

Online-to-Offline Platforms: Examining the Effects of Demand-Side Usage on Supply-Side Decisions

Xing Wan^a, Ashish Kumar Jha^{b,*}, Nikolai Kazantsev^c, Wai Fong Boh^d

^a School of Business Administration, Nanjing University of Finance and Economics

^b Trinity Business School, Trinity College Dublin, Ireland

^c Institute for Manufacturing (IfM), University of Cambridge, United Kingdom

^d Nanyang Business School, Nanyang Technological University, Singapore

ARTICLE INFO

Keywords:

Digital Platforms
Online-to-Offline Platforms
Vertical Relationships
Horizontal Relationships
Movie Theater Industry

ABSTRACT

This study explores the impact of demand-side usage of digital platforms on operational decision-making by supply-side firms. The positive impact of digital platforms on product sales is established in the literature. However, this study focuses on the perspective of supply-side firms, examining the effect of increasing reliance on digital platforms on supply-side firms' decisions. The study shows that greater demand-side usage of online-to-offline (O2O) digital platforms is associated with more efficient operational decisions of supply-side firms. Benefits of leveraging O2O platforms include information transparency and resource pooling. The study further examines the extent to which benefits from participating in O2O digital platforms are affected by inter-firm relationships in which a supply-side firm is embedded. The study uses a panel data model to test hypotheses with data on China's movie theaters that join O2O platforms. It found that movie theaters with greater demand-side usage of O2O digital platforms see better resource utilization and product concentration. Furthermore, it shows that more vertically integrated firms can better reap the benefits from demand-side usage of digital platforms. In contrast, more horizontally integrated firms can less strategically leverage the benefits from demand-side usage of O2O platforms.

1. Introduction

Recent technological developments and market shifts have led to the rise of digital platforms [1]. Extant research has shown that firms/merchants joining digital platforms can adapt their operations to platform-based markets [2]. Although most studies about platforms have identified antecedents and different outcomes of platform usage, it is yet unclear whether demand-side usage of digital platforms influences operational decision-making by supply-side firms. Hence, this study focuses on the evolving operational strategies of merchants on digital platforms.

This study explores online-to-offline (O2O) service platforms, which offer a means for consumers to order and pay for offline services online [3]. Meituan and Groupon in the restaurant business, DIDI in the local transportation business, and Priceline and TripAdvisor in the travel industry are examples of O2O digital platforms that facilitate the provision of local services. O2O platforms connect online consumers with offline merchants, creating value by increasing consumption at local

brick-and-mortar stores [4]. This study highlights a unique feature of O2O platforms. O2O platforms integrate online search and purchase with offline product/service delivery and consumption [5]. Hence, O2O platforms bridge local merchants and online customers. Brick-and-mortar stores are enabled to expand their customer size and better serve customers by leveraging O2O platforms [6]. Because of the distinct characteristics of O2O platforms, the research examines how reliance on O2O platforms affects local merchants, particularly in making their operational decisions.

The use of O2O platforms presents many potential advantages to firms. Still, by allowing merchants to tap into the increased reach and informational advantages promised by digital platforms, they should also understand how reliance on such platforms may impact the effectiveness of their operational decision-making. Merchants can market and sell their services by leveraging a large installed base of users on these platforms [5,6]. Besides achieving more effective matching of demand with supply, O2O digital platforms also provide value-added services for merchants. For example, customers can book, pay, and

* Corresponding author.

E-mail address: akjha@tcd.ie (A.K. Jha).

<https://doi.org/10.1016/j.im.2023.103757>

Received 3 February 2022; Received in revised form 17 January 2023; Accepted 20 January 2023

Available online 21 January 2023

0378-7206/© 2023 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

return services online, which reduces merchants' costs [6].

Meanwhile, merchants confront two significant challenges in O2O e-commerce. First, online customers differ from offline customers. Empowered by IT resources provided by platforms, online customers are enabled to search for products and services and make comparisons on their attributes quickly and easily [7]. Meanwhile, online customers are susceptible to the effects of electronic word of mouth, which highlights the social nature of consumption [8]. Therefore, merchants must adapt to demands presented by online channels. Second, merchants, particularly service firms, have to improve their operational decision-making to survive in the fierce platform-based market competition. Operational decisions are routine decisions that influence productivity and efficiency of firms. Above all, local service firms should design their product mix to attract consumers as services are perishable [9]. Meanwhile, local firms have to satisfy customers subject to limited budgets. Therefore, effective and efficient utilization of existing resources (e.g., workforce, space, and products) to provide services to customers is critical to ensure the firm's viability [10].

There is significant importance on operational decisions for service firms. Therefore, understanding the link between O2O platforms and a firm's operational decisions, such as resource utilization and product mix, will help firms understand how they can benefit from the platform and manage their operations. It is crucial to examine how reliance on O2O platforms may influence how efficiently and effectively firms utilize their resources to provide the requisite services to customers.

This research uses the term "demand-side usage" of the O2O digital platform to characterize the extent to which merchants rely on online platforms to sell their services. Online platforms influence the sales of products and, thus, the revenue of merchants [11]. Extant literature either investigates antecedents of merchants' joining digital platforms [12] or examines the outcomes of merchants' decisions on platforms, e.g., multihoming and service positioning [5]. Although some literature highlights interdependence between the consumer and the merchant sides in platform-based markets [13], there is a limited understanding of how the extent of online platform use influences the operational strategies and decisions of supply-side firms¹ that participate in platform-mediated markets. This leads us to our first research question:

How does reliance on (demand-side usage of) O2O platforms influence the operational decisions of merchants (supply-side firms), specifically resource utilization and product mix decisions?

The use of digital platforms allows firms to work both directly or indirectly with other firms (e.g., pooling information and attracting customers to the same platform) [14]. Existing inter-firm relationships for supply-side firms may shape how these firms leverage O2O digital platforms [15]. Firms may have existing horizontal relationships with subsidiaries in the same group (e.g., part of a franchise or same merchant chain) or vertical relationships with upstream and downstream partners in their supply or value chain. Such inter-firm relationships may benefit participating firms. For example, effective inter-firm relationships are essential for maintaining competitiveness and promoting responsiveness to changing markets. Online platforms may provide a similar set of benefits. For example, online platforms bring multiple merchants together to match their offerings with consumer needs. Thus, it is expected that the capabilities developed by firms in response to inter-firm relationships may impact their ability to leverage the benefits of O2O digital platforms.

Despite the importance of inter-firm relationships, few empirical studies have investigated the effects of firms' participation in platforms based on existing inter-firm relationships. Hence, our second research question is:

How do existing vertical or horizontal inter-firm relationships of supply-side firms affect the relationship between reliance on (demand-side usage

¹ This study uses "supply-side firms" to classify firms that provide local services for offline consumption.

of) O2O platforms and operational decision-making of merchants (resource utilization and product mix of supply-side firms)?

This study examines the use of O2O digital platforms in the Chinese movie theater industry. It investigates the extent to which movie theaters' operational decisions are associated with demand-side usage of O2O movie ticket booking platforms. The O2O platform for movie theaters allows consumers to book movie tickets from certain cinemas. The platform offers online reservations with offline consumption at the movie theaters; therefore, this platform is classified as an O2O platform [16].

This research makes two key contributions to the literature in the domain of digital platforms. First, the focus on service firms extends the research in the domain of digital platforms. Prior work has focused on product firms rather than services firms [17]. This research studies firms that sell services on O2O platforms (delivery of service is fulfilled offline). It, therefore, underscores the importance of examining firms' operational decisions because effective delivery of services offline is highly dependent on product mix and effective utilization of operational resources for service firms. Existing studies in this domain have rarely analyzed merchants' operational decisions. In fact, most have focused on strategic decisions and outcomes of the merchants [4,18]. Linking the demand-side usage of O2O platforms to supply-side operational decisions creates greater insights into the interdependence between demand-side and supply-side users of digital platforms [19].

Second, the study examines how existing inter-firm relationships for supply-side firms shape how these firms can benefit from reliance on O2O platforms. Specifically, it explores the moderating roles of vertical and horizontal integration in influencing the main effects. This generates insights into how existing inter-firm relationships interact with emerging inter-firm relationships through O2O platforms to affect the supply-side firm's decision-making capabilities.

2. Theory and Background

O2O digital platforms play a pivotal role in O2O e-commerce by matching demand with supply, improving delivery, and facilitating resource utilization [4,20]. Firms that lack customer and information technology (IT) resources can take advantage of online and mobile technology opportunities to leverage the resource repertoire from O2O digital platforms [21]. As such, O2O digital platforms help supply-side firms access the large installed customer base of users [5] and facilitate decision-making [5,21]. Prior research on online platforms has examined O2O digital platforms (e.g., Uber and Food Delivery platforms); however, they tend to examine the influence of the platform on individual service providers (e.g., drivers and food delivery personnel) due to an interest in understanding the gig economy [22]. Existing inter-firm relationships may influence the outcome of the merchants' platform choice [12]. Empirical literature that studies O2O platforms from the perspective of merchants (supply-side firms) focuses on the following four aspects:

- 1 Antecedents of merchants' participation in platforms [12]
- 2 Merchants' platform choice like multihoming or establishing proprietary platforms [4,23]
- 3 Merchants' pricing and service positioning decisions are strong predictors of their performance [20]
- 4 Interdependence between the consumer and merchant sides [24]

Synthesizing prior IS literature, we note that although most IS studies in O2O platform settings have identified antecedents and different outcomes of platform usage, it is yet unclear whether demand-side usage of digital platforms influences operational decision-making by supply-side firms. Specifically, building on the third and fourth streams, our study responds to the abovementioned gap by adding moderators for inter-firm relationships into the theoretical framework. This research examines (a) the link between platform reliance and merchants'

operational decisions; and (b) the impact of the demand side on the sales of the supply-side firms. Finally, the current research integrates these streams of research to explore the effects of the demand-side usage of O2O platforms on merchants' operational decisions.

2.1. Benefits of participating in O2O digital platforms

Information transparency and resource pooling are key benefits that O2O digital platforms create for supply-side firms. These benefits contribute to a coherent perspective on how digital affordances impact value creation in a digital ecosystem. In information system literature, affordances have been used to signify the values and benefits that a user derives from a technology artifact [25]. The literature on digital affordances [26,27] discusses how a digital ecosystem enables its users (both demand and supply side) to take actions for value creation. For O2O platforms, the study identifies the two specific benefits of digital affordance that are salient for participating firms and substantially influence their operational decisions.

Information transparency refers to the degree of availability and accessibility of information [28]. Online platforms make information available by collecting, aggregating, processing, displaying, and disseminating information from demand- and supply-side users [29]. Well-designed user interfaces, coupled with transparent information aggregated from numerous merchants, allow customers to search and compare offers, read recommendations, and select the most appropriate service [8]. For the movie theater industry, participating theaters can obtain information about purchase (e.g., movie and schedule), location of ticket purchasers, and return frequency [5]. For instance, managers can see the purchasing patterns of repeat consumers on Maoyan, one of China's major O2O platforms. This information can help with designing special offers or scheduling movies according to the preferences of the consumers of each movie theater. Such information was not available in the non-digital mode (when ticket transactions were anonymous and over the counter).

