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# **Growing through Platform Distinctiveness in Early Saturated Markets**

*Completed Research Paper*

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## **Abstract**

*High-growth ambitions are typically vital in platform markets. Yet, it is increasingly clear that the time window to occupy a novel platform market before it becomes saturated is surprisingly short. To this end, a differentiation strategy based on distinctive positioning across markets is increasingly prominent for new entrants to be competitive in early saturated markets. In the literature, two types of such tactics figure: (i) platform bundling, which aims to replicate the functionality of incumbents as part of a multimarket bundle, and (ii) platform piggybacking, which aims to tap into the functionality of incumbents through boundary resources use. In this paper, we employ a fixed-effect time series modelling approach using data from Apple's App Store to develop and test the influence of these two tactics on platform competition in terms of user base and user engagement in early saturated app markets. We contribute to a distinctiveness logic of platform competitiveness by leveraging the dualism of digital platforms as both markets and technological architectures.*

**Keywords:** Platform competition, platform distinctiveness, new entrants, social apps, early saturated market

## Introduction

Digital platforms are characterized by double-sided markets that coordinate different types of consumers (Parker and Van Alstyne 2005; Claussen et al. 2013; Parker et al. 2016). The existence of network effects is essential to a platform's competitive advantage as the value of the platform increases for each user as new users join the platform. This self-reinforcement leads to winner-take-all dynamics (Eisenmann et al. 2006; Schilling 2002) that, in turn, makes it difficult for lesser actors to catch-up with dominant players.

In view of the new reality of platform giants (e.g. Alibaba, Amazon, Meta, and Alphabet), it is increasingly clear that the time window to occupy a novel platform market<sup>1</sup> before it becomes saturated is surprisingly short. Consider, for instance, Meta's swift entry into mobile entertainment, mobile payments, and recently, metaverse markets based on its early advantage in social networking. A number of established BigTech companies simply expand into new platform markets by leveraging their existing network effects in the home market (Constantinides et al. 2018; Eisenmann et al. 2006), leaving little growth space for new entrants who are at the peripheral of a platform market with limited technical and network resources in hand (cf. Selander et al. 2013).

Under the shadow of head-on competition with incumbents in an early saturated market, platform distinctiveness, that is, distinctive positioning across markets by recombining incumbents' offerings, is becoming an increasingly important growth tactic for new entrants (cf. Cennamo 2021; Cennamo and Santalo 2013; Henfridsson et al. 2018). In this paper, we test two specific platform distinctiveness moves that leverage the dualism of digital platforms as both double-sided markets and technological architectures: First, replicating the functionality of incumbents in an adjacent market as part of a multi-platform bundle (cf. Eisenmann et al. 2011), platform bundling enables a new entrant to leverage shared user networks who had been served separately before. For instance, TikTok integrates instant message function of WeChat into short-form video sharing feature at platform; Second, tapping into the functionality of incumbents in the home market through boundary resource use (cf. Ghazawneh and Henfridsson 2013; Parker et al. 2016), platform piggybacking enables a new entrant to access and recruit existing users to participate in platform-specific functionalities spanning markets. For instance, Vine accesses to friend-findings function of Facebook through using its APIs. Comparing these tactics, we address the following research question: *what is the effect of platform bundling and platform piggybacking on the growth of new entrants in early saturated markets?*

We incorporate machine learning into the analysis of six years of data (Jan 2014 to July 2019) in the context of the iOS AppStore in China. Experiencing an on-going slowdown in app market growth since 2014, established platform giants (e.g. Tencent, Alibaba, Baidu) become more aggressive in harvesting user demands across market segments. Looking into the technological architecture configuration and market positioning of social app<sup>2</sup> entrants since 2014 as a response, we identify and test the effects of bundling and piggybacking tactics on new entrant growth in contemporary digital application marketplaces.

We operationalize platform growth as an increase in active users, measured by both user base and user engagement at a platform. Estimating fixed-effect ordinary least squares (OLS) models we find that platform bundling facilitates social app growth in user base, while platform piggybacking facilitates growth in user engagement but not in user base. We discuss these findings and their implications for an integrative view of platform competition in the open-ended value landscape of digital innovation. Our research offers a contribution to the platform literature with a focus on competition and strategy by developing and empirically comparing two distinctiveness tactics to facilitating platform growth in early saturated markets.

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<sup>1</sup> Platform markets refer to those markets emerging around platform business model that use digital technologies to connect people, organizations, and resources in an interactive ecosystem (Parker et al. 2016; Cennamo 2021) such as e-commences/books/videos or mobile application markets (e.g., mobile social networking/payment/music/healthcare/game)

<sup>2</sup> We refer social apps as those platforms on which social networking is one of the core offerings.

