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Article

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Digital Business

Provided in Cooperation with:

International Telecommunications Society (ITS)

Suggested Citation: Baek, Hyunmi; Jang, Moonkyoung; Kim, Seongcheol (2024) : Strategies to mitigate the cannibalization effect between subscription video-on-demand and transactional video-on-demand, Digital Business, ISSN 2666-9544, Elsevier, Amsterdam, Vol. 4, Iss. 1, pp. 1-7, <https://doi.org/10.1016/j.digbus.2024.100073>

This Version is available at:

<https://hdl.handle.net/10419/337949>

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Strategies to mitigate the cannibalization effect between subscription video-on-demand and transactional video-on-demand

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ARTICLE INFO

Keywords:

VOD pricing plan
SVOD
TVOD
Cannibalization effect
VOD service provider
OTT

ABSTRACT

Video-on-demand (VOD) service providers face the challenge of making strategic decisions regarding the allocation of movies to specific pricing plan libraries. This study delves into the cannibalization effect that occurs when a movie transitions from the transactional video-on-demand (TVOD) library to the subscription video-on-demand (SVOD) library. We conducted a comprehensive analysis using user purchasing and viewing data for 1541 movies offered by SK Broadband, South Korea's leading VOD service provider. Our analysis employed propensity score matching and difference-in-difference methodologies. The results of our initial analysis reveal that allocating movies to SVOD leads to an 192% increase in the number of views while simultaneously 52% decreasing TVOD sales. Additionally, we investigate the characteristics of movies that are particularly effective for SVOD servicing. To accomplish this, we scrutinized 236 movies available in SK Broadband's SVOD service using a cost-effectiveness analysis. Our second analysis demonstrates that certain categories of movies, including foreign films, non-G-rated movies, animations, and films not allowed as Download-To-Own (DTO), are more suitable for allocation to SVOD libraries. Furthermore, movies with lower box office viewership numbers exhibit greater success when allocated to SVOD. This study offers insights into the strategic considerations that VOD service providers should embrace, emphasizing a content feature-driven approach to managing pricing plan combinations.

1. Introduction

With the advent of digital media channels, the landscape of movie distribution has undergone significant diversification. In general, people can watch movies in theaters first and, after that, they can then watch the film through other formats, such as Video on Demand (VOD) or Over the Top (OTT) or Internet Protocol Television (IPTV). Unlike the theater experience, people can choose from a variety of pricing plans with VOD. For example, viewers can either pay a monthly subscription fee to watch any VOD in the platform's content library or pay to watch a VOD whenever they want. The former is called subscription video on demand (SVOD); the latter is called transactional video on demand (TVOD). The combination of the two pricing plans is called a hybrid pricing plan. In this hybrid plan, for VODs in an SVOD library, users can watch VODs in the library for a single charge; however, they must pay an additional fee to watch VOD not included in the SVOD library. Such a combination of pricing plans offers users the freedom to choose VODs, in consideration of their needs and budgets; it is also used to create alternative revenue

for VOD service providers. Thus, VOD service providers often utilize the hybrid pricing plan.

The VOD service providers offering a hybrid pricing plan face a strategic dilemma when they decide which movies to add to their SVOD library. They must choose between two conflicting strategies: one is to include popular content in the SVOD library to attract and retain monthly subscribers, while the other is to withhold popular content from SVOD to boost TVOD sales. For instance, when VOD providers prioritize attracting monthly subscribers, they typically feature movies with strong box office performances in the SVOD library. This move entices new viewers to sign up for a monthly subscription, as they get access to these popular films as part of their package. Conversely, when VOD providers aim to maximize short-term sales, they initially offer high-performing movies exclusively through TVOD. In summary, VOD providers must find a delicate balance between these two strategies to optimize their revenue streams while meeting the preferences of their diverse audience.

Considering this context, the objectives of this study are twofold. The

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first is to explore how content allocation in an SVOD library affects decreasing TVOD sales and an increasing number of views (i.e., checking the cannibalization effect between SVOD and TVOD). The second purpose is to develop a VOD company strategy of content allocation in an SVOD content library to maximize the cost-to-benefit ratio (i.e., minimizing the cannibalization effect between SVOD and TVOD). As data-driven decision-making has become increasingly important (Korherr, Kanbach, Kraus, & Mikalef, 2022), this paper conducted a sophisticated data-driven analysis to achieve the purpose of such decision-making. Specifically, this paper conducted propensity score matching, difference-in-difference analysis, and multiple regression analysis on user purchase and viewing data for VOD movie releases in 2017 and 2018 from SK Broadband, a leading VOD service provider in Korea.