Resource pooling refers to the ability of platforms to gather, aggregate, and provide resources that enable external firms to create value [30]. O2O digital platforms act as market intermediaries [19,31] that provide resources to participating firms. Digital and technical resources include data analytical capabilities [32], user-generated content (reviews and comments) [33], and business and institutional resources (financial, logistics, and marketing) [34]. For movie theaters, O2O digital platforms facilitate the entire customer journey, enabling consumers to read other online comments. This helps consumers identify suitable movies, better plan their schedule, and search for the appropriate shows and movie theaters. In addition, it allows consumers to book and pay for movie seats. Some O2O digital platforms, such as Maoyan, also provide a backend system (an enterprise resource planning system) to help movie theaters improve their operations and planning through pricing, scheduling, and advertising functionalities. Advanced software resources are available only because of cost sharing and the participation of hundreds of theaters. The features provided by the platform enable projection analysis and scheduling management, as well as the advertisement of movies on the ticketing platform. Hence, the features provided by O2O digital platforms simplify and improve the customer experience [35] while creating economies of scale. This helps supply-side firms attract more customers, increase sales [36], and better utilize the data collected by the platform.

2.2. Operational decisions

Operational decisions refer to routine decisions made by firms to improve productivity and efficiency. This includes production planning, equipment maintenance, procurement and management of inventory, pricing, and review of product quality [37]. Local merchants usually provide services, which, unlike inventory, cannot be "stored" if not sold. This attracts customers with the proper product mix [9]. When serving

customers, local merchants must improve customer satisfaction while controlling costs. To realize these two seemingly paradoxical goals, merchants must utilize resources effectively and efficiently [10]. Therefore, resource utilization and product concentration are significant operational decisions for local merchants. This study proposes that information transparency and resource pooling benefits of O2O digital platform participation will help supply-side firms improve decision-making related to resource utilization and product mix.

Resource utilization refers to the firm's strategy of introducing specific quantities of products into the market by utilizing all or part of their resources. In the case of airlines, this may include offering more flights for more popular routes or fewer flights to less desirable destinations. In the case of the movie industry, a decision would include the number of screens to allocate to a specific movie. Resource utilization is an essential metric in the movie industry because high costs are associated with theater maintenance and staffing. More seats sold per movie increases the profit margin. Movie sales also impact stakeholders like movie distributors and studios. Indeed, news reports of local movie theaters using phantom ticket sales to hide their low-resource utilization highlight the importance of this decision for the movie industry².

Despite the importance of this variable, there is a lack of empirical research on platform-facilitated decisions about resource utilization on the part of supply-side firms. This study expects that supply-side firms that join O2O digital platforms can help harness the value of their resources by leveraging platform resources [38]. Prior research has yet to empirically examine how the reliance on an online platform affects resource-utilization decisions by a supply-side firm.

Product concentration refers to decisions related to a firm's overall mix of product and service offerings. Firms tend to strategically control their number of products or services by providing a purposeful mix of offerings to maximize firm performance [38]. Firm decisions on product concentration can directly impact revenue. Decisions are crucial in the movie theater industry because movies are "perishable products." The demand for movies changes each week. Firms must, therefore, provide a thoughtful line up of movies that caters to the needs of the audience and attracts patrons to the theater.

As demand-side usage of O2O digital platforms increases, information accumulated about customer needs and preferences can help improve the supply-side firm's information about customers' needs and preferences. This enables firms to make more informed decisions about product concentration as part of the product mix offerings to customers.

2.3. Inter-firm relationships

Firms establish inter-firm relationships through strategic and equitable partnerships, alliances, and joint ventures [39]. Inter-firm relationships allow firms to pool resources [11], which improves information access and value creation [40].

2.3.1. Vertical integration

Vertically integrated inter-firm relationships exist between upstream and downstream firms in an industry value chain. The relationship between a firm and its vertical partner can take many forms, including direct ownership, equity partnerships, or contracts [39]. The literature shows that vertical relationships influence firms' strategic and operational decisions and behaviors [41]. Vertical links, a key source of information, can reduce transaction costs for upstream and downstream firms. Moreover, a firm's downstream capabilities are positively associated with the firm's performance [42,43].

Such relationships are pronounced and critical in the Chinese movie theater industry, where downstream theaters are often affiliated with upstream exhibition chains [44]. In the movie industry, exhibition

² <https://www.theticketingbusiness.com/2018/09/07/phantom-tickets-distort-chinese-box-office-figures/>

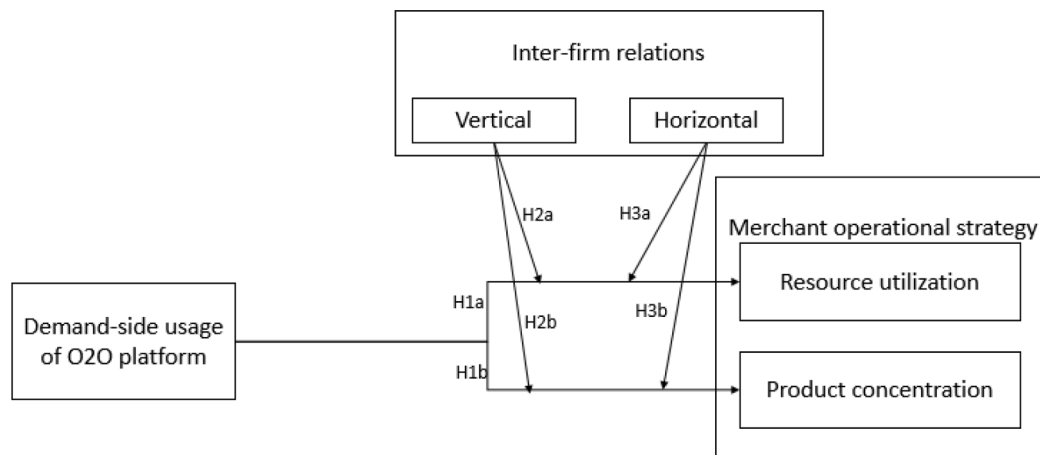


Fig. 1. Research model representing the hypotheses analyzed in this study

chains are the upstream suppliers for theaters. Cinemas can access movies distributed by their partner exhibition chains. In contrast, independent cinemas must reach an affiliation relationship with an exhibition chain by signing an agreement to access a movie.

The exhibition chains differ in terms of how they manage the vertical relationships. Some exhibition chains own the total equity of all affiliated cinemas. Some exhibition chains directly invest in a large part of their affiliated cinemas and sign affiliation contracts with independent cinemas. Still, some exhibition chains directly invest in a small portion of their affiliated cinemas, signing affiliation contracts with many independent cinemas.

2.3.2. Horizontal integration

Horizontal integration occurs among firms that offer similar or comparable products or services in an industry value chain. This usually occurs among firms that belong to the same group or larger business entity, but with independent establishments [45]. Firms often engage in networks and alliances to pool resources, overcome limitations associated with their small-scale operations, and collectively provide complete solutions [46]. Firms engage in horizontal integration networks due to convergence in strategic goals (although they may have divergent competitive goals). Firms can establish inter-firm relationships with peers in several ways, including strategic partnerships, alliances, and joint ventures [8].

This study focuses on horizontal inter-firm relationships for entities that belong to the same group or larger business entity, such as subsidiaries or franchisees to the same parent firm. Some scholars treat such entities as a part of one firm; however, this study aligns with prior research [47] that treats these entities as autonomous organizations that are horizontally linked with other subsidiaries within the same group or chain. Entities in a chain provide similar services. They are related due to their common ownership. While possessing independent decision-making powers for their unit, they coordinate and access data and resources from a wider pool of units due to joint ownership. Due to these properties, the units of a chain can be treated as horizontally integrated firms. A larger chain size indicates more substantial horizontal integration effects due to the availability of a larger pool of resources.

2.4. Research context

China's motion picture industry is an appropriate context for the current research due to its significant growth and research relevance. From 2010 to 2018, China witnessed a rapid growth in its movie picture

industry. The industry registered US\$10 billion in box office revenues in 2019³, ranking second to the market in the United States. In the nine years between 2010 and 2019 (pre-COVID), its revenue had a year-on-year rise of 25.09%. In addition, the industry reported a 10-fold increase in the number of screens (from 6,256 to 60,079). Since 2014, consumers have regularly used O2O digital platforms to search and pay for movie tickets online. O2O digital platforms continue to attract more consumers as the platform's customer experience improves.

There is extensive penetration of O2O platforms in China. For example, Meituan, China's largest O2O platform, made an initial public offering in September 2018 with an estimated value of US\$61.0 billion. According to forecasts in Meituan's prospectus, China's O2O economy accounted for US\$397.8 billion in 2017, with a year-on-year rise of 58.0% in the past five years. O2O platforms charge no fees from participating theaters, ensuring the universal participation of theaters. This also confirms that the study is independent of platform-supplier relational dynamics. Since 2017, O2O digital platforms in China have charged consumers service fees. Generally, service fees charged by O2O digital platforms are less than 10% of ticket prices, with little impact on consumers' online buying habits.

Furthermore, due to the structure of the movie theater industry, this study can investigate the moderating influence of vertical and horizontal relationships. In the traditional industry chain, movie theaters are vertically integrated with exhibition chains, which distribute movie copies to affiliated theaters. With such vertical relationships, exhibition chains will advise affiliated theaters on movie scheduling and theater management, enabling them to develop related capabilities that may influence their ability to leverage the benefits of joining O2O platforms.

Horizontally, each movie theater may be part of a cinema chain. For the movie theater industry, the size of a theater chain represents the extent of the horizontal integration of a movie theater. For instance, by the end of 2018, China's movie theater industry had 49 theater chains and 60,079 screens. In 2018, the country's top 10 theater chains, with 3,813 screens on average, accounted for 63.47% of screens in the country [48]. In comparison, the top five theater chains in the United States (Regal Entertainment Group, AMC Entertainment, Carmike Cinema, Cinemark USA, and Loews Cineplex Entertainment) owned 45% of the screens in 2003 [44]. Movie theaters in the same chain form strong inter-firm relationships aligned to common corporate objectives. Such theaters have the potential for close collaboration due to joint governance. Hence, there may be high levels of cross-firm synergies due to the benefits such as scalability, resource pooling, and knowledge transfer [49].

³ <https://www.statista.com/statistics/497954/box-office-revenue-china/>

Based on the study's interviews with theater managers (see Appendix B), the degree of vertical integration and size of the cinema chain impact theaters' decisions. Benefits from heavy reliance on O2O digital platforms are likely to vary for firms depending on their existing vertical and horizontal inter-firm relationships [50].

3. Hypotheses Development

Firms' operational decisions that affect how they *utilize resources* and provide product offerings will influence their overall performance and efficiency [31]. However, firms often lack the information to make effective resource utilization and product concentration decisions [51]. When a higher proportion of consumers make transactions on O2O platforms, information transparency and resource pooling advantages become more evident. This, in turn, impacts the operational decisions taken by the movie theater. Figure 1 summarizes the hypotheses and relations discussed in the following sections.

3.1. Resource utilization

The ability to utilize resources to their optimal level proves a challenge for many firms [52]. Improving resource utilization is vital in determining the success and performance of a firm [53]. Hence, it is one of the firm's most critical operational activities. Movie theaters with a certain number of maintained movie screens and employed staff must maximize the utilization of resources. According to research over 26 weeks in Nanjing, China, the correlation between the number of seats available in theaters and number of seats scheduled for shows was only 0.26. This indicates a significant scope for movie theaters to improve their resource utilization, which will be significant in driving the profits of movie theaters.