## Literature Review

### ***Winner-take-all Logic in Platform Competition***

In view of the unprecedented growth and competitive advantage of new platform giants such as Uber, Alibaba, and Airbnb, the urge to rapidly scaling the network of users is on the mind of every platform owner (e.g. Henfridsson 2020; Huang et al. 2017). This view is founded in the economics perspective on platforms, which are widely conceptualizing platforms as special kinds of markets that mediate value-creating interactions between external producers and consumers (Parker et al. 2016; Parker and Van Alstyne 2005; Rochet and Tirole 2003). Collectively, the platform users' interactions are subject to network effects in the sense that the value of any given user at platform depends on the number of other users who can be interacted with (Economides 1996). Once reaching a critical mass of users, a self-reinforcing feedback loop will be triggered to magnify the early advantages of incumbents, which are difficult to catch up even for those with superior performance or technology (Constantinides et al. 2018; Schilling 2002). As such, a market with strong network effects is expected to ultimately converge to few platforms with larger network size, leading to *winner-take-all* competitive outcome (Eisenmann et al. 2006).

Winner-take-all logic is particularly appealing to platform competition due to the pre-existing underlying interdependency among consumers around the core interaction in a digital market. Consider the instant message interactions between users in social networking market, online transactions between sellers and buyers in e-commerce market, and real-time matching between drivers and riders in ride-hailing market. In most cases, market demands usually concentrate on a single most important form of activity which attracts most users to a platform in the first place (Parker et al. 2016). In this regard, the kernel for platform competition lies in the earlier adoption of a platform from demand side to a threshold that touches off the market momentum (Gawer and Cusumano 2008) in favour of it. Driven by this mechanism, incumbent platforms, by virtue of first mover advantage, would harvest a digital market without question (Fuentelsaz et al. 2015) —as with Tencent's and Twitter's breakout in 2002 and 2007 respectively.

Beyond the emphasis around network size (i.e. installed user base), prior platform competition literature asks for extra attention to user engagement in network effects (Afuah 2013; Suarez 2005). Without tipping new customers into the ranks of active users who engage in the core interaction, the network effects at platform may discount and even collapse in extreme cases (Parker et al. 2016). A typical example is BranchOut which both scaled and collapsed quickly within one year due to the wrong strategic focus on membership list. Hence, both user base and user engagement are vital for the success of a platform in digital markets.

### ***Platform Distinctiveness Logic in Platform Competition***

The winner-take-all logic develops on a strong assumption that all users are equal and share similar demand in platform-mediated markets. Confronted with these barriers, most platform challengers can only succeed if they offer revolutionary functionality and invest heavily to shift users' expectation in market (Bresnahan 1999), ruling out classical strategic options of differentiation (Huotari et al. 2017; Durand and Haans 2022).

Yet, with the wakes of digital technologies, platform businesses are essentially able to exploit distinctive and emerging user needs through digital resource recombination. Serving as the building blocks of value creation in digital innovation, digital resources are re-programmable (Yoo et al. 2012) and editable (Kallinikos et al. 2013) in a layered modular architecture (Yoo et al. 2010). Since they are product-agnostic in nature with the potential to simultaneously be part of multiple value propositions (Um 2016), new entrants can gain significant traction by readily leveraging existing resources in a more granular user groups which are distinctive and underserved by the dominants today (Cennamo 2021). For example, Facebook, in its launching stage, dethrones the incumbent social networks MySpace and Friendster with an initial focus on tightknit college communities.

Similarly, as digital resources are deferred binding in the sense that functionality can be deferred to the point of use (Eaton et al. 2015; Henfridsson et al. 2014), platform businesses are able to digitally gain insights into the emerging trends on user needs and design novel offerings that drive demand tomorrow (Suarez and Kirtley 2012). For instance, Google differentiates Gmail from incumbents Hotmail and Yahoo! based on emerging needs in larger storage capability in the webmail market. This initial recombination

between webmail and cloud drive service is comparably inexpensive to scale due to the negligible marginal costs in reproduction (Yoo et al. 2010).