The findings of this study may give valuable insights into how pricing strategies can be tailored based on the unique characteristics of movie content. More specifically, this study has practical significance by presenting strategies to mitigate cannibalization effects among SVOD and TVOD. From an academic standpoint, this study is significant because it extends previous research from inter-channel cannibalization effects in movies to intra-channel cannibalization effects. Previous studies have investigated the cannibalization effect between theatrical revenue and early digital movie consumption (Liang, Burth, Cho, & Smith, 2020), the influence of digital purchase availability on physical DVD sales (Hashim, Ram, & Tang, 2019), and the phenomenon of cannibalization across distinct digital distribution channels (Ananthakrishnan, Smith, & Telang, 2016; Danaher, Dhanasobhon, Smith, & Telang, 2010; Gong, Smith, & Telang, 2015). This study contributed to the academic discourse by investigating cannibalization effects between SVOD and TVOD within the same channel.

The remainder of this paper proceeds as follows. Section 2 reviews the previous literature on VOD pricing plans and draws out new pertinent research questions. Section 3 examines whether the allocation of VOD to an SVOD content library creates the cannibalization effect between TVOD and SVOD. Section 4 analyzes content and timing characteristics for effectively allocating the content into an SVOD content library. Lastly, section 5 presents the discussion, conclusion, and implication.

2. Literature review and research question

2.1. The cannibalization effect

The concept of the cannibalization effect explains the natural conflict between SVOD and TVOD models. The cannibalization effect is when a new product or service, which has been introduced by a company, violates the market share of existing products or services (Kerin, Harvey and Rothe, 1978). Existing studies have conducted research on the cannibalization effect among distribution channels in the movie industry (Ananthakrishnan et al., 2016; Danaher et al., 2010; Gong et al., 2015; Hashim et al., 2019; Liang, Burth, Cho, & Smith, 2020). However, with those same distribution channels, users can consume VOD in a more diverse way, such as SVOD, TVOD, and so on. Thus, VOD service providers must make effective strategic decisions on allocating each VOD to a specific pricing plan. Therefore, it is also necessary for researchers to explore the cannibalization effect of each pricing plan within the same distribution channel, beyond simply the cannibalization effect among distribution channels. To minimize the cannibalization effect, the decision about which VODs would be included in an SVOD based on customer needs is vital (Cho, 2015). In other words, VOD service providers with a hybrid pricing plan of both SVOD and TVOD must examine the effective strategy of including movies in their SVOD library.

Cannibalization is defined as a phenomenon in which the demand for existing products or technologies is reduced by company's newly launched product or technology (Copulsky, 1976; Heskett, 1976; Kerin et al., 1978). This effect occurs when both new and existing products are

in an alternative relationship; furthermore, it is evaluated as a sub-concept of alternative phenomena (Sullivan, 1990).

Earlier studies investigate inter-channel cannibalization in the media industry. With the advent of digital channels for media distribution, various media industries are undergoing transformation processes (Elberse, 2010; Wlömert & Papies, 2016). Users choose which channel through which to consume media from among various available channels; this can potentially result in inter-channel cannibalization. There are also several studies that assess other aspects of cannibalization, such as the cannibalization among music distribution channels (Lee, Choi, Cho, & Lee, 2016; Wlömert & Papies, 2016), the effect that magazines' free digital content has on its print circulation (Simon & Kadiyali, 2007), the cannibalization effect between online newspaper advertising and print advertising (Sridhar & Sriram, 2015), and more.

There are also many studies in the movie industry that examine the effects of cannibalization. Danaher et al. (2010) find that digital DVD sales do not cannibalize physical DVD sales. Gong et al. (2015) state that electronic sell through (EST) price promotions do not have a cannibalization effect on digital rentals; in fact, price promotions were positive for inter-channel spillover. On the other hand, Ananthakrishnan et al. (2016) argue that free streaming on a major television network's online platform cannibalizes paid channels revenue by about 8.4%. Hashim et al. (2019) show that the digital purchase format (i.e. EST) does not affect DVD sales, but that the digital rental format (i.e. VOD) does in fact cannibalize DVD sales; they demonstrate this via a robust panel dataset consisting of movie data collected from Amazon and Barnes & Noble. Liang, Burth, Cho, and Smith (2020) confirm that Super Premium Video on Demand (SPVOD), which is offered as a VOD service at a high price, typically about four to five weeks after a movie's release, does not cannibalize theater revenue.