Underutilized resources represent an opportunity cost in terms of lost revenue; hence, firms need to maximize their resource utilization [54]. Ineffective resource utilization happens for many reasons, including, but not limited to, poor forecasting [54]. Merchants must regularly consider the fixed and operational costs associated with their offerings, as well as how they can increase resource utilization given such costs. An increase is expected in the resource utilization decisions of supply-side firms driven by greater demand-side usage of the O2O digital platforms. This is due to the benefits of resource pooling and information transparency. First, greater use of digital platforms will increase the potential reach of the supply-side firms. The firms will access a more extensive base of online users who come to an aggregated platform with multiple cinema options to fulfill their demand [55]. Consumers who buy tickets online can get better information about movie schedules. In addition, they can book seats online at any time and any place, enhancing their consumption efficiency. Compared with traditional cinemas, digital platforms are more efficient in aggregating and matching demand and supply [29], allowing cinemas to enhance their customer reach to better achieve greater sales for the movies scheduled in the cinemas.

Second, greater participation in O2O digital platforms will improve information transparency and reduce demand uncertainty, a prevalent problem in the cinematic industry [44]. Online platforms enable customers to book tickets in advance, producing a more predictable demand for cinemas. Digital platforms also provide data-driven analytics capabilities for participating cinemas, which empowers cinemas to optimize their movie scheduling. With more on-demand knowledge, cinemas can improve their resource utilization.

H1a: Greater demand-side usage of online platforms leads to higher firm resource utilization for supply-side firms.

3.2. Concentration

Product concentration is the second operational decision explored in this study. Supply-side firms must grapple with decisions about their

product mix offering. Product concentration is essential to a firm's product mix [56]. For example, in the movie theater industry, product concentration refers to the extent to which a movie theater concentrates its movie offerings on a few titles.

One can foresee two ways O2O digital platforms could affect the product concentration of supply-side firms. The literature has documented both long-tail and superstar effects in the Internet era [57]. For example, prior research has shown that the sale of goods like books on online platforms can result in a long-tail effect, where many products together constitute a considerable share of total sales. A more efficient matching process is provided by online platforms, allowing customers to find more products to meet their taste. In contrast, electronic word of mouth can amplify the demand for a few products, which leads to the superstar effect's sales that concentrate on a few products.

Movie theaters also face two possibilities. On the one hand, O2O digital platforms could increase the long-tail effect as cinemas diversify their movie offerings. This creates greater differentiation and more choices for consumers due to the better ability of O2O digital platforms to match supply with demand. On the other hand, O2O digital platforms could increase the superstar effect as cinemas concentrate their offerings on a few blockbusters. The online marketplace can magnify the demand for blockbusters, leading supply-side firms to focus on offering more blockbuster movies. The added complexity of the perishable nature of movies (due to the short life span of their demand) makes the industry more volatile. Hence, it is more critical to understand how cinemas should consider the possibilities of long-tail vs. superstar effects in their product-mix decisions.

Due to greater information transparency, this study expects to see greater superstar effects than long-tail effects as firms see greater demand-side usage of O2O digital platforms. Online marketplaces facilitate customer transparency, resulting in more information about customers' behaviors and preferences [8]. With greater demand-side usage of platforms and information transparency, supply-side firms are better equipped with the information to forecast that blockbuster films meet customer demands. Further, with greater resource-pooling benefits, supply-side firms that rely on O2O digital platforms will be able to attract more customers.

Given the complexities associated with a long-tail strategy, as well as the requirement to resolve demand uncertainty within a short horizon, supply-side firms are likely to prefer a more straightforward product mix. They will focus on a few products to reduce operational costs and complexities, which mitigates risk from market demand. This also applies to movie theaters due to the lower per-unit operating costs of handling a few blockbuster movies. It also considers ease of scheduling and risk aversion. Hence, this study expects that the greater demand-side usage of O2O platforms will impact the likelihood that supply-side firms will have better information about the demands and tastes of their customers. In addition, the wider online reach of customers will increase their ability to attract customers. This suggests that firms will have better information and resources to adopt the strategy of simplifying their product mix and increasing their product concentration. Hence, the study notes that:

H1b: Greater demand-side usage of online platforms leads to higher product concentration for supply-side firms.

3.3. Complementary effects of vertical inter-firm relations

Vertical and horizontal relationships play different roles in the cinematic industry. Vertical inter-firm relations help provide informational resources for movie theaters. Stronger vertical relationships support the firm in stronger upstream or downstream informational access [42]. Additionally, horizontal relationships impact resource pooling [49]. Greater horizontal integration can impose more constraints on the operational decision-making of firms due to the need to coordinate across the cinema chain [49]. Thus, this study expects that vertical

inter-firm relations influence the mechanism of information transparency benefits. In addition, horizontal inter-firm relations influence the mechanism of resource pooling benefits that arise from the use of O2O digital platforms.

Movie theaters that are tightly integrated with upstream exhibition chains tend to acquire and utilize more information [58]. Vertically integrated theaters obtain information like customer demands and expectations for the movies, as well as the expected line of supply of movies [59]. Given that the critical benefit to tight vertical inter-firm relations is better information transparency, this study believes that more vertically integrated theaters will have cultivated the ability to better leverage the benefits brought about by increased information transparency.

Vertically integrated theaters would have developed the systems and analytical capability to gather and process information from their vertical partners. They are better positioned to process the complementary information obtained from the digital platforms when there is greater demand-side usage of O2O digital platforms as they have cultivated the ability to use and process the information. Indeed, prior research has highlighted the importance of operational conditions like IT capability to enable firms to leverage information and other benefits from a tightly knit industry value chain [60]. Vertically integrated firms are, thus, more likely to have the capabilities to leverage the information transparency benefits from O2O digital platforms. Hence:

H2a: For supply-side firms with strong vertical inter-firm relationships, the positive relationship between demand-side usage of online platforms and resource utilization tends to be stronger than those with weak vertical inter-firm relationships.

H2b: For supply-side firms with strong vertical inter-firm relationships, the positive relationship between demand-side usage of online platforms and product concentration tends to be stronger than those with weak vertical inter-firm relationships.

3.4. Substitutive effect of horizontal inter-firm relations

In contrast, this study expects more horizontally integrated firms (i. e., members of larger cinema chains) to benefit from resource pooling advantages associated with broader horizontal inter-firm relationships. From a resource pooling perspective, horizontally integrated members already benefit from significant resource pooling effects as part of a cinema chain [61], which results in greater brand recognition and customer loyalty [44]. Therefore, it implies that such firms are likely to benefit less from the resource pooling effects and increased reach of participating in an O2O digital platform. Furthermore, as part of a larger chain, the firms may benefit less from the integrated booking system and resources provided by participating in an O2O digital platform. Movie theaters belonging to a cinema chain are likely to access similar resources. Thus, this study expects that the resource pooling benefits from greater participation in the online platform will likely be more limited when the supply-side firms are already part of a cinema chain.

Further, this study expects that supply-side firms that are horizontally integrated may face greater constraints and have less flexibility to adjust operational decisions to leverage the resources gained from participating in the O2O digital platform [61]. Firms participating in online platforms must redesign their digital business strategy to leverage platform resources [1]. In addition, horizontally integrated firms have a constrained ability to leverage the additional resources due to the need for coordination across the members of the cinema chain. Thus, the study expects that supply-side firms that are horizontally integrated are less able to benefit from the resource pooling advantages of participating in an O2O digital platform. Hence, the study hypothesizes:

H3a: For supply-side firms with strong horizontal inter-firm relationships, the positive relationship between demand-side usage of

online platforms and resource utilization tends to be weaker than those with weak horizontal inter-firm relationships.

H3b: For supply-side firms with strong horizontal inter-firm relationships, the positive relationship between demand-side usage of online platforms and product concentration tends to be weaker than those with weak horizontal inter-firm relationships.

4. Data and Methodology

This research follows a quantitative methodology, establishing a panel data model to test the effect of demand-side usage of O2O digital platforms on supply-side firms' operational decisions. To understand the Chinese movie theater industry, as well as establish the relevance of the study's assumptions, the research conducted nine semi-structured interviews with theater managers. Four interviews were conducted before the quantitative analysis; five were conducted after the completion of the analysis. Seven interviewees were middle or senior managers in their companies. On average, the interviewees had about 15 years of experience. The interviews were conducted, recorded, transcribed in Chinese, and translated to English. The transcribed texts were analyzed following an iterative process. This provided more details about how movie theaters worked. It also corroborated the theoretical mechanisms proposed about information transparency and resource pooling. This provides greater confidence about the proposed theoretical mechanisms. This is important because our study neither measured nor tested these mechanisms.

This research treats each movie theater as the unit of analysis. This is consistent with extant empirical studies that treated theaters as the unit of analysis when investigating operational decisions by movie theaters, such as movie differentiation, movie quality decisions, and daily assortment decisions [6,62]. Every movie theater's ticketing information system is open to third-party digital platforms. This allows the platforms to sell the tickets online. Therefore, every movie theater acts as a merchant on the O2O digital platforms.

Interviews with theater managers in China further established the role of the movie theater managers in operational decisions. Interviewees explained that theaters must make resource utilization and movie concentration decisions. For example, an interviewee from a multiplex theater with seven screens explained that the size and equipment of auditoriums differ. The interviewee stated, "We have to decide which auditorium will show which movie in light of potential customer demand for different movies." The interviewee added that the theater would assess the potential popularity of a movie, scheduling more exhibitions or arranging more screens for those movies expected to be popular in the local area. Another theater manager stated, "Although the chain will give us some suggestions to guide movie scheduling, we have to maximize our box-office revenues by adapting our movie scheduling to local demand." The study verified through the prospectus published by theater chains that movie theaters make their own scheduling decision even if they are included in a chain⁴. Additionally, the data show substantial differences in the scheduling decisions of different theaters owned by the same theater chain. These provide support for treating each theater as a unit of analysis even if they are part of a theater chain.

The sample for this study includes all movie theaters operating in the city of Nanjing, China, during the first half of 2017. Nanjing, the capital of China before 1949, is a city famous for its cultural and entertainment

⁴ The Prospectus of Guangzhou Jinyi Film Media Corporation, accessed from http://www.cscc.gov.cn/pub/zjhpublic/G00306202/201206/t20120627_212019.htm [page number 1-1-122], states the following: "A theater can obtain digital or film copies based on a scheduling plan made by an exhibition chain. It is up to a theater to determine the detailed exhibition time and frequency of movies. Meanwhile, a theater can adjust exhibition time and frequency in light of actual situations and revenues".

consumption in China. The study sample consists of data spanning 26 weeks from a total of 81 movie theaters across the city's 11 districts. These movie theaters are affiliated with 18 exhibition chains. The data relating to movie theaters were collected from the Ebotapp app of Endata, which provides data about China's movie industry. The database is equivalent to the IMDB (Internet Movie Database) in the United States. However, Ebotapp contains both movie information and detailed cinema-level data like weekly box office revenues and movie schedules. A research assistant trained in statistical and programming techniques was engaged to retrieve relevant information and clean the data. The study scraped data from the app through a custom-written program in January 2018. The data were randomly verified manually to ensure consistency with the information in the app. The downloaded data contained weekly movie scheduling and revenue for each of the 81 theaters. The study also collected demographic data from the Municipal Statistics Bureau of Nanjing. These data, which were open for public access, were matched with the cinema data based on the municipal district of the cinema.