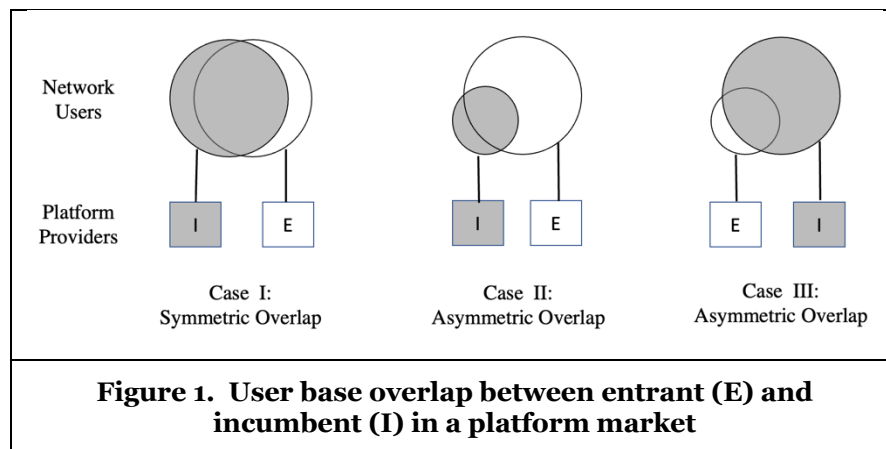
In this regard, the porous innovation boundary (Nambisan et al. 2017) of platforms opens up a fresh competitive dimension for new entrants through developing distinctive market scope. Underlying this distinctiveness logic, digital platforms are conceptualized as an open-ended value landscape (Henfridsson et al. 2018) that recognizes the dual nature of platforms as both markets and technological architectures (Gawer 2014). Specifically, while the value space in the home market may be mostly explored by incumbents, it is still possible for new entrants to exploit evolving preference of consumers across markets. Such attempts to capture value from overlapping users between markets enable a platform entrant to not only deliver distinct offerings without reinvesting technologies and/or users available at incumbents, but also span the market frontiers ruled by incumbents in the here-and-now. It is therefore important to understand the effect of different platform distinctiveness strategies on platform competition in early saturated markets.

## Hypotheses Development

Mirroring the divided perspectives on digital platforms, prior studies on new entrants' competitive strategy were restricted to either market-driven move (e.g. Eisenmann et al. 2011; Foerderer et al. 2018; Tiwana et al. 2010) or innovation-driven move (e.g. Eaton et al. 2015; Ghazawneh and Henfridsson 2013; Karhu et al. 2018). In what follows, an alternative path integrating both strategic interests is represented to complement the understanding of platform competition through a distinctiveness logic.

### Platform Bundling

Aiming at leveraging shared user relationship with incumbents, the first platform growth strategy marked for entrants in platform literature refers to platform bundling. This strategy is often enacted through swallowing an incumbent platform by bundling its functionality as a multi-market offering (Eisenmann et al. 2011; Tiwana et al. 2010). For instance, Microsoft progressively enveloped RealNetworks in the streaming media market. The combination of media player and computer operating system attracts those valuing both market offerings to switch to the established entrant. One key premise to such envelopment move therefore is the reciprocally co-specialized complements (Teece 1986) between entrant and incumbent, both of which are relatively mature and adopted by a large proportion of common user sets (e.g. eBay users and Paypal users). (See Case I in Figure 1)



Consistent with this logic, unilaterally specialized complements (Jacobides et al. 2018; Teece 1986) are out of the question due to the asymmetric user overlap between the two platforms. Specifically, the weak correlation of potential users' valuations for the two platforms discounts the envelopment deeply in Case II and even make it impossible in Case III where the entrant's growth significantly builds upon the incumbent's user base, but not vice versa (Eisenmann et al. 2011).

As a market-driven move, envelopment therefore adheres to winner-take-all logic and fails to recognize the potential of bundling in leveraging distinctiveness for new entrants in Case III. In particular, integrating

the functionality of diverse incumbents to its core offerings, a new entrant can stretch the platform scope from its home market to being a ‘specialist’ in the overlapping users across markets (cf. Seamans and Zhu 2014). In this regard, platform bundling enables a new entrant to evade from winner-take-all competition for at least two reasons.

First, by bundling a wide array of qualitatively different functionalities across markets, the new entrant creates novel usage scenarios to its native functionalities (Constantinides et al. 2018; Cennamo and Santalo 2013; Henfridsson et al. 2018). In particular, the technological capabilities against incumbents in its home market change to a technological edge (Rohfls 2003, p. 197) that leverages inter-platform heterogeneity in an adjacent market (Posen et al. 2022). For instance, Last.fm integrates social community into music feature, which created unique online music community superior to existing content delivery platforms in the online music market (Oestreicher-Singer and Zalmanson 2013).