In the context of this literature background, the concept of the cannibalization effect explains the natural conflict between SVOD and TVOD models. Previous research has delved into the inter-channel cannibalization effect in the movie industry (Ananthakrishnan et al., 2016; Danaher et al., 2010; Gong et al., 2015; Hashim et al., 2019; Liang et al., 2020). However, within these same distribution channels, users have the option to consume VOD content in various ways, such as SVOD, TVOD, and more. Consequently, VOD service providers must make strategic decisions about the allocation of each VOD title to a specific pricing plan. Hence, it becomes imperative for researchers to investigate the cannibalization effect within each pricing plan within the same distribution channel, extending beyond the traditional focus on the cannibalization effect among distribution channels. To effectively mitigate the cannibalization effect, making informed decisions about which VODs to include in an SVOD library based on customer preferences becomes a critical factor (Cho, 2015).

Several studies have focused on developing strategies to mitigate cannibalization effects in movie channel distribution. Hennig-Thurau, Henning, Sattler, Eggers, and Houston (2007) discovered that higher revenues result from simultaneous movie releases in theaters and retail markets when there is limited demand overlap between the two channels. Meanwhile, Chiang and Jhang-Li (2020) examined the conditions favoring temporal exclusivity within multichannel distribution, particularly beneficial for digital content publishers. Additionally, research has explored profit optimization within the same channel by considering movie attributes and applying diverse pricing models. In this context, Jang, Baek, and Kim (2021) identified movie characteristics suited for the DTO model. Their analysis highlighted that movies rated for general audience (i.e., G-rated movies), sequels, films with dedicated fan bases, and those featuring popular original soundtracks (OST) tend to achieve higher sales through the DTO model.

2.2. Research questions

The first objective of this study is to examine how TVOD revenue and view counts are affected when content is allocated to the SVOD library

within a hybrid pricing plan (i.e., the cannibalization effect between SVOD and TVOD). Although it is accurate to look at the monthly subscriber number or SVOD sales, it is impossible to assess the increase in the sales of each movie generated by monthly subscribers. Thus, the increase in the view counts of each movie is measured as a benefit of allocating the film to the SVOD content library. Therefore, our first set of research questions is as follows:

Research Question 1: Is there a cannibalization effect between SVOD and TVOD service?

Research Question 1–1: Is TVOD revenue decreased by allocating the VOD to the SVOD content library?

Research Question 1–2: Are the total view counts increased by allocating the VOD to the SVOD library?

Regarding the possibility of a sales cannibalization effect between SVOD and TVOD, [Cho \(2015\)](#) contends that if the most recently released movies are offered via SVOD, then the sales cannibalization effect between SVOD and TVOD may become bigger. Therefore, it is important to decide which movies are included in the SVOD library based on a consideration of the cannibalization effect. Given the growing influence of SVOD, careful attention to strategy is required to minimize the effect. In other words, the provider should consider cannibalization strategies, which can produce positive results, depending on timing or method. Thus, the provider must examine, through empirical data, what movie characteristics are effective when included in an SVOD library, and at what point they should be included. Our second set of research questions is as follows:

Research Question 2: How should VOD service providers respond to the cannibalization effect between SVOD and TVOD services?

Research Question 2–1: What kinds of content should be allocated to an SVOD content library?

Research Question 2–2: When should the content be allocated to an SVOD content library?

3. Result 1: The cannibalization effect between SVOD and TVOD

3.1. Data and analysis method

3.1.1. Data and variables

This study used data on users' purchasing and viewing histories for 1541 movies released by VOD in 2017 and 2018; the data were obtained from SK Broadband, one of Korea's leading VOD service providers. The number of daily views, daily purchases, and daily price trends for each movie were aggregated for a year after each movie was released via VOD. In addition, we obtained data on whether, and when, each VOD was included in the SVOD library, as well as the holdback period. We also collected movie characteristics variables, such as the number of box office viewers and the movie's rating, genre, and domestic/foreign status through the Korea Box Office Information System (KOBIS), provided by the Korean Film Council. The number of broadcast introductions was calculated daily by checking the TV guide for how many were included in the movie introduction shows of the three terrestrial broadcasters in Korea (i.e., KBS, MBC, and SBS). Among these movies, 860 were included in SK Broadband's Premier SVOD,¹ while 681 were not. [Table 1](#) describes the variables for Research Question 1.

According to our analysis of the dates when 1541 movies were allocated to the SVOD library, most of the VODs were allocated into SVOD within 100 days after VOD release and were included in an SVOD, on average, 72 days after VOD release. [Fig. 1](#) shows the proportion of movies that were allocated to SVOD as time passes after the VOD release date. The graph below shows a sharp increase in the ratio of movies allocated to SVOD after two weeks, three weeks, four weeks, and 70 days

¹ As of 2019, SK Broadband's "Premier SVOD" is a representative SVOD service that provides about 5000 movies, which is 53% of the SK Broadband's movies.

