Thursday) and KRW 6,000 to 10,000 on weekends (Friday through Sunday), depending on the show time. However, from March 2016, prices are further differentiated even at the same time slot according to the location of the seat, and the distribution ranged from KRW 6,000 to 10,000 on weekdays and from KRW 7,000 to 11,000 on weekends. Prime time, which mainly attracts audiences, is set between 4-10 pm on weekdays and 10 am-midnight on weekends, so the price of a typical movie is KRW 9,000-10,000 on weekdays and KRW 10,000-11,000 on weekends.

Unlike the US and Spain, which have a sliding scale form (Filson et al., 2005; Gil and Lafontaine, 2012), the revenue sharing structure for ticket sales in Korean motion picture market is fixed. After deducting 10 percent of sales tax and 3 percent of the movie development fund, the half of remaining ticket sales (43.5 percent of the total) is taken from the exhibitor (theater). Of the other half, 10 percent is allocated to the distributor’s commission. Finally, the remaining amount is divided between the producer and the investor in a 40 to 60 ratio. The Korean motion picture market has a fixed revenue sharing scheme in that the above-mentioned distribution ratio does not change over time after the release date, partly because exhibitors, multiplex chains in particular, have superior market power compared to distributors with respect to the vertical value chain.

Lastly, the Korean motion picture market reveals general characteristics of motion picture market with respect to seasonality and within-week variation. First, as shown in Figure 3, seasonal changes generally show the highest number of audiences in summer (especially August), followed by December. Two biggest holidays in Korea are set according to the lunar calendar: Korean Thanksgiving Day in September or October and Lunar New Year's Day in January or February. Among them, the effect on demand seems to be relatively large on Lunar New Year's Day. Throughout the year, spring generally has the lowest attendance.

[Insert Figure 3 about here]

Second, the markets in weekdays and weekends show distinctive features. Most prominently, weekend sales and attendance on Saturdays and Sundays significantly exceed those during weekdays. By year, sales and attendance on Saturday and Sunday are 1.69-3.28 and 1.47-3.12 times that of Wednesday, respectively. Considering that prices from Friday to Sunday are higher than other days of the week as mentioned above, the gap between the weekend and weekday markets is substantial.

2.2. Day of Culture

The Korean government proclaims that the DoC is designated for the purpose of realizing a cultural life through the expansion of the people's right to enjoy culture in their daily lives in accordance with Article 12 (2) of the Framework Act on Culture. As introduced above, the DoC policy was first implemented in January 2014, and the legal basis for the policy was laid by amending the Framework Act on Culture in May 2016.

On the DoC, the last Wednesday of every month, discounts on movie tickets are offered along with discounts on admission to other performances, exhibitions, and sporting events. The ticket price for 2D movies that are screened between 17:00 and 21:00 at major movie theaters nationwide is discounted to KRW 5,000, which is about half of the normal price. There is no government subsidy for the discount on movie admission fees, and the participation of movie theaters in the discount policy was completely voluntary. While the market share of multi-screen theaters is high as mentioned above, the three major multiplexes and small local movie theaters participated from the beginning of the policy, showing a participation rate of about 80 percent of the total theaters.

As a result of a survey of 5,000 individuals aged 15 and above to find out their awareness and satisfaction with the DoC, the responses that they were aware of the DoC were 60.0 percent and 68.9 percent in 2017 and 2018, respectively. Among the respondents who said they knew about the DoC, the proportion of those who used it were 50.7 percent and 59.8 percent in 2017 and 2018, respectively. As shown in Figure 4, both the awareness of and participation to the DoC have steadily increased with CAGR 13.1 percent and 14.0 percent from 2014 to 2019, respectively (Regional Culture and Development Agency, 2020, pp.15-16).

[Insert Figure 4 about here]

As mentioned earlier, the DoC offers discounts not only for movies but also for other cultural activities. However, most people perceive it as a day when they can get movie discounts. Multiple selections were allowed in asking ask whether there was any experience of receiving a discount on the DoC in 2019, and as a result of combining the 1st and 2nd rankings, "watching a movie at the cinema" was the most at dominating 79.0 percent. Next, they answered that they had experience in the order of "watching a performance at a performing art center or concert hall' (24.5 percent) and "watching an exhibition at a museum or art gallery" (18.3 percent) (Regional Culture and Development Agency, 2020, p.17).

[Insert Figure 5 about here]

The change in the release date is mentioned as an example of the DoC's influence on the behavior of theaters as shown in Figure 5. Prior to 2014, most movies were released on Thursday. As discussed above, due to the high weekend demand of the motion picture market, releasing on Thursday, the weekday just before the weekend in which Friday is included, was a strategy to increase weekend audiences by word-of-mouth. However, after the DoC was introduced in 2014, theaters that were expecting an increase in demand to take advantage of the DoC discount began to move the release date one day up to Wednesday. Since then, the release date has been diversified for smaller-sized films to avoid the release dates of large-scale works.

III. Data and Estimation Method

3.1. Data from Korean Box Office Information System

The Korean box office information system (KOBIS) is a computer network that counts the number of moviegoers in Korea in real time, operated by the Korean Film Council. The KOBIS was established in 2003 and a half of theaters joined the system in 2004. In 2006, the subscription rate was 86 percent. Meanwhile, the Article 39 of the Act on Promotion of the Motion Pictures and Video Products mandates that each movie theater operator should connect to the KOBIS, which was newly inserted on March 2010. As a result, since 2011 the system collects information from more than 99 percent of all theaters. For the sake of data consistency, we use the data from 2011 to 2019 to prevent omission of uncounted data before 2011 and to eliminate the impact of changes in movie viewing behavior due to the pandemic of COVID-19 after 2019.

The statistical information contained in the KOBIS is detailed and extensive, and is made in real time. Starting with basic information about films and filmmakers, it provides the list of cinemas with their characteristics, daily and periodical box office statistical information including number of screenings, seats, sales, and attendance by region. In order to take advantage of the richness of the provided data, the unit of analysis is set to be “province”, the regional unit of data aggregated at the lowest level. At the provincial level, Korea has 17 regions in two types: 9 provinces and 8 metropolitan cities. Although provinces generally have a large area, metropolitan cities have a high population density, so the population is relatively evenly distributed. Among metropolitan cities, Sejong City, which was newly separated from a province in 2012, was excluded from the analysis due to the lack of time series data and its significantly small population.