Second, as more highly used functionalities offered by the incumbents in the home market are bundled with adjacent markets’ offerings, overlapping users between the two markets will be stretched to the maximum at the new entrant platform (Cennamo et al. 2018; Henfridsson et al. 2018; Selander et al. 2013). For instance, by adding a variety of social features (i.e. loved track tagged, forum, affinity groups) into the mobile music platform, Last.fm embraced all overlapping users with different social participation demands (i.e. visitor, novice, regular, leader) (Oestreicher-Singer and Zalmanson 2013).

Taken together, these distinctive bundling portfolios drive the adoption of a platform entrant by overlapping users across markets. We therefore hypothesize that differentiation through platform bundling positively impacts new entrant growth in terms of user base in an early saturated market.

*H1: platform bundling stimulates new entrant growth in terms of user base in early saturated markets.*

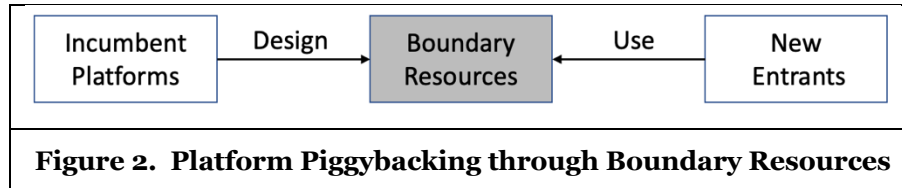
Table 1 below provides a detailed comparison of platform envelopment and platform bundling discussed before.

Platform Growth Strategy	Platform Envelopment	Platform Bundling
Perspective	Platform as double-sided market	Platform as open-ended value landscape
Fundamental Literature	Eisenmann et al. (2011)	Henfridsson et al. (2018)
Strategic Interest	Winner-take-all dynamic	Platform Distinctiveness
Definition	The platform swallows other platform markets by leveraging shared user relationships	The platform develops distinct positioning across markets by integrating incumbents’ functionalities as multi-market offerings
Illustration in Literature	-Booking.com integrates house-rental service of Airbnb into platform offering (Cennamo 2021) -Apple envelops Adobe’s Flash software by introducing its own HTML5 standard in Safari (Eaton et al. 2015)	- Last.fm integrates social community into music feature at platform (Oestreicher-Singer and Zalmanson 2013) -TikTok integrates instant message function into short-form video sharing feature at platform (Liu et al. 2019)
<b>Table 1. Comparison of Platform Envelopment to Platform Bundling</b>		

## Platform Piggybacking

Gaining access to incumbents’ technical and network resources through an arm’s-length connection, the second platform growth strategy for entrants refers to platform piggybacking. (Figure 2) Central to this strategic move is the use of boundary resources (i.e., the software tool that serve as the interface for resourcing contributions on the platform) designed by incumbent platforms, which stimulates win-win innovation outcome in a platform market (Ghazawneh and Henfridsson 2013). Specifically, new entrants enjoy low-cost innovation (Selander et al. 2013; Yoo et al. 2010) and incumbents benefit from

heterogeneous innovation capability (Hukal et al. 2020), both of which feed to the economies of scope in innovation when cost of jointly innovating is lower than the cost of innovating independently (Boudreau 2012; Gawer 2014).



Underlying this mutually beneficial interdependency in platform innovation literature, technological complementarity (Teece 2018) drives platform growth through boundary resource connections. In particular, serving as the innovation hub of a digital market, an incumbent platform's value won't be fully unlocked without external contributions. Boundary resources design therefore serve as ecosystem-wide investments (Boudreau and Hagiu 2009) to decrease the threshold for accessing its resources and make them more attractive so as to increase platform offerings beyond the original functional area (Ghazawneh and Henfridsson 2013; Henfridsson et al. 2018). On the other hand, drawing upon the boundary resources of an incumbent, new entrants make platform-specific investments that develop peripheral functionalities for satisfying user needs beyond the incumbent platform's core offerings (Dyer et al. 2018; Kude et al. 2012).

In this regard, the complementarity developed between new entrants and incumbent platforms through boundary resource connections is rather asymmetric, in the sense that the new entrants heavily depend on an incumbent platform, whereas an incumbent platform hardly dependent on individual entrants (Hurni et al. 2022; Selander et al. 2013). Through acting on boundary resources they design, incumbent platforms can wield their dominant power in shaping and even forcefully framing the direction that new entrants take for their product or service offerings; new entrants, instead, may find their choices restricted and have to accommodate these boundary resources by repressing their growth ambitions (Eaton et al. 2015; Hurni et al. 2022). For instance, the nature of novel functions that new entrants can offer and the sub-markets they can penetrate or have to quit depend on changes in the underlying incumbent platform they build upon (Foerderer et al. 2018).