4.1. Dependent variables

This study examines the resource utilization and product concentration-dependent variables. It operationalizes resource utilization with the *seat utilization* variable, which refers to the *total number of seats scheduled by a movie theater each week divided by the total number of seats in the theater*⁵. Movie theaters make money from ticket sales and the sale of snacks and drinks. Therefore, their profitability will increase if they can sell more tickets for the limited seat capacity. Whether the scheduled seat is finally sold depends on local demand. The study's measure reflects the extent to which a movie theater can efficiently utilize its seat resources. This depends on the ability of the theater to forecast consumer demand for movies and attract patrons to the cinema. In the past, movie theaters used information from marketing firms and studios to analyze customer demand for movies to schedule seats [44]. Increasingly, however, movie theaters schedule their movies based on real-time feedback and information from customers through digital platforms [63]. It is suitable to use this variable to examine the impact of movie theaters' reliance on O2O digital platforms.

The study uses the market concentration variable for product concentration, which is widely used in the strategic management literature [64]. Measured by the Herfindahl–Hirschman Index, it shows the distribution of seats per week across the movie titles shown in the movie theater. The following formula is used:

$$\text{Concentration} = \sum_{j=1}^n \left(\frac{x_{ijt}}{x_{it}} \right)^2$$

x_{it} represents the total number of seats scheduled for all shows by movie theater i in t^{th} week. x_{ijt} represents the number of seats scheduled for a specific j^{th} movie title by movie theater i in t^{th} week. The measure considers seats scheduled for all movie titles.

4.2. Independent variables

Demand-side usage of O2O digital platforms for each movie theater is operationalized with the *online ratio* variable. This is the percentage of online box office revenues in each week's total box office revenues. It measures the extent to which each movie theater has a large base of online customers (purchasing tickets through O2O digital platforms) relative to offline customers (purchasing tickets at the theater). The online box office revenues include revenue from all O2O digital platforms for ticket purchases. The greater the adoption and usage of O2O

⁵ The study does not consider the differences in seats as each seat in a session is identically priced in the context where the study is conducted.

digital platforms by the patrons of a particular movie theater, the higher the value of *online ratio*. The variable captures demand-side usage of O2O digital platforms, which reflects the extent to which the movie theater depends on O2O digital platforms.

The *vertical relationship* is measured by the degree to which a movie theater is integrated with an upstream exhibition chain. In China, a movie theater must establish vertical relationships with an exhibition chain to obtain the rights to show a movie distributed by the exhibition chain [5]. The degree of ownership has been used to operationalize the vertical relationship between firms in the extant literature [65] and in the context of the movie theater industry [66]. An exhibition chain would invest to different extents in a movie theater to which it distributes movies. Their equity relationship ranges from none, to partial, to total ownership. The construct is measured as an ordinal variable. It considers the varying degrees of vertical integration. It is set to three for complete ownership, two for partial equity holdings, and one for zero equity holding (i.e., contract-based vertical relationships).

The study operationalizes the strength of horizontal relationships through the size of a theater chain. This is coded by the *chain size* variable. *Chain size* is measured by the total number of screens of a chain with which a movie theater is affiliated. This measure is consistent with prior studies [44], which have measured the size of movie chains by the total number of screens they own.

4.3. Control variables

The study includes five control variables based on the existing literature to control for other effects. These include average ticket price, resource attributes of cinemas like the number of seats and screens, age of the movie theater, and demographic attributes of the potential audience (i.e., the population density of the administrative district where a movie theater is located) [44,62].

- a **Average Ticket Price:** The *price* variable is measured by the average price per week, in Renminbi currency, set by a movie theater. In China, movie theaters must set their prices within the range imposed by the State Administration of Broadcasting, Film, and TV. Prices are set on factors like a movie theater's quality and the demographics of patrons in the metropolitan area. The average ticket price, thus, reflects differences in the quality of movie theaters and target customer segments [67].
- b **Total Capacity:** The *seats* variable is measured by the total number of seats owned by a movie theater. It represents a theater's capacity [5] and size.
- c **Total Number of Screens:** The *screens* variable is measured by the total number of screens possessed by a movie theater. This indicates how many movies a movie theater can show at the same time.
- d **Age:** The *age* variable is measured by the total number of months since the establishment of a movie theater as of August 2017. This reflects how long the theater has been in operation.
- e **District Population Density:** The *density* variable is measured by the population density of the administrative district in which a movie theater is located. The unit of *density* is 10,000 persons/square kilometer, reflecting the potential size of a theater's target market [67]. The study measured the residential population in Nanjing's 11 administrative districts at the end of 2016 using Nanjing Municipal Annual Statistics.

4.4. Empirical methods

The study uses a panel data model to analyze the data. It consists of 26 weeks of data from 81 movie theaters. Movies are released weekly; therefore, each movie theater must make weekly operational decisions about which movies to show, concentration of movies, and scheduling of seats. The study uses a one-week time interval for analysis. In total, there are 1,997 samples in the unbalanced panel. This is eventually reduced to

Table 1
Descriptive statistics and correlation coefficients

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
1. Seat utilization	40.96	6.22	1									
2. Concentration	0.22	0.08	-.08**	1								
3. Online ratio	88.23	7.70	.30**	.03	1							
4. Vertical relationship	1.77	0.89	-.06*	.06**	.06*	1						
5. Chain size	2428.75	1309.55	.02	-.01	-.02	.08**	1					
6. Price	32.80	19.84	.25**	.22**	.22**	.16**	-.02	1				
7. Seat	1025.52	497.81	-.21**	.07**	-.01	.38**	.14***	.14**	1			
8. Screen	7.31	2.42	-.21**	.05*	.01	.30**	-.07**	.25**	.76**	1		
9. Age	53.44	39.92	-.13**	.05*	-.05*	.35**	-.04	.21**	.16**	.29**	1	
10. Density	0.71	0.85	-.09**	.12**	.13**	.15**	-.26**	.16**	.25**	.39**	.27**	1

* p < 0.05
** p < 0.01.

Table 2
Results of hypotheses testing

Variable	Seat Utilization _t Model 1	Model 2	Model 3	Concentration _t Model 4	Model 5	Model 6
Controls						
Seat utilization _{t-1}	0.332*** (0.023)	0.335*** (0.023)	0.332*** (0.023)			
Concentration _{t-1}				-0.005 (0.023)	0.004 (0.023)	0.007 (0.023)
Price _{t-1}	0.031*** (0.004)	0.030*** (0.004)	0.030*** (0.004)	0.209*** (0.015)	0.196*** (0.014)	0.189*** (0.014)
Seat	0.308* (0.176)	0.110 (0.211)	0.176 (0.212)	-1.098*** (0.953)	-0.798 (0.803)	0.172 (0.808)
Screen	-0.026 (0.024)	-0.020 (0.061)	-0.037 (0.061)	-0.167 (0.109)	0.201 (0.226)	-0.039 (0.227)
Age	0.084 (0.073)	-0.036 (0.044)	-0.019 (0.044)	-0.680* (0.393)	-0.396** (0.158)	-0.239 (0.160)
Density	0.026* (0.015)	-0.005 (0.017)	-0.001 (0.017)	-0.049 (0.078)	0.005 (0.076)	0.041 (0.076)
Predictors						
Online ratio _{t-1}		0.049** (0.022)	0.589* (0.321)		0.754*** (0.095)	4.124*** (1.346)
Vertical relationship		-0.009 (0.014)	-0.230* (0.130)		0.029 (0.051)	-2.654*** (0.609)
Chain size		-0.081 (0.044)	0.256 (0.186)		-0.049 (0.094)	2.500*** (0.777)
Interactions						
Online ratio _{t-1} × Vertical relationship			0.050* (0.029)			0.594*** (0.135)
Online ratio _{t-1} × Chain size			-0.078** (0.041)			-0.531*** (0.170)
Movie theater fixed effects	Included	Included	Included	Included	Included	Included
Week dummies	Included	Included	Included	Included	Included	Included
No. of observations	1720	1720	1720	1720	1720	1720
Wald chi square	5848.17	5852.67	5914.05	1385.91	1509.51	1574.90

* p < 0.10
** p < 0.05
*** p < 0.01. Numbers are GLS regression coefficients. Numbers in parentheses are standard errors.

1,720 samples after the following procedures for removing abnormal values. First, movie theaters established after January 1, 2017, are omitted from the sample because the new theaters are in a trial phase and, therefore, have problems with missing data. Second, three movie theaters are omitted because they are owned by large travel or recreational firms. These theaters tend to cater to the demands of their parent firms (such as catering to large tour groups).

The study uses generalized least squares (GLS) regression to analyze the panel dataset. The GLS method has been widely used in management research for panel data analysis with potential panel autocorrelation [68]. The predictor variables are lagged by a time unit (week). Firms' operational decisions are often dependent on the patterns of their own decisions [69]. Therefore, this study includes the lagged firm decisions variable as a control. This also controls for regression-to-the-mean effect [68].

Potential problems of such an analysis are multicollinearity and the non-normal distribution of variables. The maximum value of the variance inflation factors (VIFs) stands at 3.34, with the mean VIF being 2.07. Consequently, no problems of multicollinearity exist. The study uses log transformations to ensure that variables conform to a more normal distribution [70]. It also accounts for heteroskedasticity in the analysis by running a series of tests to identify proper model specifications. This includes modified Wald statistic for groupwise heteroskedasticity, Wooldridge test for serial correlations, and Breusch-Pagan statistic for groupwise contemporaneous correlations. The results

indicate the existence of heteroskedasticity, which is accounted for by using robust standard errors.

5. Results and Analysis

Table 1 presents the descriptive statistics and Pearson correlation coefficients of all variables. Table 2 displays tests of the hypotheses. Models 1–3 and 4–6 use resource utilization (*seat utilization*) and product concentration (*concentration*) as the dependent variables, respectively. Models 1 and 4 are baseline models. They only include control variables. Models 2 and 5 include the independent variables for testing Hypotheses 1a and 1b. Models 3 and 6 include interaction terms between demand-side usage of O2O digital platforms and the extent of vertical and horizontal inter-firm relationships to test Hypotheses 2a, 2b, 3a, and 3b. All models tested are statistically significant. Wald's chi-square values are reported.

The results show the online ratio's significant impact on *seat utilization* and *concentration*. Model 2 shows that the *online ratio* positively and significantly impacts *seat utilization* ($\beta = 0.049, p < 0.05$; Model 2). It indicates that greater demand-side usage of digital platforms can result in better resource utilization by movie theaters, supporting H1a. In Model 5, the impact of *online ratio* on *concentration* is positive and significant ($\beta = 0.754, p < 0.01$; Model 5), indicating that greater demand-side usage of digital platforms results in higher product concentration. This supports H1b.

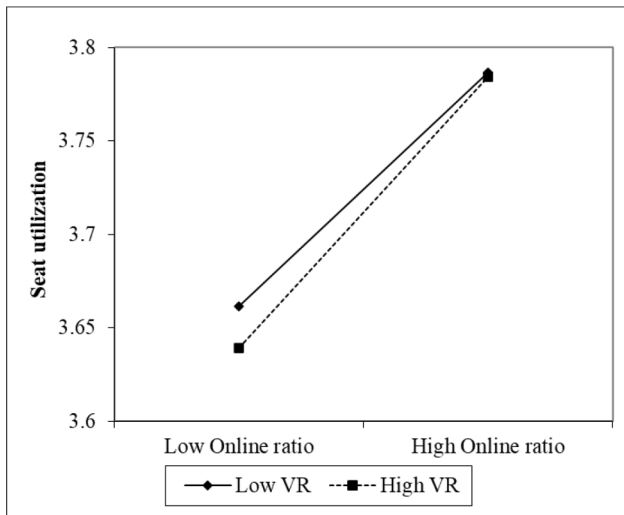


Fig. 2. Moderating effect of vertical relationship on the relation between online ratio and seat utilization. VR represents a vertical relationship.