To analyze the effect of the DoC, a comparison between the recipients of discount by the DoC and the control group should be performed. Unfortunately, the data is aggregated by day, so it is impossible to distinguish between those who received the discount those who did not on the DoC. Therefore, comparison between the DoC and non-DoC should be performed. As can be seen from the previous explanation of movie ticket pricing, demand for movies is clearly divided into weekdays and weekends. Moreover, considering the number of observations in the data, it is possible to set the control group to non-last week Wednesdays to remove the effect of the day of the week.

Figure 6 compares the ticket sales to admission ratio, i.e. per capita admission fee, between the last Wednesday of each month and the other Wednesdays. From 2014, the values show a significant difference between the two groups, which implies that the demand is concentrated during the discount timeslot (between 17:00 and 21:00) as the DoC is on a weekday.

[Insert Figure 6 about here]

3.3. Estimation Method and Variables Used

We use the DID method to examine the effect of the DoC. The model setup is as follows:

$$log\, Y_{it} = X_{it}^{'}\beta + \gamma D_{it}^{Last} + \tau D_{it}^{After} + \delta D_{it}^{Last} \times D_{it}^{After} + \eta_i + \nu_t + \varepsilon_{it}$$

where the dependent variable Y_{it} may be the sales and audience of region i at time t provided by KOBIS. On the right-hand side we have two dummy variables D_{it}^{Last} and D_{it}^{After} whose value is one if the day is in the last week of the month and after the introduction of the DoC (January 2014), and zero otherwise, respectively. Other characteristics of region i at time t along with a constant are included in X_{it}. The region fixed effect and time fixed effect are summarized in η_i and ν_t, respectively. For the time fixed effect, we consider month fixed effect as well as week fixed effect. The unobserved disturbance is denoted as ε_{it}.

The analysis is different from the usual DID setting, in that the data are divided into regions and time to construct a panel, but regions are not divided into treatment and control groups. Instead, the treatment group is the last Wednesdays of months corresponding to the DoC from 2014, and the control group is the other Wednesdays.

Typical estimation techniques of panel data such as fixed effect (FE) and random effect (RE) assume that disturbances are cross-sectionally independent. Given this, we follow the convention to select a model between FE and RE using the Hausman test. However, the cross-section dependence of the disturbance may exist in general and thus we check it with the cross-section dependence (CD) test proposed by Pesaran (2021). Detecting the cross-section dependence of the disturbance, we use the panel-corrected standard errors (PCSE) approach which assumes that the disturbances are, by default, heteroskedastic and cross-sectionally correlated across panels (Beck and Katz, 1995).

[Insert Table 1 about here]

Table 1 summarizes the variables used and their basic statistics. The explanatory variables include characteristics of a day in a region directly related to movie showing and factors affecting the movie demand. To control for weather, measures of temperature and precipitation are included following the convention in literature (e.g. Gil and Hartmann, 2009 and De Roos and McKenzie, 2014). The temperature measure, $Temp_{it}$, is the difference between the daily highest temperature and the monthly average in Celsius, while the precipitation is measured daily in centimeters as in De Roos and McKenzie (2014). Both temperature and precipitation are obtained by excluding 10 observations in areas without movie theaters out of 66 observation points nationwide used to calculate the average for each province by Korea Meteorological Administration.

Two log-transformed variables representing potential demand by region and capacity to accommodate demand are added: population ($Lpop_{it}$) and number of screens ($Lscreen_{it}$). We use the monthly regional resident registration demographics published by the Ministry of Public Administration and Security and the number of screens by region on a year of KOBIS. For a similar control, McKenzie and Walls (2016) used the number of theaters in log-form but considering high proportion of multi-screen theaters in the market whose screen counts are varied widely, we include the number of screens as in Davis (2006).

Holidays, which have a significant impact on demand, are controlled as a dummy variable, $Holiday_{it}$ (Gil and Lafontaine, 2012). It has a value of 1 if the date is an official holiday, either a public or national holiday, and 0 otherwise. Since Korean holidays do not set a specific day of the week but are determined according to the date, the fact that Wednesday is a holiday does not have a systematic pattern.

Finally, we consider the supply-driven market condition. In estimating movie demand, Marshall et al. (2013, p.1086) introduced a competition measure by calculating the number of movies released simultaneously as well as the total amount of copies of these released films. However, the KOBIS data do not include such information and thus we include two variables to indicate the state of supply of movies in a region on a given day: number of showings and "freshness." The number of showings per day in logarithm, $Ldayshowing_{it}$, is the log-transformed sum of the number of screens that showed a movie on that day.

The freshness is uniquely defined in the current study to represent the attractiveness of movies shown in a region on average. It is calculated as the weighted average of the number of days elapsed from the release date of the two films with the highest occupancy among films screened on a day in a region. Here, the weight is determined by the (relative) number of viewers of each movie and the release date is counted as one. For example, "Aladdin" and "Parasite" were released on

May 23 and 30, 2019, respectively. Let us say that on June 1st, each film occupied most of the sales and had an audience of 50,000 and 80,000 in a region, respectively. In this case, the freshness of the region is $(8/13)\times3+(5/13)\times10=5.69$. Targeting the top 2 movies is intended to account for the fact that there is a strong demand concentration on specific films in the Korean film market as discussed in the previous section, while giving weights according to the number of viewers is to reflect the audience's preference.

As introduced above with Figure 5, while the Korean film industry's conventional choice of release date was Thursdays, the number of releases on Wednesdays has been increasing, and this is especially the case in the last week of the month after 2014 with the implementation of the DoC. The freshness variable proposed in this study indicates such a change in the releasing behavior of theaters. As shown in Table 2, in the last week of each month before 2014, there was a statistically significant difference in the freshness of Wednesday and Thursday, but no difference after 2014, which indicates that more releases occur on the DoC. Contrastingly, for other weeks, the preference for a Thursday release after 2014 remains.