The above arguments imply a divergent outcome of piggybacking in the sense that innovation-driven moves through boundary resource use may come at the expense of platform scope for future growth. Specifically, when a new entrant positioning differently across markets attempts to piggyback the incumbents in the home market, its in-house native functionalities might lose their strategic relevance in developing platform distinctiveness for at least two reasons.

First, tapping into the well-established functionalities that are central to the workings of incumbent platforms, the new entrant is exposed to their dominant power in innovation and network effects in the home market (Eaton et al. 2015; Jacobides et al., 2018). In this regard, on-boarding users tend to rather consume boundary resources in place of the similar native functionalities provided in-house, forcing the new entrant to bundle more platform-specific functionalities from adjacent markets.

Further, as boundary resources only serve as the interface that opens up specific technological capabilities at an incumbent platform (Foerderer et al. 2018; Ghazawneh and Henfridsson 2013; Karhu et al. 2018), the functionalities engaged by on-boarding users in nature still stage separately on each platform. For example, consider how Facebook pulled back the access of friend-finding function from Vine, a short-form video app, by simply blocking their API connection (Gawer 2020). As such, for a new entrant stretching its platform scope through bundling, platform piggybacking restrains the consequent synergy in value-in-use between markets because parts of the offerings (i.e., the native functionality/service) valued by overlapping users are still manipulated by outside incumbents.

Together, platform piggybacking might decrease the distinctiveness advantage derived from platform bundling for a new entrant. In early saturated markets, the ineffectiveness of piggybacking strategy on attracting new users is more evident as boundary resources are also commonly used by other less-established actors for exploiting overlapping users with incumbents. Social media incumbents (e.g.

Facebook, Twitter, YouTube), for instance, have been widely connected to encourage user-generated content across different market segments (Yang et al. 2019). We therefore expect following hypotheses:

*H2: platform piggybacking negatively moderates the relationship between platform bundling and new entrant growth in terms of user base in early saturated markets.*

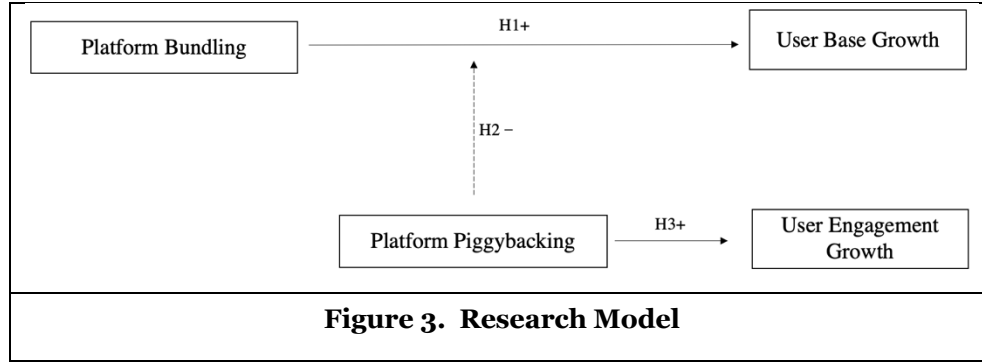
Despite these side-effects, platform piggybacking is vital to sustain user attention on new entrants, which is a scarce resource for maintaining competitive advantage in early saturated markets. Specifically, given the overwhelming network effects generated on incumbent platforms, switching to a new entrant without boundary resource connection means that users would incur a huge cost of not just abandoning their investment in the incumbent platforms but also abandoning the benefit accumulated from having used the incumbent platforms (Tiwana 2013). In this regard, coercive user lock-in (e.g., refusal to connect existing user base of incumbent platforms) is rarely sustainable and likely to drive on-boarding users away on the new entrant. (Parker et al. 2016) This is particular the case in a market driven by same-side network effects where the value generated from platform users is specific to incumbents to a great extent (cf. Fuentelsaz et al. 2015; Li and Agarwal 2017; Parker et al. 2016). For instance, a Skype user would find it difficult to convince her entire network to migrate to an alternative platform that offers even superior functionalities (Tiwana 2013). Platform piggybacking therefore enables an on-boarding user to keep engaging in value-adding activities on top of the incumbents in the home market.

*H3: platform piggybacking stimulates new entrant growth in terms of user engagement in early saturated markets.*

Table 2 below provides a detailed comparison between boundary resource connection and platform piggybacking discussed before. The research model is shown in Figure 3.