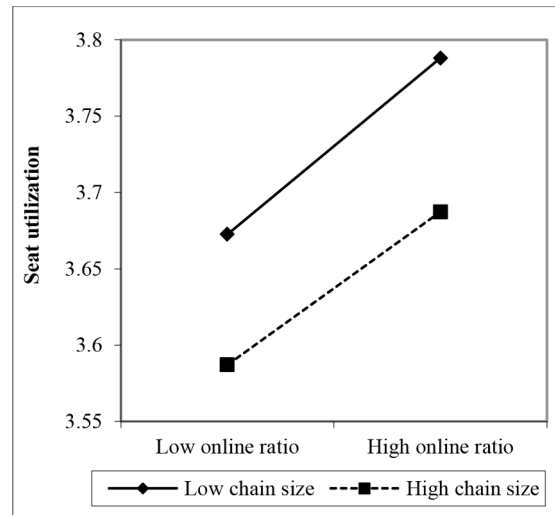


Fig. 4. Moderating effect of chain size on the relation between online ratio and seat utilization.

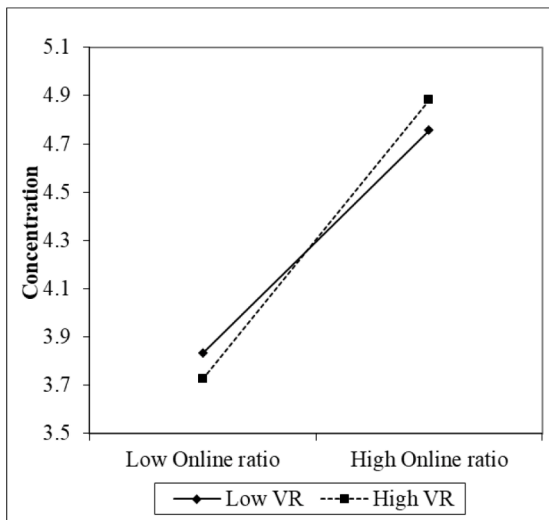


Fig. 3. Moderating effect of vertical relationship on the relation between online ratio and concentration. VR represents a vertical relationship.

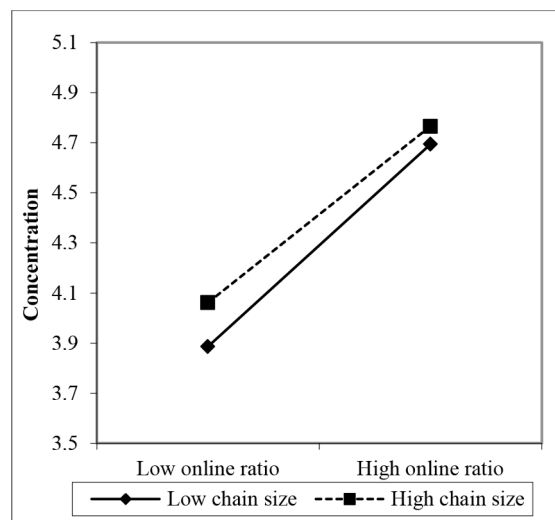


Fig. 5. Moderating effect of chain size on the relation between online ratio and concentration.

The results show that the *vertical relationship* positively moderates the relationship between demand-side usage of O2O digital platforms and firms' resource utilization decision ($\beta = 0.050, p < 0.1$, Model 3), as well as the product concentration ($\beta = 0.594, p < 0.01$, Model 6). This supports H2a and H2b. In addition, *chain size* negatively moderates the relationship between the demand-side usage of O2O digital platforms and firms' resource utilization decision ($\beta = -0.078, p < 0.05$, Model 3) and product concentration ($\beta = -0.531, p < 0.01$, Model 6). This supports H3a and H3b.

Figures 2–5 show the moderating effects of the *vertical relationship* and *chain size*. *Chain size* and *online ratio* are assigned the values of one standard deviation above and below their means. Standard deviation cannot be used to compute the higher and lower extreme values of the *vertical relationship* because it is an ordinal variable. Hence, the study uses the value of 3 for high VR and 1 for low VR because there are three categories in a vertical relationship (1 and 3 represent the two extremes of the relationship). The figures confirm the positive impacts of the *online ratio* on *seat utilization* and *concentration*. Figures 2 and 3 show that the positive impact of the *online ratio* is lower for movie theaters with low *vertical relationships* and higher for those with high *vertical*

relationships, respectively. Figures 4 and 5 indicate that the positive effect of the *online ratio* is lower for large *chain sizes* and higher for small *chain sizes*, respectively.

5.1. Endogeneity

The study tackles potential endogeneity biases in multiple ways. First, the model uses lagged dependent variables as described, which eliminates the simultaneity bias and may introduce endogeneity to the analysis. Second, the study introduces a rich set of controls to account for multiple theoretical effects that might impact the dependent variables. This may limit the biases arising from omitted variables [71]. However, there could still be bias due to omitted variables that impact the dependent and independent variables beyond the control variables included. Finally, to address endogeneity concerns, the study performs an instrumental variable analysis.

The instrumental variable of choice is the platform's service fees to consumers. Platforms charge service fees to earn revenue. The service fees are not fixed and may, therefore, vary by movie theater and week. The fees generate profits and cover operational and marketing costs to

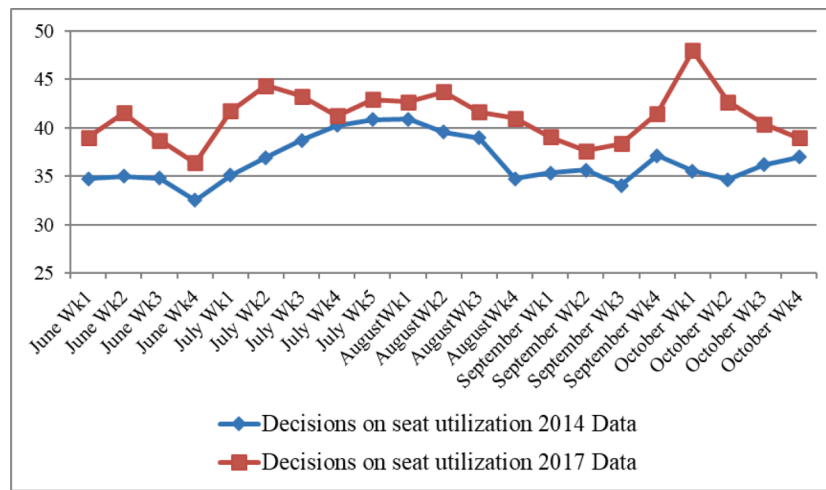


Fig. 6. Comparison of seat utilization decisions between 2014 and 2017.

Note: The seat utilization decision is measured by the total number of seats scheduled by a movie theater each week divided by the total number of seats in the theater. The indicator is the average of all theaters per week.

Table 3
Alternative explanation analysis

Phenomenon	Alternative Explanation	Solution
Simultaneity	Does online platform adoption and firm decisions impact each other?	During lagged regression, the online platform adoption variable lagged to ensure that simultaneity could be ruled out.
Construct Definition	Are the variables defined in a way to induce results?	Alternative construct measures were tested to ensure robustness.
Lag Effect	Does past behavior (older than t-1) impact a firm's current behavior?	When testing for different time lags, the qualitative results are similar. The effect becomes weaker; however, it remains significant.
Endogeneity	Do other effects impact firm behavior?	An instrument variable analysis contains two instruments.

the O2O platforms. Movie theaters generally have no control over these service fees. No such service fees exist for sales transactions at the movie theater's sales office (without the use of the O2O platform). This variable potentially affects the online ratio of platform users for each movie theater [72]; however, it will not impact the product concentration or resource utilization of movie theaters. The correlation coefficients of service fees with online ratio ($r = 0.516, p < 0.01$), seat utilization ($r = 0.142, p > 0.1$), and concentration ($r = 0.0055, p > 0.1$) attest to this.

The study analyzes a panel instrumental variable regression with fixed effects for time and movie theater. The Wald's chi-square value for the first stage of G2LS analysis for service fees as the instrumental variable is $2.04e + 06$ ($p < 0.001$). The high value of the chi-square resolves the under-identification issue and provides evidence that the instrument is not weak. As reported in the two-stage analysis, the F-statistic for the instrument variable is significantly more than the minimum threshold of 10, which ensures minimum bias. The study performs a two-stage GLS analysis with the instrument variable; the results are like the main analysis.

Table A1
Results of robustness check

Variable	Seat Utilization _t Model 2a	Model 3a	Concentration _t Model 5a	Model 6a
Controls				
Seat utilization _{t-1}	0.335*** (0.023)	0.332*** (0.023)		
Concentration _{t-1}			0.009 (0.023)	0.011 (0.022)
Price _{t-1}	0.030***(0.004)	0.030*** (0.004)	0.220*** (0.016)	0.213*** (0.016)
Seat	0.289 (0.307)	0.386 (0.308)	-1.579 (1.305)	-0.510 (1.313)
Screen	-0.076 (0.091)	-0.103 (0.091)	0.439 (0.380)	0.142 (0.382)
Age	0.014 (0.070)	0.039 (0.070)	-0.659 (0.293)	-0.379 (0.295)
Density	0.034 (0.037)	0.045 (0.038)	-0.139 (0.175)	-0.017 (0.176)
Predictors				
Online ratio _{t-1}	0.049** (0.022)	0.473* (0.267)	0.912*(0.104)	3.601***(1.244)
Vertical relationship	-0.001 (0.017)	-0.213 (0.129)	-0.029 (0.085)	-3.055*** (0.667)
Chain size	-0.155 (0.084)	0.182 (0.208)	0.559 (0.380)	2.943 (0.960)
Interactions				
Online ratio _{t-1} × Vertical integration		0.048* (0.029)		0.679*** (0.148)
Online ratio _{t-1} × Chain size		-0.081* (0.043)		-0.599*** (0.200)
Theater fixed effects	Included	Included	Included	Included
Week dummies	Included	Included	Included	Included
No. of observations	1720	1720	1720	1720
Wald chi square	5852.67	5910.93	1503.25	1571.50

* $p < 0.10$

** $p < 0.05$

*** $p < 0.01$. Numbers are GLS regression coefficients. The numbers in parentheses are standard errors.

Table A2
Results of regressions on the performance of operational decisions

Variable	Revenues Model 7	Model 8	Audience Model 9	Model 10
Controls				
Price	1.148*** (0.014)	1.086*** (0.015)	1.002*** (0.010)	0.958***(0.010)
Seat	0.570 (0.823)	0.533 (0.788)	1.399** (0.577)	1.371***(0.553)
Screen	0.020 (0.094)	0.004 (0.090)	-0.085 (0.066)	-0.095 (0.063)
Age	-0.173 (0.336)	-0.105 (0.322)	0.245 (0.235)	0.291 (0.226)
Density	-0.003 (0.064)	-0.010 (0.062)	0.107** (0.045)	0.101** (0.043)
Predictors				
Seat utilization		0.592***(0.064)		0.418***(0.045)
Concentration		0.191*** (0.021)		0.131***(0.014)
Theater fixed effects	Included	Included	Included	Included
Week dummies	Included	Included	Included	Included
No. of observations	1720	1720	1720	1720
Wald chi square	24734.26	27156.46	41124.63	44978.79

* p<0.10

** p<0.05

*** p<0.01. Numbers are GLS regression coefficients. The numbers in parentheses are standard errors.

Table A3
Demographics of the interview respondents

Position	Experience		
Senior Manager	<10 years	2	2
Middle Manager	10-20 years	5	6
Junior Manager	20+ years	2	1

5.2. Robustness checks and additional analysis

As stated, the study conducted interviews with theater managers to validate assumptions and provide additional validation for the results. The interview data support the study’s findings that theaters generally increase their resource utilization with greater reliance on online platforms. Managers reported that their theaters could, on average, schedule an additional show every day after joining O2O platforms. For example, theaters usually arranged two shows per night before joining O2O platforms. However, they have found that scheduling three shows at night is profitable. This conclusion resulted from greater information transparency and increased reach. Potential patrons were provided information about movie seat availability; thus, online patrons could make sudden discretionary purchases online, which they previously could not do in person. Greater demand-side usage of online platforms also reduced information asymmetry for theaters as they have greater means to understand customer purchase patterns and changing requirements. Therefore, the evidence supports the study’s argument that increasing demand-side usage of O2O platforms will lead to scheduling more seats and increased resource utilization.