[Insert Table 2 about here]

Given a strong seasonal fluctuation as seen in Figure 3, we allow controlling for seasonality by including month fixed effect along with year fixed effect. Contrastingly, Marshall et al. (2013) generated a continuous and discrete variable considering standardized values between 1 and 0 as a result of the average monthly attendance during the three years of evaluation, and three scenarios: high, medium, and low attendance, respectively (Marshall et al., 2013, p.1086). Given sufficiently longer series of the current study's data, we avoid such a continuous transformation and arbitrary discrete categorization.

IV. Estimation Results and Discussions

4.1. Main Results

Tables 3 and 4 show the estimation results for expenditure and attendance on Wednesdays, respectively. The panel models are selected between FE and RE by the results of Hausman tests. In any cases with and without fixed effects, the cross-sectional independence is rejected by Pesaran's CD test. Therefore, the PCSE models on the right-hand side of each table are relevant for interpretation. Among them, we interpret the results focusing on the model that considers both the month fixed effect and the week fixed effect (Model VI). Here, we can confirm that the results of Models IV and V show similar patterns to those of Model VI, showing the robustness of the main model.

[Insert Tables 3 and 4 about here]

The statistical significances are identical for expenditure and attendance except the temperature, for which the expenditure is positively influenced whilst no statistically significant influence to attendance is found. This is probably partly because when the weather is nice, people watch movies in the daytime rather than in the evening. In this case, especially in the DoC, the amount of expenditure increases even if there is no significant change in the total number of visitors on the day.

Population that represent potential demand in a region has statistically significant influence on both expenditure and attendance as expected. A 1 percent increase in population *ceteris paribus* induces 0.88 percent increase in expenditure and 0.29 percent increase in attendance on average. Comparing the magnitude of them, the influence of population is more sensitive to the attendance in prime time when ticket prices are high.

The number of screens in a region which describes the capacity to accommodate demand shows opposite results to the expenditure and attendance. A 1 percent increase in the number of screens *ceteris paribus* causes 2.04 percent increase in expenditure and 1.15 percent decrease in attendance on average. Other things being equal, this may suggest that in areas with high screen count, people tend to watch movies mainly during the daytime.

The holiday effect is prominent to both the expenditure and attendance. When other factors are controlled for, spending on public holidays is 3.42 times higher and the number of visitors is 1.63 times higher than on non-holidays. Similar to the influence of population above, we can conjecture that the number of audience during prime time increases relatively larger than those during other timeslots on public holidays.

Two factors indicating the supply of movies show different patterns of influence. First, a 1 percent increase in the number of showings per day reduces the expenditure by 2.13 percent and increases the attendance by 1.92 percent. Since movies are shown almost continuously during prime time, which is generally 4-10pm, an increase in the number of screenings usually means that more movies are shown outside of prime time. Therefore, when other factors were controlled for, these results show that, although more audiences attended on high screening days, the increase mainly occurred outside of prime time.

Second, the freshness affects the expenditure and attendance as expected. A 1 percent decrease in the freshness raises the expenditure and attendance by 0.27 percent and 0.19 percent, respectively. In other words, if the movies with the largest number of audiences on one day have just been released, they have a high attracting power.

We are remained to interpret the estimated coefficients of dummy variables, $\hat{\gamma}$, $\hat{\tau}$, and $\hat{\delta}$. First, from $\hat{\gamma}$, we find that the fact that it is the last day of the week does not have a statistically significant effect on both the expenditure and attendance before 2014.

Second, comparing Wednesdays not in the last week of a month before and after 2014 using $\hat{\tau}$, expenditure increased by 37.2 percent and attendance decreased by 8.64 percent on average, after other factors are controlled for. This is partly explained by the price increase in 2016. Considering that the price increase in 2016 was 11.1-12.5 percent, we can infer that the attendance decreased, but the proportion of prime-time audiences increased after 2014.

Third, the interaction term of the last week dummy and the post-2014 dummy, which is of our main interest, has a statistically significant and positive effect on both expenditure and attendance ($\hat{\delta} > 0$). Therefore, looking at the last Wednesdays alone, expenditure has increased by 83.8 percent and attendance by 31.1 percent as it has been designated as the DoC since 2014. Finally, comparing the DoCs and other Wednesdays after 2014, expenditure and attendance are 34.0 percent and 43.5 percent higher on the DoC. This result shows that people actually watched movies more at the time the DoC discount was applied. Interestingly, the revenue at the cinemas also increased despite providing a discount of about half the normal price at DoCs.

4.2. Source of Increased Demand: Creation versus Cannibalization

As we confirmed that the DoC increased spending and attendance, it is necessary to find out where this increase in demand came from. Two possible scenarios are (a) a newly created demand for people who would not have watched the movie without the discount to get the discount offered by the DoC, and (b) a transfer demand by people who change plan to watch a movie from Tuesday or Thursday to Wednesday in the last week of a month to receive the discount. In the latter scenario, not only the assumption that choice is made between adjacent dates, but also the fact that there is a large gap between the markets on weekdays and weekends including Fridays, and the low rate of releases on Mondays are taken into account. The policy goal of enhancing cultural enjoyment opportunities is to be achieved by inducing an increase in demand through the former route, and if the latter cannibalization occurs, it means that the policy effect is limited.

To confirm this empirically, it is possible to perform an analysis similar to the previous analysis on Tuesdays and Thursdays, and look at how demand changes in the last week of each month. Before we delve into the analysis, looking at the basic statistics in Table 1, among Tuesdays, Wednesdays and Thursdays, Tuesdays shows the lowest demand. As indicated by the freshness and daily number of showings, this is due to the way theaters usually release movies on Thursdays although more releases occur on the DoC (last Wednesdays in a month) after 2014.

[Insert Tables 5 and 6 about here]

Tables 5 and 6 show the estimation results for checking cannibalization on Tuesdays and Thursdays, respectively. From Table 5, we can see that the expenditure increases by 27.2 percent while the attendance drops by 13.8 percent on Tuesdays after 2014. Table 6 indicates that the expenditure is raised by 45.3 percent on Thursdays after 2014. In both cases, no statistically significant average treatment effect is found, which suggests no evidence of cannibalization. This result is encouraging as it is in line with the policy goals as discussed above. This result is encouraging as the increase in demand on the DoC has apparently taken a path that meets the policy goals.