Table 1

Variables.

Name	Description	Source
$TVOD_{Sales_{it}}$	TVOD sales revenue of movie i on day t	
$View_{it}$	Viewing frequency of movie i on day t	
$SVOD_{it}$	Whether movie i is provided as SVOD on day t (0 = Not available as SVOD; 1 = Available as SVOD)	SK Broadband
$Price_{it}$	Average price of movie i on day t	
DTO_i	Whether movie i is provided as DTO-VOD (0 = Not available DTO-VOD; 1 = Available as DTO-VOD)	
$VODRelease_i$	Release date of movie i as VOD	
$Genre_i$	Genre of movie i	
Age_i	Age rating of movie i	
$Domestic_i$	The country of production (0 = foreign; 1 = domestic)	KOBIS
$BoxOffice_i$	The cumulative number of box office viewers before the VOD release date	
$TheaterRelease_i$	Release date of movie i at the box office	
$TerrestrialTV_{it}$	The number of times that movie i was introduced on day t through 3 terrestrial broadcasters	3 main terrestrial broadcasters

of the VOD release date. Of all the VODs, 50% was allocated to SVOD after 279 days.

3.1.2. Analysis method

To analyze the cannibalization effect between SVOD and TVOD, this study used the propensity score matching (PSM) method and difference-in-difference (DID) analysis. These two approaches are quasi-experimental research methodologies that have been used in earlier studies aimed at measuring the effectiveness of specific interventions. We conducted the analysis using PSM and DID in the order as follows. First, to conduct quasi-experimental research, two groups were formed, the treatment group (movies included in SVOD) and the control group (movies not included in SVOD). To this end, we worked on 1:1 matching between the treatment and control groups, according to the propensity score. Movies with similar characteristics were matched 1:1 in terms of representative VOD characteristics, such as *Domestic*, *DTO*, *R-rated*, *BoxOffice*, and *TerrestrialTV*. Second, we conducted a DID analysis on these matched films. By conducting a DID analysis based on the treatment group and the control group matched 1:1 by PSM, we then tried to assess how allocating to SVOD changes the purchase amount and the number of views for TVOD.

3.2. Analysis results

3.2.1. Results of propensity score matching

PSM method is used to enhancing the similarity of characteristics between the treatment and control groups. The PSM method balances data through matching the treatment and control groups on propensity scores ([Rosenbaum & Rubin, 1983](#)). The propensity score is the conditional probability that an individual will receive any specific treatment given the observed covariates ([Rosenbaum & Rubin, 1983](#)). If a pair of treatment and control groups have a similar propensity score, then they are considered as comparable. To conduct DID, PSM was conducted to match movies that are included in SVOD and those that are excluded. We calculated propensity scores for the films, using representative VOD characteristics, such as *Domestic*, *DTO*, *R-rated*, *BoxOffice*, and *TerrestrialTV*. Based on the estimated propensity scores, we then used the 1:1 nearest neighbor matching algorithm to match the treatment and control groups. As a result, we obtained 200 movies that were included in SVOD (treatment group) and 200 movies that were not (control group). To check whether the matching results were successful, we conducted a *t*-test on *Domestic*, *DTO*, *R-rated*, *BoxOffice*, and *TerrestrialTV*. [Table 2](#) shows no significant difference in the covariates between the treatment

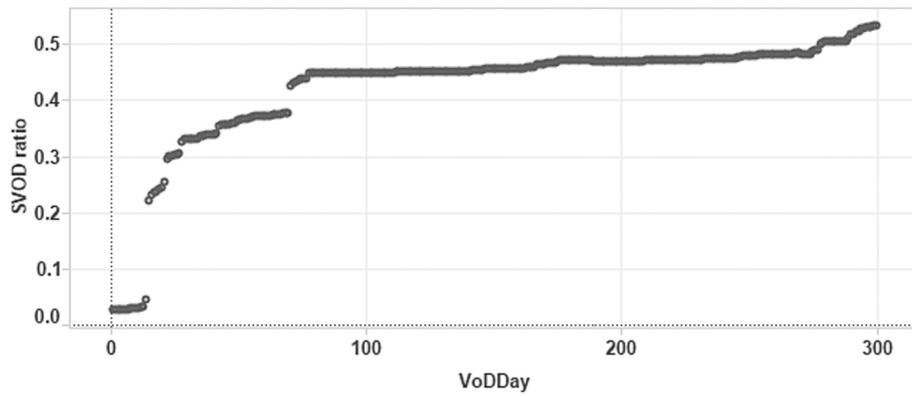


Fig. 1. The ratio trend of movies included in SVOD.