The interviews also provide insights to support the study’s results on product concentration. For example, one of the respondents stated, “When scheduling movies, theaters would take into account such factors as the director or cast of a movie, the review by media or critics, the response to the movie trailer, and the preference of local consumers.” The manager also mentioned that they utilize “online information, including attention degree in social media like WeChat and TikTok and electronic word-of-mouth in O2O platforms like Maoyan ... they would rely more on the online information when more consumers choose to buy movie tickets online.” Hence, the online ratio reflects the customer mix and informs theaters about the extent to which they can rely on online information in making operational decisions. This shows that movie theaters recognize that online consumers differ from offline consumers in their behaviors (e.g., their search behaviors and susceptibility to electronic word of mouth) [21]. Movie theaters will benefit more from information provided by O2O platforms when they have more patrons through the online channel.

To further verify the study’s results, it collected resource utilization

and online usage data for 2014 and 2017. This created a pseudo-natural experiment to analyze the impact of increasing online ratio (usage of O2O platform by consumers) on resource utilization (operational decisions) of the theaters, independent of theater-level variations. As shown in Figure 6, with the demand-side usage of O2O platforms increasing from about 25% in 2014 to more than 70% in 2017, theaters’ seat utilization ratio increased. Irrespective of firm-level capabilities and decisions, this denotes the apparent association between increasing online ratio and greater resource utilization by theaters.

To ensure that the results are robust against the choice of how the variables are operationalized, the study uses alternate measures of the concentration and chain size variables. First, it recalculates the variable concentration by considering the concentration coefficient based on the top five movies shown by a movie theater vs. all the movies shown by a theater each week. Second, the study uses different measures for chain size, including the total number of movie theaters affiliated with a theater chain. Generally, these measures produce similar results. Table A1 in the Appendix presents the results of robustness checks when the total number of all movie theaters is used as the measure of chain size and the new measure of concentration. The results indicate that the online ratio remains a strong predictor for operational decisions made by theaters. The study also finds that vertical relationship and chain size remain significant moderators. Hence, the results are robust to new formulations of critical variables.

The study also conducts a sensitivity analysis on the lagging effect in robustness analysis. In the main analysis, the study uses a time lag of t-1 on the basis that firms make operational decisions based on past consumer behavior (not simultaneously). To ensure that the study’s results are not biased by errors in the duration of past behavioral effects, it varied the lag by two- and three-time units (weeks) instead of one. Again, the study finds similar similar, though the effects are understandably muted.

Finally, the study incorporates demand characteristics by adding a dummy variable to indicate key festival holidays in the robustness checks. For China, the Golden Week holiday, a one-week spring festival in January, overlaps with the time of the study.⁶ Therefore, Golden Week is coded 1 if the week is golden (or 0 if not). The results are like the

⁶ According to the prospectus of Guangzhou Jinyi Film Media Corporation (P1-1-110), there are four major and minor movie peak periods in the year. The minor movie peak periods only allow one additional day off (e.g., the Dragon Boat Festival) or no day off (e.g., Valentine’s Day), so they are not taken into account. Regarding the four major movie peak periods, the Spring Festival is the only movie peak period in this sampling period. Therefore, this analysis only added the dummy variable for Spring Festival. Adding the other minor movie peak periods does not change the results.

main analysis. This analysis also supports all hypotheses; however, the coefficient of the interaction term of online ratio and vertical relationship is not significant. The study runs an additional robustness test by including the ownership pattern (state vs. private) to account for firm capabilities. It finds the effect to be nonsignificant. The inclusion of the variable does not affect our results. Table 3 provides a summary of the validation and robustness checks.

5.3. Outcomes of operational decisions

This study investigates resource utilization and product concentration outcomes by analyzing the impact of these decisions on the performance of movie theaters. Models 7–10 use resource utilization (*seat utilization*) and product concentration (*concentration*) as independent variables. Models 7 and 8 use *revenues* of each movie theater as the dependent variable; Models 9 and 10 use *audience* as the dependent variable. *Revenues* represent a movie theater's total box office revenues in one week. The *audience* represents the total number of customer visits to a movie theater in one week. The two variables, combined, capture the performance of movie theaters. The *revenues* variable reflects financial performance, while the *audience* reflects potential gains from consumers who buy snacks, drinks, and movie derivatives. Table A2 in the Appendix shows the results. Models 7 and 9 contain control variables, while Models 8 and 10 include independent variables. In Model 8, the results show that both *seat utilization* ($\beta = 0.592, p < 0.01$) and *concentration* ($\beta = 0.191, p < 0.01$) have a positive and significant impact on *revenues*. In Model 10, the results show that both *seat utilization* ($\beta = 0.418, p < 0.01$) and *concentration* ($\beta = 0.131, p < 0.01$) have a positive and significant impact on the *audience*.

The regression results show that both operational decision variables have significantly positive impacts on the performance of movie theaters. Further, the coefficients of *seat utilization* are larger than 0.4. The coefficients of *concentration* are larger than 0.1. As both dependent and independent variables are in their log forms, the coefficients represent elasticity. This suggests that revenue increases by more than 0.4% with a 1% increase in resource utilization and more than 0.1% when product concentration increases by 1%. The large coefficients indicate that the two decisions are crucial for performance, showing that those movie theaters that are more effective in leveraging resources and offering a compelling product mix perform better.

6. Discussion and Implications

The results presented in the preceding section provide numerous insights. First, the study finds that demand-side usage of digital platforms can lead to decisions of efficient resource utilization and concentrated product offerings. Extant literature finds that joining O2O platforms can improve the performance of participating merchants [73]. This research confirms the finding, adding to the literature on O2O platforms by examining operational decisions made by merchants. It extends the discussion in extant literature that investigates the antecedents of performance or value creation [32,74] to focus on the antecedents of decisions by supply-side firms joining digital platforms. This study hypothesizes that O2O platforms drive better supply-side decisions by facilitating information transparency and resource pooling.

Second, the results indicate that vertical integration positively moderates the relationship between demand-side usage of digital platforms and firms' decisions on resource utilization and product concentration. The findings suggest that firms already embedded in tight vertical inter-firm relations may have the capabilities to better leverage the benefits provided by O2O digital platforms. Prior research finds that firms with stronger downstream capabilities will see a greater association between joining digital platforms and sales [5]. This study extends extant research by exploring the role of vertical relationships in moderating the influence of demand-side usage of digital platforms on merchants' operational decisions. For vertically integrated merchants,

performance improvement can be ascribed to platform-enabled better operational decisions.

Third, the results show that horizontal integration negatively moderates the relationship between the demand-side usage of O2O digital platforms and the firms' decisions on resource utilization and product concentration. The finding suggests that horizontal relationships may present similar benefits as those provided by O2O digital platforms. They may also present some inflexibilities that constrain firms from fully leveraging the benefits of digital platforms. Extant literature suggests that merchants are increasingly concerned with their high reliance on digital platforms [16,74]. This study adds to this research by pointing out that horizontal relationships provide a partial substitute for digital platforms. In addition, merchants can join a large chain to access additional resources that would have a similar effect as utilizing platform-enabled resources.

6.1. Theoretical implications

The study has several theoretical contributions. First, it contributes to existing research by exploring demand-side drivers of supply-side decision-making. Prior research that examined supply-side firms on e-commerce platforms would focus on the relationship between firms' decisions and performance [5,42]. However, research has not examined the association between digital platforms and firms' operational decisions. The current research fills the gap by examining how demand-side usage of O2O digital platforms influences the operational decisions of supply-side firms. The study finds that digital platforms enable supply-side firms to better utilize their resources. They can make optimal product mix decisions by taking advantage of benefits provided by O2O digital platforms.

Furthermore, research on platforms tends to focus on products and less on services [17]. Even when prior research examined the cinema context, it would focus on cinematic shows as products, investigating the influence of social media and eWOM on movie sales [6,62]. This research contributes to this work stream as it examines the provision of services through O2O digital platforms, the cinema theater as a unit of analysis, and their operational decisions. It provides insights that may shed light on the benefits and outcomes of relying on O2O digital platforms by service firms.

This study also contributes to a greater understanding of how existing inter-firm boundaries of supply-side firms affect how they might benefit from using and relying on digital platforms. Extant literature regards platforms as metaorganizations that connect, coordinate, and empower firms that join the platform [17]. Platforms, thus, create new inter-firm relationships. They will interact with existing inter-firm relationships, including vertical and horizontal inter-firm relations [4]. This study shows that firms' existing vertical and horizontal relationships [15] appear to affect the extent to which the firm can leverage the benefits from demand-side usage of the O2O digital platform. A supply-side firm's existing vertical and horizontal inter-firm relationships reflect and shape the firm's ability to acquire, combine, and apply platform resources, and, thus, influence the firm's resource and product decisions.

6.2. Managerial implications

This study informs managerial decision-making for merchants using digital platforms, helping them to understand how reliance on digital O2O platforms impacts the effectiveness of operational decision-making. Theoretically, the study proposes that firms that rely more on O2O digital platforms can leverage informational transparency and resource pooling effects to improve their operational decision-making.

The findings highlight that demand-side usage of digital O2O platforms has implications for supply-side firms' operational decisions. This suggests that firms should understand the extent to which they rely on digital O2O platforms for sales of their services. They should, then,

factor that into consideration of how they would leverage informational resources and other resources from digital platforms to inform operational decisions. For instance, the study's interviews suggest that greater demand-side usage of O2O platforms implies that merchants should pay greater attention to consumer reviews and sentiment on O2O platforms. These factors may impact decisions related to their product mix and resource utilization, recognizing that customers making an online purchase may differ from those who purchase offline. The findings also suggest that firms may wish to rely on platform-based resources, functionalities, and informational benefits for making operational decisions if they have greater demand-side usage of O2O platforms among their customer base. A further analysis that shows that both resource utilization and product concentration have significant revenue implications also suggests that these are important decisions that impact firm performance. Therefore, merchants should pay attention to these implications as they leverage the O2O digital platforms.

Furthermore, the findings show that firms embedded in vertical inter-firm relations (rather than horizontal inter-firm relations) are better placed to leverage O2O digital platforms. This suggests that firms should consider their existing inter-firm relations when assessing their abilities to leverage the benefits provided by O2O digital platforms for making operational decisions.

6.3. Limitations

This research has some limitations, which suggests areas for future research. First, as noted in the article, the study proposes information transparency and resource pooling as the key underlying theoretical mechanisms for the hypotheses. While the study uses interviews to ascertain the face validity of these theoretical mechanisms, it did not measure and test the proposed underlying theoretical mechanisms due to data limitations. Future research should empirically examine and test these specific constructs to show the mediating effects of these constructs.