V. Concluding Remarks

This study empirically found the effectiveness of the DoC which provides the discount to movie tickets on the last Wednesday in each month. Although both the expenditure and attendance are increased as the DoC was introduced in 2014, the increase in the expenditure outweighs that in attendance, which suggests that moviegoers take advantage of the discount. Other covariates to control for the factors may affect the movie demand revealed influences as expected including day-specific characteristics such as temperature and whether it is a public holiday or not, regional capacity to uphold the movie demand such as population and the number of screens, and film-related characteristics such as the number of daily showings and freshness. In particular, the freshness, which is uniquely proposed in this study as the weighted average of the number of days elapsed since the release date for which the weights are given by the proportion of attendance, captures the influence of the composite attractiveness of the films screened on a day.

Moreover, this study confirmed that the increased expenditure and attendance on the DoC are apparently newly created without reducing those on last Tuesdays and Thursdays in each month (two days adjacent to the DoC). These results show the effectiveness of the policy as it is consistent with the policy goal of expanding cultural enjoyment opportunities.

In 2019, there was a political debate that raised criticism that the budget for subsidizing movie ticket discounts on the DoC was not allocated. This study provides policy implications on whether it is necessary to support theaters in response to such issues. The analysis results of this study suggest that voluntary participation of theaters is incentive-compatible in the sense that the increase in demand for DoC is a pure increase, rather than absorbing the demand of surrounding dates.

The limitations of this study are tri-fold. First, due to the limitation of data being aggregated by day, it is impossible to accurately determine the change in demand only during the time period when the DoC discount is applied. In the current study, therefore, the effect of the DoC is diluted over the whole day. This prevents confirmation of the presence of within-day cannibalization on the DoC, i.e. adjusting the visiting hours to take advantage of the DoC discount, which is important in assessing the effectiveness of the policy. If many moviegoers had adjusted their time to receive the discount, there would be a relatively small change in attendance and a greater reduction in the expenditure. In this case, the estimation results of this study may have been exaggerated.

Second, since the expenditure data of this study is only for movie ticket sales, it is not possible to gauge the change in the total revenue of theaters in which concession sales are also accounted for. From the perspective of theaters, it is essential to make a decision that considers not only ticket sales revenue but also concession revenue. Since the change in the latter cannot be known, the effect of DoC on theaters’ revenue may be inaccurate from a comprehensive point of view. However, we may expect that the change in concession revenue due to the DoC discount will not show a significant difference. Dealing with the relationship between the willingness to pay for admission and intensity of demand for concessions, Gil and Hartmann (2009, p.1048) assumed that demand for concessions is not affected by the movie ticket price following the discrete choice demand literature. Without relying on this assumption, the change in concession sales is plausibly bidirectional. On the one hand, we can expect an increase in concession sales, as spending cut by movie ticket discounts is likely to be used for concession consumption. On the other hand, those watching movies at discount times may not spend much on concessions as they are price-sensitive consumers, which may lead to reduced concession revenue.

Lastly, the analysis period of this study is limited to a period free from the impact of the Covid-19 pandemic. Therefore, a follow-up study is needed on the effect of the discount policy when strong constraints are applied to demand and in the process of loosening those constraints.

References

Beck, N. and J. N. Katz (1995). "What to Do (and Not to Do) with Time-series Cross-section Data," *American Political Science Review*, 89(3), pp.634-647.

Davis, P. (2006). "Spatial Competition in Retail Markets: Movie Theaters," *The RAND Journal of Economics*, 37(4), pp.964-982.

De Roos, N. and J. McKenzie (2014). "Cheap Tuesdays and the Demand for Cinema," *International Journal of Industrial Organization*, 33, pp.93-109.

Filson, D, D. Switzer, and P. Besocke (2005). "At the Movies: The Economics of Exhibition Contracts," *Economic Inquiry*, 43(2), pp.354-369.

Gil, R. and W. R. Hartmann (2009). "Empirical Analysis of Metering Price Discrimination: Evidence from Concession Sales at Movie Theaters," *Marketing Science*, 28(6), pp.1046-1062.

Gil, R. and F. Lafontaine (2012). "Using Revenue Sharing to Implement Flexible Prices: Evidence from Movie Exhibition Contracts," *Journal of Industrial Economics*, 60(2), pp.187-219.

Ho, J. Y., Y. Liang, C. B. Weinberg, and J. Yan (2018). "An Empirical Study of Uniform and Differential Pricing in the Movie Theatrical Market," *Journal of Marketing Research*, 55(3), pp.414-431.

Korea Film Council (2020). *Korean Film Yearbook 2020* (in Korean).

Marshall, P., M. Dockendorff, and S. Ibáñez (2013). "A Forecasting System for Movie Attendance," *Journal of Business Research*, 66(10), pp.1800-1806.

Motion Picture Association (2020). *Theme Report 2019*.

McKenzie, J. and W. D. Walls (2016). "File Sharing and Film Revenues: Estimates of Sales Displacement at the Box Office," *The BE Journal of Economic Analysis & Policy*, 16(1), pp.25-57.

Orbach, B. Y. and L. Einav (2007). "Uniform Prices for Differentiated Goods: The Case of the Movie-theater Industry," *International Review of Law and Economics*, 27(2), pp.129-153.

Pesaran, M. H. (2021). "General Diagnostic Tests for Cross-sectional Dependence in Panels," *Empirical Economics*, 60(1), pp.13-50.

Regional Culture and Development Agency, (2020). *2020 Day of Culture Recognition Survey* (in Korean).