Platform Growth Strategy	Boundary Resources Connection	Platform Piggybacking
Perspective	Platform as technological architecture	Platform as open-ended value landscape
Fundamental Literature	Ghazawneh and Henfridsson (2013)	Gawer (2014) Henfridsson et al. (2018)
Strategic Interest	Economies of scope in innovation	Platform Distinctiveness
Definition	The platform realizes innovation potential by drawing upon external contribution	The platform develops distinct positioning across markets by connecting incumbents' offerings with its platform-specific functionalities
Illustration in Literature	-Apple provides APIs and SDKs for third-party developers (Eaton et al. 2015) -Google provides APIs and SDKs for photography apps on Google play (Foerderer et al. 2018)	-Vine accesses to friend-findings function of Facebook through using its APIs (Gawer 2020) -Airbnb access to existing users at Craigslist with a 'publish on Craigslist' button at launching stage (Dou and Wu 2021)

**Table 2. Comparison of Boundary Resource Connection to Platform Piggybacking**



## Research Method

### *Empirical context*

Our empirical focus is on the mobile app marketplace in China. Starting from the early twenty-first century, China's mobile app marketplace experienced a high-growth period with the popularization of 3G and 4G infrastructure. After the total mobile internet users grew to more than 500 millions with average 25 hours use time per week in 2014, China Internet Network Information Centre (CNNIC) reported a slowdown of the yearly growth rate for the first time, following by an on-going decline to less than 4% and 1% respectively until 2019.

Underlying this slowdown in app market growth, more market segments tend to be harvested by established platform giants due to the escalating competition over existing users. This is particularly salient for the social networking application segment, driven by same-side network effects. In order to dodge winner-take-all outcome, new entrants are expected to develop platform distinctiveness for exploiting new growth opportunities. Typical examples include Pinduoduo which combines e-commerce with social networking (Zhu 2019), Douyin which combines short video with social networking (Liu et al. 2019), and NetEase Cloud music which combines music content with social community (cf. Oestreicher-Singer and Zalmanson 2013). To provide empirical evidence for our claims, we use social app data on the iOS store in China. We have chosen this setting for a number of reasons. First, iOS store is the single biggest mobile application marketplace that accounts for more than 40 percentage of total apps in China. This ensures the representativeness of our sample and app-level variation that we can exploit for the platform distinctiveness moves.

Second, apps on iOS store are required to disclose update logs regularly, which gives us access to all apps' functionality update history since launch. Attributing to the normalized governance of iOS store, there are multiple app statistic third-party platforms (i.e. Analysys, QIMAI, ChanDaShi, iai.cn) that we can use to cross-check and obtain additional monthly app-level data (e.g. user base, user engagement, sister app, rating). As such, we gain more complete picture for each app's evolution journey.

Third, the app marketplace on iOS store is naturally separated into different sub-categories and each app can only reside in one category at a time, which is guided and regulated by iOS store according to its core functionalities. In this regard, iOS store is a perfect site to test different competition logic (i.e., winner-take-all in the home market vs. platform distinctiveness in other markets) of social apps. Taken together, this gives a unique dataset to study social apps' distinctiveness moves, and the effect on their platform growth.

### *Identifying Platform Bundling and Platform piggybacking*

In the first step, we screened the apps at Apple's iOS store in China between Jan 2014 and July 2019 from a app statistic third-party platform Analysys. We omitted incumbent apps that launched before 2014 and accounted for more than 10% market share in each segment in Jan 2014, and long-tail apps that were not counted by Analysys due to their short life cycle less than one month and unstable monthly user base lower than ten thousand over the life cycle. We then manually identified all new social app entrants that first offered social functionalities once launch (i.e., for those launched after 2013) or since Jan 2014 (i.e., for

those launched before 2014) by checking their app interface and update log. In other words, first social functionality should be involved in their first update log since Jan 2014. The final dataset includes 1759 apps across 21 categories at iOS store.

In the second step, we traced each app's strategic move during the 67 months. In order to maintain the original perplexity existed in the raw data sample, the dataset covers multiple data dimensions (e.g. app update log, monthly user base, app ranking, app rating, user comment, developer information) from diverse sources (e.g. iOS store, official website of app, third-party app tracing platforms, third-party analysis reports) through web crawler. We then proceeded the data coding based on extant platform competition literature discussed before. In particular, platform distinctiveness for new entrants manifests in platform architecture configuration (i.e., functionality design and boundary resource use) that targets specific user groups differing from the incumbents in the home market. As such, we take apps' update history log and category affiliation since launch on iOS store as the main focus of data analysis.