Table 2
Comparison between the treatment group and the control group.

Variable	Mean		t-test	
	Treatment group	Control group	t	p
Domestic	0.255	0.305	-1.1125	0.2666
DTO	0.395	0.39	0.1021	0.9187
R-rated	0.16	0.18	-0.5313	0.5955
BoxOffice	294,611	461,039	-1.1571	0.2479
TerrestrialTV	1.15	1.06	0.4496	0.6532
N	200	200		

and control groups.

Among the VODs selected by PSM, we deleted VODs when variables before and after the allocating of SVOD were not secured due to specific reasons, such as allocating SVOD on the first day or VODs allocated to

SVOD after one year. As a result, the 187 pairs of VODs were finally selected for the DID analysis. In other words, a total of 374 movies (187 VODs allocated to SVOD and 187 VODs not allocated to SVOD) were selected for analysis. In addition, because the allocating dates of SVOD differed (Fig. 1), we matched the introduction date of SVOD allocation for matched pairs. In other words, in the case of movie A in the control group, which is matched with movie B in the treatment group, the SVOD allocation date of movie A follows that of movie B.

Before conducting our DID analysis, we plotted the daily TVOD sales and view counts estimation for both the treatment and control groups by focusing on the before and after dates of allocation to SVOD (Fig. 2). The results show a tendency to allocate content with high initial view counts and high TVOD sales to SVOD. While the change in the number of views due to allocating to SVOD is dramatic, the decrease in TVOD sales does not seem to differ significantly from the control group. Next, through DID analysis, we examined whether there have been significant changes in TVOD sales and the number of views due to allocating to SVOD.

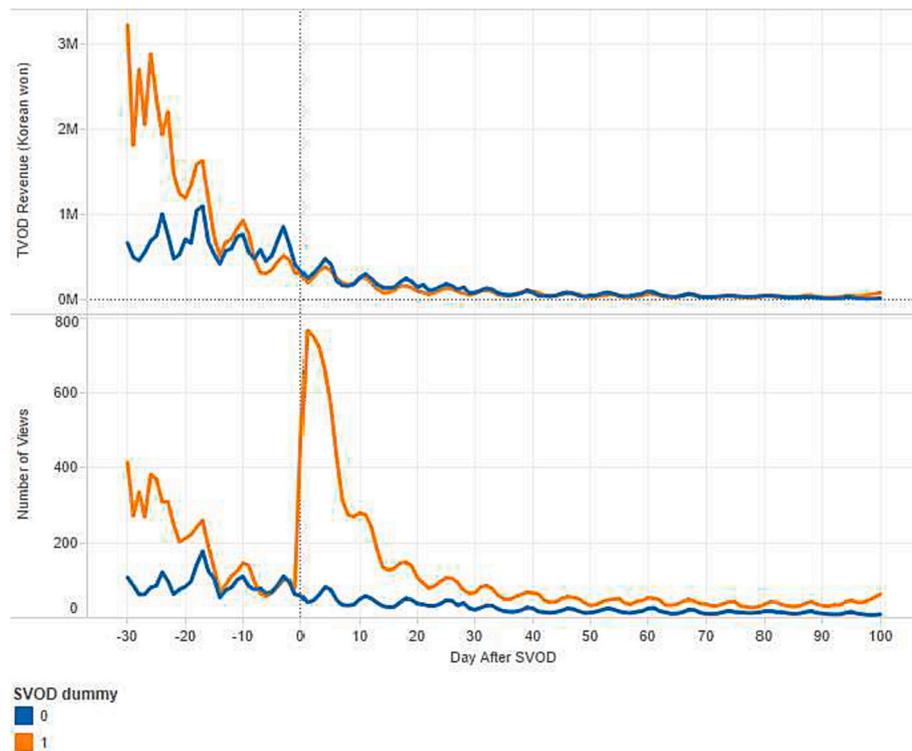


Fig. 2. Daily change in TVOD sales and the view counts after movies had been included in SVOD.

Note: Orange ± Movies that were included in SVOD (treatment group).

Blue — Movies that were not included in SVOD (control group).