Table 1

Basic Statistics of Variables

Category	Variable	Definition	Day of week	Obs.	Mean	Std. Dev.	Min	Max
Dependent	$Lexp_{it}$	Log of expenditure	Tuesday	7,520	17.70	1.703	12.74	22.15
			Wednesday	7,504	17.93	1.714	12.72	22.20
			Thursday	7,504	17.97	1.681	13.04	22.06
	$Latt_{it}$	Log of attendance	Tuesday	7,520	9.350	1.033	6.619	13.06
			Wednesday	7,504	9.606	1.047	6.760	13.12
			Thursday	7,504	9.619	0.9917	6.848	13.05
Explanatory	$Temp_{it}$	Difference between daily highest temperate and monthly average temperature	Tuesday	7,520	5.175	3.502	-6.3	18.25
			Wednesday	7,504	5.013	3.514	-8.8	16.70
			Thursday	7,504	5.046	3.723	-8.7	18.99
	$Precip_{it}$	Amount of precipitation	Tuesday	7,520	0.3351	1.108	0	20.14
			Wednesday	7,504	0.3971	1.369	0	30.15
			Thursday	7,504	0.3187	1.051	0	18.79
	$Lpop_{it}$	Log of population	Tuesday	7,520	14.67	0.7245	13.26	16.40
			Wednesday	7,504	14.67	0.7246	13.26	16.40
			Thursday	7,504	14.67	0.7245	13.26	16.40
	$Lscreen_{it}$	Log of number of screens	Tuesday	7,520	4.710	0.7616	3.258	6.589
			Wednesday	7,504	4.709	0.7615	3.258	6.589
			Thursday	7,504	4.710	0.7615	3.258	6.589
	$Holiday_{it}$	Dummy for holiday (1=holiday, 0=otherwise)	Tuesday	7,520	0.04468	0.2066	0	1
			Wednesday	7,504	0.05757	0.2329	0	1
			Thursday	7,504	0.04478	0.2068	0	1
	$Ldayshowing_{it}$	Log of daily number of showings	Tuesday	7,520	6.392	0.7806	4.736	8.544
			Wednesday	7,504	6.410	0.7828	4.727	8.572
			Thursday	7,504	6.420	0.7810	4.754	8.538
	$Lfresh_{it}$	Log of daily freshness of showings (average of numbers of days since release date of daily top 2 movies weighted by audience)	Tuesday	7,518	2.435	0.4547	0.6616	7.246
			Wednesday	7,504	1.935	0.8937	-1.182	5.024
			Thursday	7,504	1.706	0.7953	0	7.224

Table 2

Freshness as a Measure of Releasing Behavior of Theaters

Week	Period	Day of week	Obs.	Mean	Std. Dev.	t score
Last week	Before 2014	Wednesday	576	9.554	8.200	7.99
		Thursday	576	6.320	5.206	
	After 2014	Wednesday	1,152	6.887	5.471	-1.59
		Thursday	1,152	7.244	5.312	
Other weeks	Before 2014	Wednesday	1,920	12.02	7.451	1.60
		Thursday	1,920	10.13	50.839	
	After 2014	Wednesday	3,856	8.988	6.519	6.69
		Thursday	3,856	7.179	15.465	

Table 3

Estimation Results I: Expenditure on Wednesdays

Variable	Panel model			PCSE model		
	Model I (RE)	Model II (RE)	Model III (RE)	Model IV	Model V	Model VI
$Temp_{it}$	0.001315 (0.001279)	0.006828*** (0.001056)	0.006874*** (0.001041)	0.03435*** (0.006534)	0.04185*** (0.005660)	0.04196*** (0.005618)
$Precip_{it}$	0.007845*** (0.003211)	0.007717*** (0.002658)	0.006301*** (0.002626)	0.02185 (0.01481)	0.01578 (0.01313)	0.01437 (0.01309)
$Lpop_{it}$	0.6483*** (0.2186)	1.097*** (0.1832)	1.118*** (0.1807)	0.8462*** (0.04702)	0.8795*** (0.04167)	0.8753*** (0.04139)
$Lscreen_{it}$	−1.723*** (0.05350)	−0.7634*** (0.04760)	−0.7265*** (0.04694)	0.5476*** (0.1911)	2.010*** (0.1886)	2.037*** (0.1880)
$Holiday_t$	0.9659*** (0.01956)	1.113*** (0.01634)	1.091*** (0.01617)	1.3375*** (0.1027)	1.516*** (0.08744)	1.487*** (0.08705)
$Ldayshowing_{it}$	2.484*** (0.04214)	1.446*** (0.03980)	1.420*** (0.03923)	−0.6293*** (0.1917)	−2.110*** (0.1880)	−2.133*** (0.1874)
$Lfresh_{it}$	−0.1819*** (0.005180)	−0.2026*** (0.004339)	−0.1998*** (0.004282)	−0.2425*** (0.02670)	−0.2714*** (0.02289)	−0.2682*** (0.02272)
$Lastweek_t$	0.06369*** (0.01792)	0.06335*** (0.01466)	0.1633*** (0.03279)	0.03449 (0.09526)	0.03638 (0.07944)	0.1286 (0.1785)
$After_t$	−0.03415*** (0.01423)	0.01133 (0.01169)	0.008709 (0.01152)	0.2672*** (0.05793)	0.3168*** (0.04850)	0.3162*** (0.04802)
$Lastweek_t \times After_t$	0.1767*** (0.02185)	0.2006*** (0.01787)	0.2017*** (0.01760)	0.2595*** (0.1161)	0.2909*** (0.09681)	0.2927*** (0.09586)
Constant	0.8836 (3.226)	−3.384 (2.713)	−3.550 (2.677)	6.955*** (0.5201)	9.249*** (0.4877)	9.507*** (0.4893)
Month fixed effect	No	Yes	Yes	No	Yes	Yes
Week fixed effect	No	No	Yes	No	No	Yes
Number of observations	7,504	7,504	7,504	7,504	7,504	7,504
F						
Wald χ^2	14,171.34 [0.000]	24,906.68 [0.000]	25,917.94 [0.000]	71,128.08 [0.000]	39,263.34 [0.000]	38,995.24 [0.000]
Hausman	4.94 [0.1765]	6.36 [0.095]	6.56 [0.087]			
Pesaran CD	187.24 [0.000]	198.30 [0.000]	197.92 [0.000]			
R^2	0.1349	0.1594	0.1598	0.1775	0.2285	0.2300

*Note: Numbers in parentheses and brackets refer to clustered standard errors and p values, respectively. Asterisks indicate statistical significance: *, p < 0.1; **, p < 0.05; ***, p < 0.01.*