Second, the study conducts empirical research in the context of China's motion picture industry. The data are, therefore, restricted to one city in China. Generalizing the findings of this research to other service industries, countries, and regions requires more empirical studies. Given the data-imposed restrictions, we could not control for movie assortment at a theater level that can be included in future studies to enhance robustness of the analysis.

Third, this study expects that the underlying benefits of information transparency and resource pooling would apply to most O2O digital platforms in the service industry, such as hotels and restaurants. Most service firms should pay attention to operational decisions like resource utilization and product concentration. For example, restaurants are similarly concerned with seat occupation and must, therefore, decide on their menu offerings. Nevertheless, operational decisions may be of varying importance to different sectors (e.g., movie offerings are more dynamic than restaurant menu offerings). Hence, the study acknowledges that different operational decisions will likely feature more heavily for different industries. Future research may wish to examine the influence of O2O platforms on other operational decisions and for other industries.

Finally, the study's empirical tests did not conclusively show causality although it tried to mitigate this limitation in several ways. First, statistically, the independent variables are lagged to the dependent variables. Over the extended panel, this ensures that the reverse causality is less of a concern. Second, the study conducted an instrumental variable analysis, ruling out endogeneity concerns through a statistical approach. Future research may adopt research designs that are more conducive to establishing causality for this research question.

7. Conclusions

Despite the limitations, this research extends the research in O2O

digital platforms, specifically for service firms. Focusing on China's cinema industry, the study shows that greater reliance on digital platforms for supply-side firms results in more optimal operational decision-making. This is likely due to the information transparency and resource pooling benefits provided by O2O digital platforms. Furthermore, the study considers how a firm's existing inter-firm relationship interacts with and moderates the ability to reap benefits from reliance on O2O digital platforms. As such, this research significantly enhances the understanding of how digital adoption by consumers affects supply-side firms' operational decisions due to the benefits and resources provided by O2O digital platforms.

CRedit authorship contribution statement

King Wan: Conceptualization, Data curation, Methodology, Formal analysis, Software, Writing – original draft. **Ashish Kumar Jha:** Conceptualization, Methodology, Formal analysis, Software, Writing – original draft. **Nikolai Kazantsev:** Conceptualization, Writing – original draft. **Wai Fong Boh:** Conceptualization, Writing – review & editing.

Acknowledgments

The authors thank the organizers and mentors of the paper-a-thon event at the International Conference on Information Systems (ICIS) 2017, particularly Prof. Nick Berente (University of Notre Dame), Prof. Jungpil Hahn (National University of Singapore), and Prof. Yuqing Ren (University of Minnesota). The first author gratefully acknowledges financial support from the National Social Science Foundation of China (grant no. 21BGL033), Principal Scholar/Excellent Team of Instructors of Qinglan Project of Universities in Jiangsu, and Coordinated Innovation Base of Jiangsu Grass-root Social Governance Research. The third author acknowledges that their work was supported by the Engineering and Physical Sciences Research Council (grant number EP/T022566/1). DIGIT Lab is a Next Stage Digital Economy Centre. The third author acknowledges support of HSE University travel grant to attend ICIS 2017, where the authors of this paper met.

Appendix A

[Table A1](#), [Table A2](#)

Appendix B: Details of semi-structured interviews

The interviews were conducted in two phases. Four interviews had been conducted during the data collection phase before the empirical analysis was performed. Five additional interviews were conducted after the analysis was completed. The first set of interviews were aimed at understanding the context to help guide the study's theoretical development and data analysis. The second set of interviews were aimed at testing our theorizing assumptions and confirming our results' intuition. The interviews were conducted, recorded, and transcribed in Chinese. They were then translated to English by a native Chinese speaker who understood movie theaters in China. Three authors analyzed the transcribed texts following an iterative process for analyzing content (Miles and Huberman, 1994). Any differences were resolved through peer review and discussion (Kassarjian, 1977). External validity was further ensured by conducting a thorough review of previous literature on platforms in the cinema industry. We followed the abductive procedure of Dubois and Gadde (2002), i.e., evolving the theoretical, empirical fieldwork, and analysis simultaneously.

[Table A3](#) shows the profile of the respondents.

We used a semi-structured interview protocol using the following interview guide. Further probing questions were asked as a follow-up, where required during the interview.

Interview Guide

I. Introduction

We are a team of researchers focusing on the impact of O2O platforms on theaters. We hope to ask you a few questions to understand this topic better. Your identity will not be revealed at any point. We will be recording the interview for analysis purposes.

II. Demographics (filled by the authors)

- Level of management (junior, middle, senior)
- Experience in 10-year bands

III. Questions

1. Basic issues about operational decisions made by a movie theater?

- A Which decisions are made by movie theaters routinely, on a daily, weekly and monthly basis?
- B Among operational decisions made, which are the most crucial for theaters' revenue? And why these decisions are crucial?
- C How do theaters make operational decisions, especially the crucial decisions?

2. Basic issues about scheduling decisions?

- A Content of scheduling decisions: titles, time slots, auditorium ...
- B Frequency of scheduling decisions
- C When will a scheduling decision be made, and who makes the decisions?
- D When will the scheduling decision be changed, and who will change the decision?

3. Factors influencing scheduling decisions?

- A Which factors impact decision-making by theaters?
- B Demand-side factors: local demographics, preferences ...
- C Supply-side factors: screens, 3D, seats, services, location ...
- D Impact of data revealed or provided by O2O platforms: online comments, sales volume

4. What is the role of theaters in making scheduling decisions?

- A Which decisions are made by theaters?
- B What are the changes in theaters' scheduling decisions after the emergence of O2O platforms?
- C What is the relationship (wholly owned, partially owned, or non-equity holding) impact on the distribution of decision-making rights between theaters and exhibition chains?
- D How about the relationship between the theaters and other theaters in the exhibition chain? Does the relationship influence the distribution of decision-making rights?
- E Does the ownership nature of the theaters influence the scheduling decision made?

5. What is the role of the exhibition chain affiliated with your theaters in scheduling decisions?

- A Which decisions are made by your exhibition chain?
- B What changes have occurred to the decisions made by your exhibition chain after the emergence of O2O platforms?

6. What is the role of O2O platforms in scheduling decisions?

- A How about the opportunities for and challenges in theaters when joining O2O platforms?
- B The role of O2O platforms in scheduling decisions?
- C Does the role vary with the titles of movies? How and why does the role vary with the title of movies?
- D Any difference between scheduling decisions made by Maoyan and Taopiaopiao, two major O2O platforms in China?

7. What changes in scheduling decisions in busy seasons (golden weeks)?

- A Any change in decision-making power distribution: who have more powers?
- B How about the changes in the decision made by theaters: titles, distribution of titles, number of exhibitions per day?

References

- [1] A. Bharadwaj, O.A. El Sawy, P.A. Pavlou, N. Venkatraman, Digital business strategy: toward a next generation of insights, *MIS Quarterly* 32 (2) (2013) 471–482.
- [2] X. Liu, Y.W. Zhou, Y. Shen, C. Ge, J. Jiang, Zooming in the impacts of merchants' participation in transformation from online flash sale to mixed sale e-commerce platform, *Information & Management* 58 (2) (2021), 103409.
- [3] S. Xiao, M. Dong, Hidden semi-Markov model-based reputation management system for online to offline (O2O) e-commerce markets, *Decision Support Systems* 77 (2015) 87–99.
- [4] X. Wan, N. Wang, B.S.-C. Liu, Impact of O2O platform multihoming and vertical integration on performance of local service firms – a quantile regression approach, *Internet Research* 30 (5) (2020) 1583–1610.
- [5] X. Wan, J. Chen, The relationship between platform choice and supplier's efficiency-evidence from China's online to offline (O2O) e-commerce platforms, *Electronic Markets* 29 (2) (2019) 153–166.
- [6] X. Wan, J. Chen, B. Chen, Exploring service positioning in platform-based markets, *International Journal of Production Economics* 220 (2020) 1–11.
- [7] Y. Yang, Y. Gong, L.P.W. Land, T. Chesney, Understanding the effects of physical experience and information integration on consumer use of online to offline commerce, *International Journal of Information Management* 51 (2020) 1–18.
- [8] C. Dellarocas, The Digitization of Word of Mouth: Promise and Challenges of Online Feedback Mechanisms, *Management Science* 49 (10) (2003) 1407–1424.
- [9] S. Fay, J. Xie, C. Feng, The effect of probabilistic selling on the optimal product mix, *Journal of Retailing* 91 (3) (2015) 451–467.
- [10] L. Li, W.C. Benton, Hospital capacity management decisions: Emphasis on cost control and quality enhancement, *European journal of operational research* 146 (3) (2003) 596–614.
- [11] C. Cennamo, J. Santalo, Platform competition: Strategic trade-offs in platform markets, *Strategic Management Journal* 34 (2013) 1331–1350.
- [12] A. Kathuria, P.P. Karhade, B.R. Konsynski, In the realm of hungry ghosts: multi-level theory for supplier participation on digital platforms, *Journal of Management Information Systems* 37 (2) (2020) 396–430.
- [13] J. Zhou, X. Wan, How to Build Network Effects on Online Platforms for Mental Health, *California Management Review* 64 (4) (2022) 20–46.
- [14] S. Nambisan, Digital entrepreneurship: Toward a digital technology perspective of entrepreneurship, *Entrepreneurship Theory and Practice* 41 (6) (2017) 1029–1055.
- [15] L.W. Thomas, E. Autio, D.M. Gann, Architectural Leverage: Putting Platforms in Context, *Academy of Management Perspectives* 28 (2) (2014) 198–219.
- [16] J.D. Westphal, Collaboration in the boardroom: Behavioral and performance consequences of CEO-board social ties, *Academy of Management Journal* 42 (1999) 7–24.
- [17] T. Kretschmer, A. Leiponen, M. Schilling, G. Vasudeva, Platform ecosystems as meta-organizations: Implications for platform strategies, *Strategic Management Journal*, Forthcoming (2020).
- [18] J. Chen, J. Chen, K.-Y. Goh, Y. Xu, B.C.Y. Tan, When do sellers bifurcate from Electronic Multisided Platforms? The effects of customer demand, competitive intensity, and service differentiation, *Information & Management* 51 (8) (2014) 972–983.
- [19] T. Eisenmann, G. Parker, M. Van Alstyne, Strategies for two-sided markets, *Harvard Business Review* 84 (10) (2006) 92–101.
- [20] H. Li, Q. Shen, Y. Bart, Local Market Characteristics and Online-to-Offline Commerce: An Empirical Analysis of Groupon, *Management Science* 64 (4) (2018) 1860–1878.
- [21] L. Xiao, Z. Guo, J. D'Ambra, Benefit-based O2O commerce segmentation: a means-end chain approach, *Electronic Commerce Research* 19 (2) (2018) 409–449.
- [22] P. Fleming, C. Rhodes, K.H. Yu, On why Uber has not taken over the world, *Economy and Society* 48 (4) (2019) 488–509.