3.2.2. Results of difference-in-difference analysis

To answer the Research Question 1, this study investigated the impact of including movies in SVOD on both TVOD sales and view counts, by using a DID estimator. A DID analysis is quasi-experimental and imitates experimental design (Angrist & Pischke, 2008). The estimator is an approach for analyzing casualty, which is difficult to implement for experimental manipulation. The DID method can analyze the effect of different outcomes, both before and after an intervention, by also comparing the difference between the treatment and control groups (Meyer, Viscusi, & Durbin, 1995). Furthermore, the DID estimator allows researchers to control for the confounding effects of both unobserved factors and time invariant factors from treatment effects (Meyer, 1995). The DID estimator can be presented in Eq. (1), below.

$$Y_i = \beta_0 + \beta_1 * Treat_i + \beta_2 * Change_i + \beta_3 * Treat_i * Change_i + \beta_4 * BoxOffice_i + \beta_5 * TerrestrialTV_i + \beta_6 * SVOD_Date_i + u_i \tag{1}$$

Y_i represents the observed outcome variables of movie i , such as the view counts and TVOD sales. The view counts and TVOD sales, as a dependent variable for DID analysis, are not normally distributed; thus, the log transformation was performed. As control variables, we included the cumulative number of box office viewers before the VOD release date ($BoxOffice_i$), the number of times that movie i had been introduced on day t through three terrestrial broadcasters ($TerrestrialTV_i$), and the date when movie i was included in SVOD ($SVOD_Date_i$). Table 3 presents the DID analysis result. The analysis showed, after movies had been included in SVOD, a 52% decrease in TVOD sales (p -value <0.1), while the number of views increased 192% (p -value <0.01). The number of times that the film was introduced through terrestrial broadcasters increased the number of viewers by 69.8% (p -value <0.01) and increased TVOD sales by 80% (p -value <0.01). If the date of inclusion in SVOD was delayed by one day, then the number of views decreased by 0.2% (p -value <0.01) and TVOD sales decreased by 0.6% (p -value <0.01).

4. Result 2: The strategy of allocating VODs to SVOD

4.1. The analysis method and variables

To answer Research Question 2, we examined ways to maximize the benefit (i.e., increasing the number of views) compared to the cost (i.e., decreased TVOD sales) of allocating to SVOD. Cost-effectiveness analysis as used to analyze the economics of allocating VODs to SVOD. The cost of allocating to SVOD, used in this study, is the loss of TVOD sales; the benefit is the number of views. The benefit of allocating a movie to SVOD is not interchangeable with the same unit as the cost. Therefore, in this study, the cost-effectiveness analysis was intended to derive a strategy for allocating VODs to SVOD that will maximize the unit cost-effectiveness. In other words, we intended to compare the increase in the number of views with the decrease in the TVOD purchase cost of

Table 3
Result of DID analysis.

Variable	(1) View	(2) TVOD_Sales
	Estimate (S.E.)	Estimate (S.E.)
$Treat_{ij}$	0.444** (0.175)	0.941*** (0.187)
$Change_{ij}$	-1.635*** (0.180)	-2.471*** (0.195)
$Treat_{ij} * Change_{ij}$	1.919*** (0.252)	-0.518* (0.270)
$BoxOffice_i$	0.000 (0.000)	0.000 (0.000)
$TerrestrialTV_{it}$	0.698*** (0.041)	0.800*** (0.044)
$SVOD_Date_i$	-0.002*** (0.001)	-0.006*** (0.001)
constant	1.019*** (0.140)	9.653*** (0.151)
N	741	748
R ²	0.5053	0.5873
Adjusted R ²	0.5013	0.5838

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

KRW 1000. Cost-effectiveness analysis is a method of economic analysis that compares the relative costs and effects of different actions. This analytical method is used mainly for measuring the effects of physical units rather than those of monetary units.

Independent variables that affect the benefit and cost of allocating to SVOD include movie characteristics (grade, domestic or foreign), hold-back period, and the number of box office viewers. We also considered the date of allocating to SVOD as a moderating variable.

We analyzed the effect for 30 days because both the number of views and the change in the amount of TVOD sales due to allocating lasts about 30 days after SVOD inclusion, as shown as Fig. 2. Table 4 presents the operational definition of the variables used for Research Question 2.

4.2. Analysis results

Because the dependent variable of this study can only be derived if the amount of TVOD purchase decreases and the number of views increases, we analyzed 236 VODs that met this condition to answer Research Question 2. In the case of these movies, the effect of allocating to SVOD is an average increase in the number of views by 31.5 at a cost of KRW 1000 (i.e., decreasing TVOD sales). Log transformation was conducted for dependent variables. Multiple regression analysis was conducted to minimize the decrease in TVOD sales while increasing the view counts when allocating to SVOD. Table 5 shows the results of the multiple regression analysis, used to investigate the factors that alter the effect of allocating to SVOD based on changes in the number of views and purchase amount for 30 days, both before and after allocating to SVOD. The analysis results show that movies of foreign production, non-G-rated, animation, or not allowed as DTO are more effective to allocate to SVOD. The lower the number of box office viewers, the more effective it is to allocate to SVOD and, if the box office market performance is high, it is more effective to allocate to SVOD late.