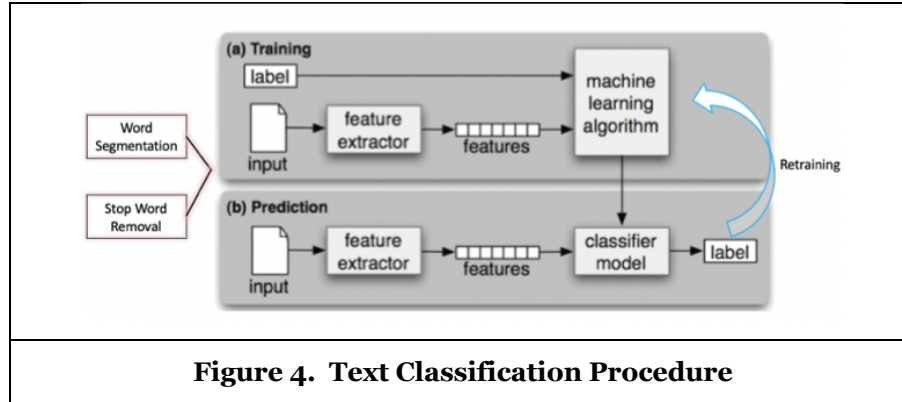
Specifically, we classified each app update record into one or more classes based on following labels: social function update (S), non-social function update (NS), API connection (C), and function maintenance (M). (See Table 3) As a social app entrant, social function is identified as the native functionality offered in the home market, while non-social function represents distinctive functionality offered outside the home market. APIs, in a similar vein, constitute a typical boundary resource in software platform settings, which were broadly used in prior studies (e.g., Ghazawneh and Henfridsson 2013; Karhu et al. 2018).

Label	Description	Sample Codes
Social function update (S)	Function directly contributing to user interaction, content sharing, or content community	Chat; topic; message; friend; emoji; @; sharing; record; group document; friend circle; video call; nearby; face-to-face; dating; contacts; reply
Non-social function update (NS)	Function not directly contributing to user interaction, content sharing, or content community	Map; trip; health; game; music; dance; wallet; interface; payment; weather; special effects; filter; beauty; AR; 3D; geography; travel; shopping
API connection (C)	Connecting APIs offered by social incumbent apps	Connect; synchronize; QQ; WeChat; Weibo; third-party sharing; interconnect; Circle of friends; channelling; skip/jump; inbound links
Function maintenance (M)	Function optimization and bug fix	Strengthen, optimize; fix; speed; bugs; collapse; crash; failure; compatibility; fluent; performance
<b>Table 3. Sample Text Labeling Codes</b>		

Integrating diverse social and non-social functions at platform, such bundling move facilitates a social app entrant to exploit underserved demand of overlapping users across markets. We are particularly interested in those social app entrants that were born with or shifted to a category than the home market (i.e., the social category) on iOS store, marked with a time-varying dummy variable *NonSocialCat<sub>it</sub>*. In such case, the new entrant adopts a distinctiveness logic by fundamentally integrating an adjacent market' functionalities into its core offering, which generates value propositions completely distinct from the incumbents in the home market. Consider how the rising star Instagram in photo & video category differs from the incumbent Facebook in the social category. The former cultivates new social interaction around photo and video sharing, while the later merely combines photo-sharing as an additional means for social interaction. As for piggybacking move, we identify the use of APIs offered by the social incumbents (e.g. WeChat, QQ, Weibo) in the home market, a fairly common practice for new social app entrants to recruit existing user bases that account for more than 90 percentage of the mobile application marketplace. Function maintenance links with the optimization and reinforcement of existing functionality at apps and we record them as additional controls in the analysis.

We did this text categorization task through semi-supervised machine learning based on BERT model. (see Figure 4) In simple words, we firstly randomly select 10% apps to label their update history manually which constitutes our initial training set to predict the remaining dataset. After the first round of prediction, we

second-round the manual coding for the top 10% data with highest uncertainty figured by BERT model, followed by machine prediction. After several rounds of processing, the prediction accuracy reached our expectation and we stopped.



### Dependent Variables

In the context of iOS store, platform growth related to the number of active users of an app. This is the primary source of value creation and value capture for platform businesses (Henfridsson 2020; Huang et al. 2017; Parker et al. 2016). We therefore operationalized two dependent variables from the app statistic third-party platform Analysys to capture the growth of active users in installed user base and user engagement on the app:

- User base: the number of users in a given month who open the app at least once.
- User engagement: the average use time of the app per user in a given month.

we introduce a one-month lag to assess how the independent variables and controls in month  $t$  impact new user adoption and engagement in month  $t+1$ . We also use, as a robustness check, different time windows, as well as an alternative variable (average open times of the app per user) for user engagement, and find similar result.