Table 4

Estimation Results II: Attendance on Wednesdays

Variable	Panel model			PCSE model		
	Model I (RE)	Model II (FE)	Model III (FE)	Model IV	Model V	Model VI
$Temp_{it}$	0.0002597 (0.001282)	0.005805*** (0.001059)	0.005862*** (0.001045)	0.0000562 (0.003986)	0.004113 (0.003340)	0.004134 (0.003291)
$Precip_{it}$	0.004617 (0.003220)	0.004855 (0.002664)	0.003608 (0.002637)	0.003021 (0.008110)	0.002692 (0.006736)	0.001427 (0.006638)
$Lpop_{it}$	0.3668*** (0.07152)	1.242*** (0.1933)	1.262*** (0.1907)	0.2779*** (0.02980)	0.2959*** (0.02509)	0.2926*** (0.02474)
$Lscreen_{it}$	-1.836*** (0.05300)	-0.8451*** (0.04776)	-0.8101*** (0.04718)	-1.862*** (0.08980)	-1.170*** (0.07204)	-1.150*** (0.07106)
$Holiday_t$	0.8920*** (0.01961)	1.040*** (0.01638)	1.020*** (0.01624)	0.8807*** (0.06733)	0.9870*** (0.05673)	0.9662*** (0.05623)
$Ldayshowing_{it}$	2.557*** (0.04212)	1.494*** (0.03990)	1.470*** (0.03940)	2.640*** (0.08722)	1.936*** (0.06996)	1.920*** (0.06901)
$Lfresh_{it}$	-0.1834*** (0.005190)	-0.2049*** (0.004350)	-0.2021*** (0.0043)	-0.1819*** (0.01743)	-0.1965*** (0.01476)	-0.1939*** (0.01457)
$Lastweek_t$	0.06619*** (0.01797)	0.06560*** (0.01469)	0.1459*** (0.03293)	0.06688 (0.06329)	0.06794 (0.05261)	0.1491 (0.1176)
$After_t$	-0.09722*** (0.01385)	-0.05728*** (0.01175)	-0.05971*** (0.01160)	-0.1130*** (0.03943)	-0.08991*** (0.03196)	-0.09041*** (0.03149)
$Lastweek_t \times After_t$	0.3477*** (0.02191)	0.3723*** (0.01791)	0.3736*** (0.01768)	0.3455*** (0.07714)	0.3613*** (0.06411)	0.3623*** (0.06316)
Constant	-3.224*** (0.9850)	-13.72*** (2.829)	-13.88*** (2.791)	-2.312*** (0.3190)	-1.128*** (0.2686)	-0.9285*** (0.2680)
Month fixed effect	No	Yes	Yes	No	Yes	Yes
Week fixed effect	No	No	Yes	No	No	Yes
Number of observations	7,504	7,504	7,504	7,504	7,504	7,504
F		1,200.44 [0.000]	1,044.40 [0.000]			
Wald χ^2	14,639.97 [0.000]			134,429.86 [0.000]	178,237.27 [0.000]	180,045.17 [0.000]
Hausman	3.82 [0.431]	19.55 [0.001]	21.23 [0.000]			
Pesaran CD	185.95 [0.000]	197.67 [0.000]	197.40 [0.000]			
R^2	0.8494	0.8288	0.8283	0.8499	0.8884	0.8906

Note: *Numbers in parentheses and brackets refer to clustered standard errors and p values, respectively. Asterisks indicate statistical significance: *, p < 0.1; **, p < 0.05; ***, p < 0.01.*

Table 5

Estimation Results for Checking Cannibalization I: Tuesdays

Variable	PCSE model for expenditure			PCSE model for attendance		
	Model I	Model II	Model III	Model I	Model II	Model III
$Lastweek_t$	-0.01795 (0.1004)	-0.02792 (0.08462)	-0.2348 (0.1469)	0.01438 (0.06360)	0.01134 (0.05318)	-0.2098 (0.09175)
$After_t$	0.2017*** (0.06023)	0.2406*** (0.05092)	0.2483*** (0.04947)	-0.1707*** (0.03813)	-0.1516*** (0.03189)	-0.1482*** (0.03076)
$Lastweek_t \times After_t$	0.02929 (0.1230)	0.04203 (0.1036)	0.04289 (0.1006)	0.009978 (0.07792)	0.01394 (0.06513)	0.01687 (0.06283)
Month fixed effect	No	Yes	Yes	No	Yes	Yes
Week fixed effect	No	No	Yes	No	No	Yes
Number of observations	7,518	7,518	7,518	7,518	7,518	7,518
Wald χ^2	83,314.17 [0.000]	39,362.65 [0.000]	38,032.72 [0.000]	120,720.32 [0.000]	164,332.01 [0.000]	169,579.88 [0.000]
R^2	0.1641	0.2249	0.2305	0.8372	0.8795	0.8853

*Note: Numbers in parentheses and brackets refer to clustered standard errors and p values, respectively. Asterisks indicate statistical significance: *, p < 0.1; **, p < 0.05; ***, p < 0.01.*

Table 6

Estimation Results for Checking Cannibalization II: Thursdays

Variable	PCSE model for expenditure			PCSE model for attendance		
	Model I	Model II	Model III	Model I	Model II	Model III
$Lastweek_t$	0.1433 (0.09571)	0.1835** (0.07880)	0.07841 (0.1186)	0.1073* (0.06261)	0.1250** (0.05154)	0.08959 (0.07753)
$After_t$	0.3328*** (0.05744)	0.3747*** (0.04737)	0.3738*** (0.04725)	-0.06685* (0.03754)	-0.04898 (0.03085)	-0.04915 (0.03074)
$Lastweek_t \times After_t$	-0.02835 (0.1170)	-0.04063 (0.09613)	-0.03680 (0.09589)	-0.02522 (0.07654)	-0.02758 (0.06293)	-0.02743 (0.06270)
Month fixed effect	No	Yes	Yes	No	Yes	Yes
Week fixed effect	No	No	Yes	No	No	Yes
Number of observations	7,504	7,504	7,504	7,504	7,504	7,504
Wald χ^2	83,314.17 [0.000]	37,015.32 [0.000]	36,777.44 [0.000]	150,137.51 [0.000]	176,740.77 [0.000]	177,344.51 [0.000]
R^2	0.1569	0.2101	0.2106	0.8328	0.8755	0.8762

*Note: Numbers in parentheses and brackets refer to clustered standard errors and p values, respectively. Asterisks indicate statistical significance: *, p < 0.1; **, p < 0.05; ***, p < 0.01.*