5. Discussion and conclusion

This study investigated the cannibalization effect between SVOD and TVOD through PSM and DID analysis methods using data provided from SK Broadband, one of Korea's leading IPTV service providers. Because VOD service providers can utilize various types of pricing plans, service providers need to make strategic decisions about whether to allocate

Table 4
Variables.

Variable	Definition
Dependent Variable	$SVOD_Effect$
	The effect of allocating VODs to SVOD
	The increased number of views compared to the decreased amount of purchase
	log transformation of (the number of views earned per 1000 won)
	log [(the number of view changes / the amount of purchase change) * [-1000]]
	log [(total views for 30 days after allocating to SVOD - total views for 30 days before allocating to SVOD) / (total amount of TVOD purchase for 30 days after allocating to SVOD - total amount of TVOD purchase for 30 days before allocating to SVOD) * [-1000]]
Independent Variable	$Viewer$
	$Domestic$
	$G-rated$
	$Animation$
	Domestic: 1, Foreign: 0
	G-rated: 1, Not G-rated: 0
	Animation: 1, Not Animation: 0
	Whether to allow as DTO
	DTO: 1, not DTO: 0
Moderating Variable	$SVOD_Day$
	The date when VOD was allocated to SVOD after VOD release

Table 5
The result of the multiple regression analysis.

Variable	Estimate (S.E.)
Domestic	-0.456*(0.245)
G-rated	-0.877*(0.453)
Animation	4.468***(1.034)
DTO	-0.495**(0.234)
Viewer	-5.69e-07***(1.06e-07)
SVOD_Day	-0.004***(0.001)
Viewer * SVOD_Day	1.78e-09***(5.65e-10)
constant	2.818***(0.235)
N	236
R ²	0.2634
Adjusted R ²	0.2408

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, VIF: 1.60, DV: SVOD_Effect.

certain movies to an SVOD library. To make this decision, it is necessary to consider simultaneously the costs of reducing TVOD sales if a particular movie is allocated to SVOD and the benefits of increasing SVOD subscribers due to an increased number of views through SVOD. Therefore, this study examined the impact of allocation to the SVOD library on TVOD sales and on the number of views via PSM and DID analysis. The analysis showed that the allocation of movies to the SVOD library decreases TVOD sales by 52% and increases in the number of views by 192%. Although these analysis results have a limitation, namely not seeing a rigorous cannibalization effect due to the absence of revenue data via SVOD, it is nonetheless meaningful that we empirically investigated changes in TVOD sales and in the number of viewings in the context of how the SVOD inclusion of certain movies work in a hybrid pricing plan. As expected, an SVOD allocation resulted in decreased TVOD sales, increased number of views, and a much higher percentage of viewers, especially compared to the decrease in TVOD sales. These results seem to be in line with existing research that shows the inter-channel cannibalization effect (Ananthakrishnan et al., 2016; Danaher et al., 2010; Gong et al., 2015; Hashim et al., 2019; Liang et al., 2020). For example, Ananthakrishnan et al. (2016) found that free streaming availability cannibalizes EST sales by about 8.4%. In addition to the inter-channel cannibalization effect in previous studies, we empirically confirm the existence of a cannibalization effect between TVOD and SVOD within the same channel.

Furthermore, this study explored strategies for maximizing the effectiveness of SVOD allocation (i.e., a strategy to minimize the percentage of TVOD sales that decreases and to maximize the percentage of viewers that increases) by cost-effectiveness analysis. The findings suggest non-G-rated movies, animations, foreign origin, and those with lower box office performance are found to be more effective when released through SVOD. Conversely, G-rated, domestic, DTO movies, and movies with high box office performance tend to benefit from release through TVOD. This is likely due to the fact that movies with a wide range of viewers, such as G-rated movies and movies released for DTOs, have characteristics of attracting TVOD purchases. It was also confirmed that the higher the primary market performance, the more effective it is as TVOD; it was also confirmed that if the primary market performance is high, then it is effective to delay the SVOD allocation date. In the case of high primary market performance, SVOD allocation is considered to have a negative effect because viewers have a strong incentive to watch movies even if individual purchases are made through TVOD. This finding is consistent with previous research that box office performance has a positive impact on VOD performance (Kim & Kim, 2017). According to the theory of time preference, in the case of Blockbuster with its high performance in the primary market, people prefer to choose what to watch now by comparing the value of current and future consumption. As a result, people are willing to pay for TVOD purchases for immediate consumption around the VOD release date, so it is an effective strategy to delay the Blockbuster allocation to SVOD as much as possible. In conclusion, movies with a high willingness to pay

are suitable for TVOD distribution. For movies that do not fall within this category, enhancing user satisfaction in terms of content diversity can be achieved by including them in the SVOD library.