- [23] G. Zhou, P. Song, Third-party apps (TPAs) and software platform performance: The moderating role of competitive entry, *Information & Management* 55 (7) (2018) 901–911.
- [24] H. Li, Y. Fang, K.H. Lim, Y. Wang, Platform-Based Function Repertoire, Reputation, and Sales Performance of E-Marketplace Sellers, *MIS Quarterly* 43 (1) (2019) 207–236.
- [25] E. Karahanna, S.X. Xu, Y. Xu, N.A. Zhang, The needs–affordances–features perspective for the use of social media, *MIS Quarterly* 42 (3) (2018) 737–756.
- [26] F.T.C. Tan, B. Tan, S.L. Pan, Developing a leading digital multi-sided platform: examining IT affordances and competitive actions in Alibaba. com, *Communications of the Association for Information Systems* 38 (1) (2016) 36.
- [27] A. Hein, D. Soto Setzke, S. Hermes, J. Weking, The influence of digital affordances and generativity on digital platform leadership, in: *International Conference on Information Systems*, AIS, Munich, 2019.
- [28] K. Zhu, Information Transparency of Business-to-Business Electronic Markets: A Game-Theoretic Analysis, *Management Science* 50 (5) (2004) 670–685.
- [29] H.K. Bhargava, V. Choudhary, Economics of an Information Intermediary with Aggregation Benefits, *Information Systems Research* 15 (1) (2004) 22–36.
- [30] G. Parker, M.V. Alstyne, X. Jiang, Platform ecosystems: how developers invert the firm, *MIS Quarterly* 41 (2017) 255–266.
- [31] X. Wan, J. Cenamor, G. Parker, M. Van Alstyne, Unraveling Platform Strategies: A Review from an Organizational Ambidexterity Perspective, *Sustainability* 9 (2017) 1–18.
- [32] P. Song, C. Zheng, C. Zhang, X. Yu, Data analytics and firm performance: An empirical study in an online B2C platform, *Information & Management* 55 (5) (2018) 633–642.
- [33] A.K. Jha, S. Shah, Disconfirmation effect on online review credibility: An experimental analysis, *Decision Support Systems*, Forthcoming (113519) (2021).
- [34] A. Ghazawneh, O. Henfridsson, A paradigmatic analysis of digital application marketplaces, *Journal of Information Technology* 30 (3) (2015) 198–208.
- [35] A. Castillo, J. Benitez, J. Llorens, X. Luo, Social media-driven customer engagement and movie performance: Theory and empirical evidence, *Decision Support Systems*, Forthcoming (113516) (2021).
- [36] C. Cennamo, H. Ozalp, T. Kretschmer, Platform Architecture and Quality Trade-offs of Multihoming Complements, *Information Systems Research* 29 (2) (2018) 461–478.
- [37] R. Shivakumar, How to tell which decisions are strategic, *California Management Review* 56 (3) (2014) 78–97.
- [38] F. Fréry, X. Lecocq, V. Warmier, Competing With Ordinary Resources, *MIT Sloan management review* 26 (2015) 69–77.
- [39] E. Atalay, A. Hortaçsu, C. Syverson, Vertical integration and input flows, *American Economic Review* 104 (2014) 1120–1148.
- [40] V. Grover, R. Kohli, Cocreating IT value: New capabilities and metrics for multifirm environments, *MIS Quarterly* (2012) 225–232.
- [41] M. Carney, E. Gedajlovic, Vertical integration in franchise systems: Agency theory and resource explanations, *Strategic Management Journal* 12 (1991) 607–629.
- [42] M. Ceccagnoli, C. Forman, P. Huang, D.J. Wu, Cocreation of value in a platform ecosystem: The case of enterprise software, *Mis Quarterly* 36 (1) (2012) 263–290.
- [43] A. Sinha, A. Adhikari, A.K. Jha, Innovational duality and sustainable development: finding optima amidst socio-ecological policy trade-off in post-COVID-19 era, *Journal of Enterprise Information Management* 35 (1) (2022) 295–320.
- [44] J. Eliashberg, A. Elberse, M.A.A.M. Leenders, The Motion Picture Industry: Critical Issues in Practice, Current Research, and New Research Directions, *Marketing Science* 25 (6) (2006) 638–661.
- [45] P.H. Rubin, The Theory of the Firm and the Structure of the Franchise Contract, *The Journal of Law and Economics* 21 (1978) 223–233.
- [46] L. Capron, J. Hulland, Redeployment of brands, sales forces, and general marketing management expertise following horizontal acquisitions: A resource-based view, *The Journal of Marketing* (1999) 41–54.
- [47] S.C. Michael, Can a franchise chain coordinate? *Journal of Business Venturing* 17 (2002) 325–341.
- [48] J. Lu, H. Liu, China’s film industry report, 2018 *Contemporary Film (China)* (3) (2019) 13–20.
- [49] J.G. Combs, D.J. Ketchen Jr, Explaining interfirm cooperation and performance: toward a reconciliation of predictions from the resource-based view and organizational economics, *Strategic management journal* 20 (1999) 867–888.
- [50] D.G. Sirmon, M.A. Hitt, R.D. Ireland, Managing firm resources in dynamic environments to create value: Looking inside the black box, *Academy of Management Review* 32 (2007) 273–292.
- [51] T.K. Das, B.-S. Teng, A resource-based theory of strategic alliances, *Journal of management* 26 (2000) 31–61.
- [52] S.H. Park, R.R. Chen, S. Gallagher, Firm resources as moderators of the relationship between market growth and strategic alliances in semiconductor start-ups, *Academy of Management Journal* 45 (2002) 527–545.
- [53] J. Barney, Firm resources and sustained competitive advantage, *Journal of management* 17 (1991) 99–120.
- [54] S. Chatterjee, Excess resources, utilization costs, and mode of entry, *Academy of Management Journal* 33 (1990) 780–800.
- [55] P. Huang, M. Ceccagnoli, C. Forman, D.J. Wu, Appropriability Mechanisms and the Platform Partnership Decision: Evidence from Enterprise Software, *Management Science* 59 (1) (2013) 102–121.
- [56] E. Fredericks, Infusing flexibility into business-to-business firms: A contingency theory and resource-based view perspective and practical implications, *Industrial Marketing Management* 34 (2005) 555–565.
- [57] E. Brynjolfsson, Y. Hu, D. Simester, Goodbye pareto principle, hello long tail: The effect of search costs on the concentration of product sales, *Management Science* 57 (2011) 1373–1386.
- [58] R. Huggins, Forms of network resource: knowledge access and the role of inter-firm networks, *International Journal of Management Reviews* 12 (3) (2010) 335–352.
- [59] N. Argyres, Evidence on the role of firm capabilities in vertical integration decisions, *Strategic Management Journal* 17 (1996) 129–150.
- [60] D. Zepeda, G.N. Nyaga, G.J. Young, Vertical Integration and Hospital Performance: Evaluating Physician Employment in Hospitals, in: *Academy of Management Annual Meeting*, NY, 2018.
- [61] W.W. Fu, Screen survival of movies at competitive theaters: Vertical and horizontal integration in a spatially differentiated market, *Journal of Media Economics* 22 (2) (2009) 59–80.
- [62] D.C. Chisholm, M.S. McMillan, G. Norman, Product differentiation and film-programming choice: do first-run movie theatres show the same films? *Journal of Cultural Economics* 34 (2) (2010) 131–145.
- [63] A. Kumar, M.D. Smith, R. Telang, Information discovery and the long tail of motion picture content, *MIS Quarterly* 38 (4) (2014) 1057–1078.
- [64] A. Pe’er, I. Vertinsky, T. Keil, Growth and survival: The moderating effects of local agglomeration and local market structure, *Strategic Management Journal* 37 (3) (2016) 541–564.
- [65] A. Hortaçsu, C. Syverson, Cementing relationships: Vertical integration, foreclosure, productivity, and prices, *Journal of Political Economy* 115 (2) (2007) 250–301.
- [66] G. Negro, O. Sorenson, The competitive dynamics of vertical integration: evidence from US motion picture producers, 1912–1970, in: J.A.C. Baum, S.D. Dobrev, A. V. Witteloostuijn (Eds.), *Ecology and Strategy*, Emerald Group Publishing Limited., Bingley, 2006, pp. 363–398.
- [67] J. McKenzie, The economics of movies: A literature survey, *Journal of Economic Surveys* 26 (2012) 42–70.
- [68] Y. Zhang, N. Rajagopalan, Once an outsider, always an outsider? CEO origin, strategic change, and firm performance, *Strategic Management Journal* 31 (2010) 334–346.
- [69] K.M. Eisenhardt, Making fast strategic decisions in high-velocity environments, *Academy of Management journal* 32 (1989) 543–576.
- [70] C.L. Dezsö, D.G. Ross, Does female representation in top management improve firm performance? A panel data investigation, *Strategic Management Journal* 33 (2012) 1072–1089.
- [71] K. Grigoriou, F.T. Rothaermel, Organizing for Knowledge Generation: Internal Knowledge Networks and the Contingent Effect of External Knowledge Sourcing, *Strategic Management Journal* 38 (2017) 395–414.
- [72] J.-C. Rochet, J. Tirole, Platform competition in two-sided markets, *Journal of the European economic association* 1 (2003) 990–1029.
- [73] E. Raguseo, P. Neirotti, E. Paolucci, How small hotels can drive value their way in infomediation. The case of ‘Italian hotels vs. OTAs and TripAdvisor, *Information & Management* 54 (6) (2017) 745–756.
- [74] J. Braojos, J. Benitez, J. Llorens, How do social commerce-IT capabilities influence firm performance? Theory and empirical evidence, *Information & Management* 56 (2) (2019) 155–171.

Xing Wan is Professor of Business Administration in the School of Business Administration at Nanjing University of Finance and Economics. He received his Ph.D. from Southeast University of China. His research is interdisciplinary and spans Electronic Commerce and Industrial Organization. His works have been published in journals such as *California Management Review*, *International Journal of Production Economics*, *International Journal of Production Research*, *Electronic Markets*, among others. His current research interests include platform strategies and governance. Email: 675975069@qq.com, wanxing@nufe.edu.cn.

Ashish Kumar Jha is an Associate professor of Business Analytics at Trinity College Dublin. His research interests are in the fields of business analytics, sentiments of user-generated content, and technology innovation. His papers have been published in journals such as *Journal of MIS*, *Decision Support Systems*, *Information and Management*, *International Journal of Production Economics*, *Communications of AIS*, among others. Ashish is an associate editor for the *Journal of Organizational Computing and Electronic Commerce*, and *Information & Management*.

Nikolai Kazantsev is a Postdoctoral researcher in Elastic Manufacturing Systems at the Institute for Manufacturing (IfM), University of Cambridge. He received his Ph.D. from the Alliance Manchester Business School, The University of Manchester. His research interests include flexibility, collaboration and resilience in production systems. His papers have been published in journals such as *Supply Chain Management: An International Journal*, *Decision Support Systems*, *Information and Management*, among others. In 2023, Nikolai has joined an Early Career Editorial Board of *Journal of Strategic Information Systems* and he serves as a Social Media Editor for the *International Journal of Production and Operation Management*.

Wai Fong Boh is President’s Chair and Professor of Information Systems at Nanyang Technological University (NTU), in Singapore. She received her Ph.D. from the Tepper School of Business at the Carnegie Mellon University. She has published in leading IS and management journals, including *Management Science*, *MIS Quarterly*, *Academy of Management Journal*, *Organization Science*, *Journal of Management Information Systems*, *Strategic Management Journal*, *Journal of Association Information Systems*, *Research Policy*, and *Information & Organization*. She is currently a senior editor of *MIS Quarterly*, and is on the editorial board of the *Journal of Management Information Systems*, *Organization Science*, and

Journal of Strategic Information Systems. She was previously an associate editor at *Management Science*, and *ISR*.