Figure 1

Market Trend in New Release, Screening, Sales, and Admission

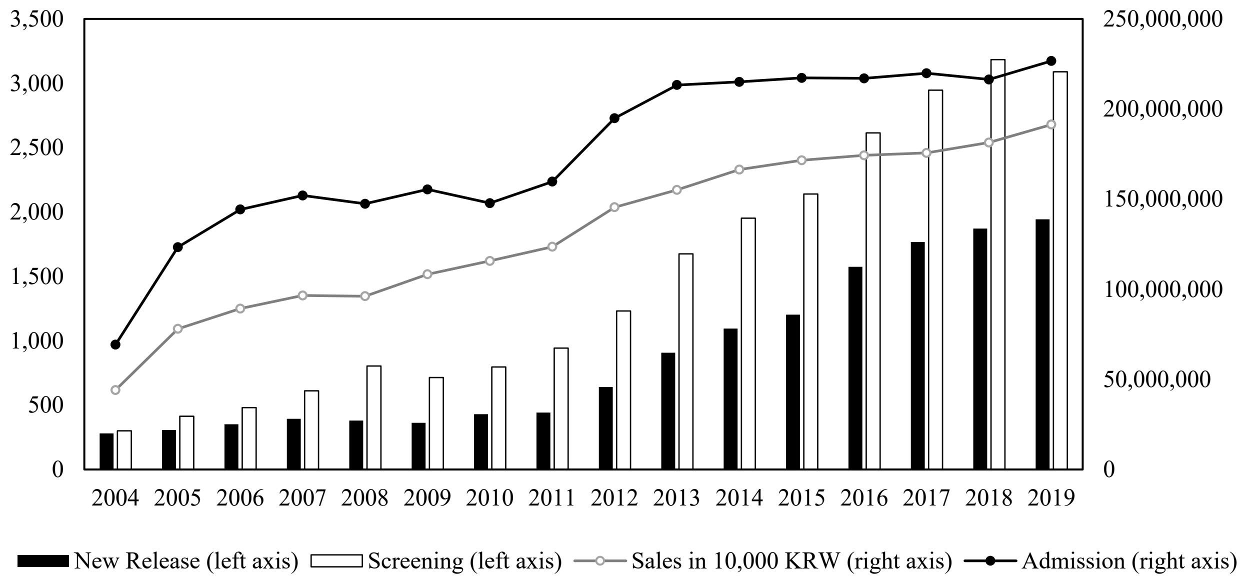

Figure 2

Proportion of Multi-screen Theaters

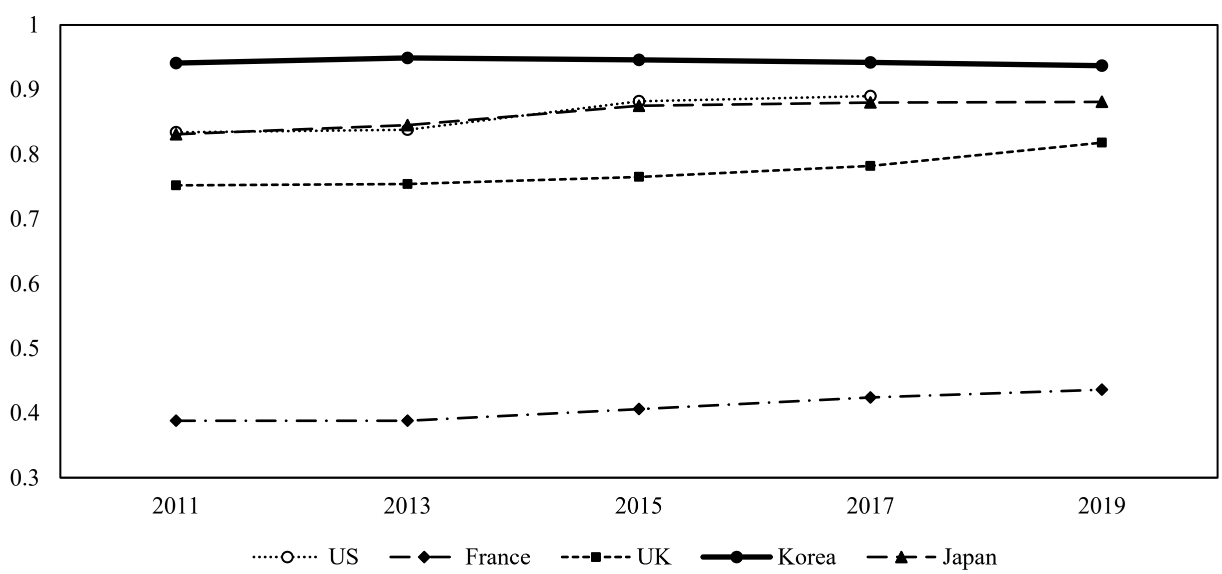

Figure 3

Seasonality of Demand

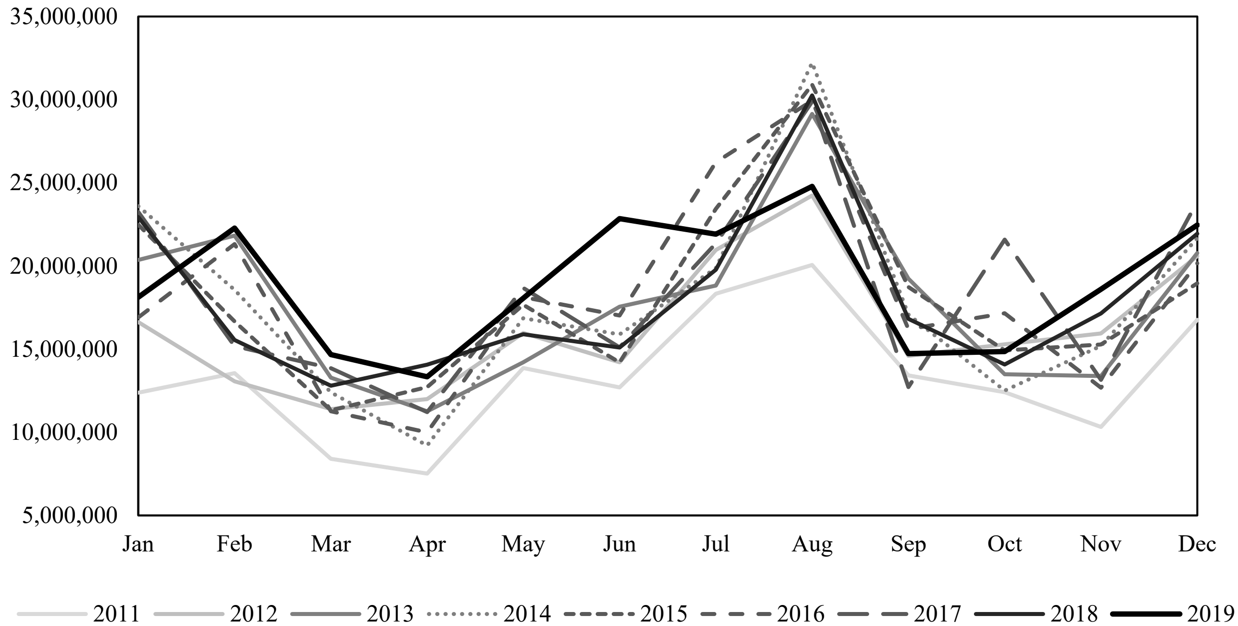

Figure 4

Awareness of and Participation to the Day of Culture