This study is intended to provide useful practical guidelines for VOD service providers in strategic research regarding VOD pricing plans. For businesses, one of the most important concerns is determining which plan can maximize the VOD service provider's profits. In particular, it is necessary to identify which content needs to be allocated to SVOD when people can consume numerous pieces of content through various plans in one VOD service provider. Although VOD service providers cannot utilize a price discretion strategy through SVOD, they can do both price discretion and bundling strategies through hybrid plans, depending on content. Thus, the service provider must secure high-quality content, but it is most necessary to secure high-quality content as SVOD content. Pereira and Tam (2021) highlighted the connection between users' enjoyment and intention to continue to use in terms of the hedonic aspects of VOD. To optimize the enjoyment obtained from VOD, the provision of a diverse and high-quality content in the SVOD library holds significant importance. However, the VOD service providers position is not simple. If all high-quality content is allocated to SVOD, then TVOD sales will be reduced due to the cannibalization effect. Therefore, when the cannibalization effect exists, from the perspective of VOD service providers, content selection strategies that can generate optimal profits are imperative. Recently, an increasing number of VOD service providers have been introducing various types of SVOD services, such as children- and seniors-targeted SVOD, to increase profits. In this context, this study is expected to help set a strategic direction for taking an SVOD strategy that will maximize profitability.

To the best of our knowledge, this study also offers a theoretical contribution, in that it is the first study to explore the cannibalization effect between the two VOD service models, SVOD and TVOD. The digitization of the media industry has led to media consumption through diverse channels, and several studies have been conducted on inter-channel cannibalization, which can be used to derive advanced content distribution strategies. However, few studies have yet been conducted on the cannibalization effects among various VOD service models in the same channel. This gap in the academic literature is due to the limitations of data access to measure the effectiveness of a firm's decision-making. This study performed empirical verification of the cannibalization effect between SVOD and TVOD for the VOD service provider that chooses the hybrid plan from among the movie VOD providers. Moreover, it is meaningful that we have looked specifically at which content characteristics moderate the cannibalization effect. In particular, this study's significance can be found in its demonstration that it is effective to allocate movie content to SVOD at some point, focusing on the achievements made in the primary market and on movie characteristics.

However, this study has made room for future studies. First, to measure the effect of SVOD allocation, TVOD sales and the number of views were analyzed by considering costs and benefits, but it is necessary for future research to consider additional costs and benefits. For example, the increase in the number of subscribers resulting from the SVOD allocation of a particular piece of content could be considered as a sales increase. Although this study did not specifically analyze this factor due to limited access to corporate data, we used the number of views as a proxy to measure sales increase. This study does not actually look at the changes caused by specific content, so there is a limit to utilizing the results of this study. Although it is effective to delay the SVOD allocation of movies with a high performance in the primary market, the number of the latest box office movies included in the SVOD library can serve as a promotional feature to attract SVOD subscribers. It is also a limitation of this study that it did not consider these kinds of indirect benefits. Secondly, this study focused on the cannibalization effect between SVOD and TVOD. Future research should include the emerging advertising-based video-on-demand (AVOD) pricing model, which is being actively adopted by OTT providers. Third, future academic studies

should develop an SVOD strategy for allocating content by considering not only the company's internal situation but also the current status of its external competitors. The SVOD strategy could have greater implications by considering how competitors are providing the same content. Fourth, this study investigated ways to minimize cannibalization between SVOD and TVOD by analyzing movie attributes suitable for the SVOD library. However, our study's limitation lies in the absence of specific exploration of interactions among various movie attributes. Consequently, future research should emphasize a more comprehensive investigation of these interactions, offering precise guidance for devising revenue-maximizing strategies for VOD operators.

CRediT authorship contribution statement

Hyunmi Baek: Conceptualization, Data curation, Methodology, Writing – original draft. **Moonkyoung Jang:** Conceptualization, Methodology, Visualization. **Seongcheol Kim:** Supervision, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Acknowledgments

This work was supported by the Ministry of Education of the Republic of Korea, the National Research Foundation of Korea (NRF-2019S1A3A2099973), and the MSIT (Ministry of Science and ICT), Korea, under the ITRC (Information Technology Research Center) support program (IITP-2023-2020-0-01749) supervised by the IITP (Institute for Information & Communications Technology Planning & Evaluation).

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