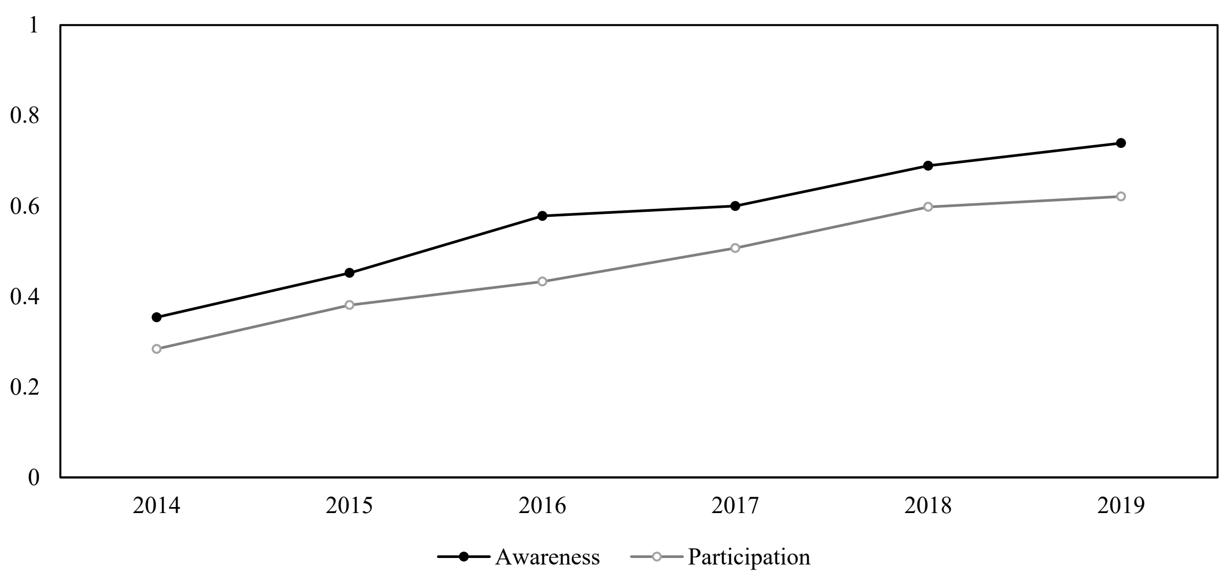

Figure 5

Proportion of Releases by Day of the Week

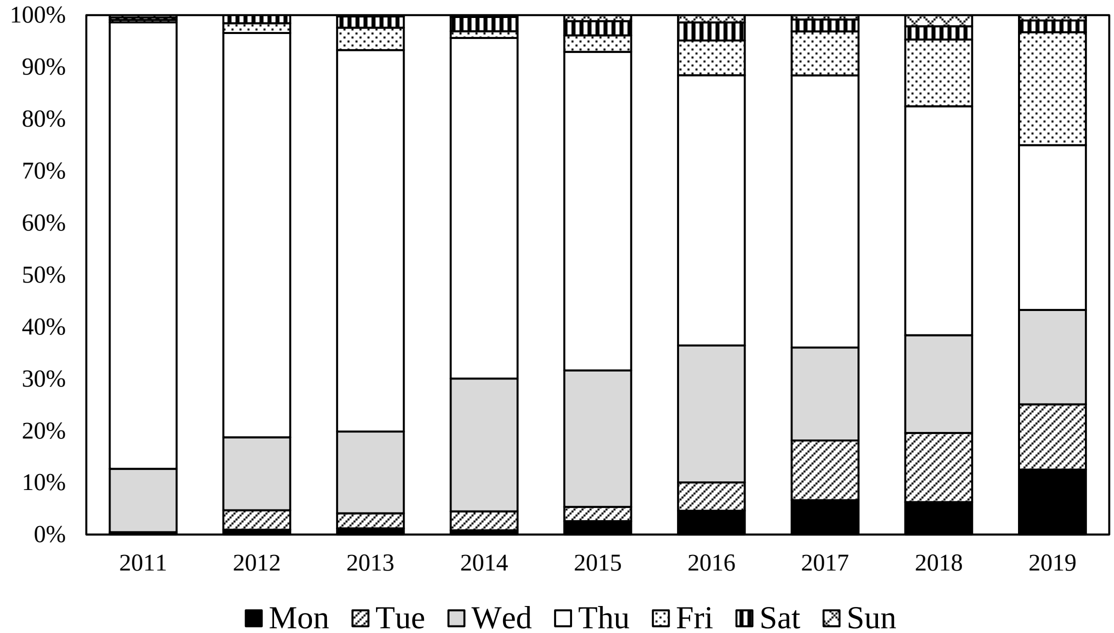
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2011
2012
2013
2014
2015
2016
2017
2018
2019
Mon
Tue
Wed
Thu
Fri
Sat
Sun

Figure 6

Ticket Sales to Admission Ratio