### Control Variables

We control for a number of factors in our analysis. As time passes and competition escalates into winner-take-all outcome in early saturated markets, we can expect negative *network effects* on new social app entrants in the sense that on-boarding users tend to converge on incumbents over time with highest network value (Eisenmann et al. 2011). Hence, we control for *app age* to capture this user outflow effect, which is measured as the number of month since it has launched on iOS store.

We also control for app rating and app review number which are two dimensions to imply *app quality* from user experience. Higher rated apps with more reviews are more likely to be promoted on the iOS recommendation list, leading to more user adoption and higher user engagement (Lee and Raghu 2014). In addition, we also include the number of sister apps offered by the same developer to account for *portfolio effects* (Boudreau 2012). While positive spillovers exist for social apps (Claussen et al. 2013), opposite effect may arise in the saturated market since limited resources have to be dispersed into different apps which also distract users' attention widely.

App ranking is another factor that reflects the relative competition position of the app within and across specific sub-markets (Zhu and Liu 2018) and therefore affects an app's capability to attract users. Besides, we collected data on monthly function maintenance of an app as one of the control variables. One would expect such on-going optimization activities account for the majority of update log, which facilitate to refine and reinforce the value propositions added on the app. Therefore, it may affect platform growth positively. Variable definition and summary statistics are given in Table 4 and 5.

Variable	Definition
$UserBase_{it}$	Monthly number of users who have opened the app at least once (in ten thousand)
$UserEngage_{it}$	Monthly average use time of an app per user per month (in hour)
$NonSocialCat_{it}$	Dummy for the social category (zero if an app is in the social category and one if it is in other categories on iOS store)
$SocialF_{it}$	Number of social function in a month
$NonSocialF_{it}$	Number of non-social function in a month
$APIConnection_{it}$	Number of connection of API offered by social incumbents in a month
$FuncMaintenance_{it}$	Number of function optimization and bug fix in a month
$AppAge_{it}$	Number of months since launching at iOS store
$NumSisterApps_{it}$	Number of sister apps offered by the same developer in a month
$Rating_{it}$	Consumers' rating of an app in a month (scale in 1-5; 5 is high rating)
$Review_{it}$	App review numbers in a month
$CategoryRanking_{it}$	Ranking median of an app in its category in a month (scale in 1-2121; 1 is high ranking)
$OverallRanking_{it}$	Ranking median of an app in iOS store in a month (scale in 1-2398; 1 is high ranking)

Table 4. Variable Definition

Variable	Mean	Std. Dev	Min	Max
$UserBase_{it}$	251.16	1880.47	0	66780.30
$UserEngage_{it}$	3.13	11.15	0	871.70
$NonSocialCat_{it}$	0.78	0.41	0	1
$SocialF_{it}$	8.20	10.25	0	128
$NonSocialF_{it}$	10.64	12.62	0	124
$APIConnection_{it}$	1.89	2.55	0	66
$FuncMaintenance_{it}$	16.94	17.45	0	197
$AppAge_{it}$	29.40	21.31	1	165
$NumSisterApps_{it}$	8.43	32.13	0	368
$Rating_{it}$	3.83	1.36	0	5
$Review_{it}$	124.90	989.53	0	102977
$CategoryRanking_{it}$	715.97	698.54	1	2121
$OverallRanking_{it}$	1812.33	636.91	1	2322

Table 5. Summary Statistics

### Empirical Model

We test our hypotheses using a cross-sectional time series fixed effects model of the following form:

$$\ln(UserBase_{i,t+1}) = \Phi_i + T_t + \beta_1 SocialF_{i,t} + \beta_2 NonSocialF_{i,t} + \beta_3 (SocialF_{i,t} \times NonSocialF_{i,t}) + \beta_4 APIConnection_{i,t} + \beta_5 (NonSocialF_{i,t} \times APIConnection_{i,t}) + \beta X_{i,t} + \xi_{i,t} \quad (1)$$

$$\ln(UserEngage_{i,t+1}) = \Phi_i + T_t + \beta_1 SocialF_{i,t} + \beta_2 NonSocialF_{i,t} + \beta_3 APIConnection_{i,t} + \beta X_{i,t} + \xi_{i,t} \quad (2)$$

We run the model in the subset data according to the time-varying dummy  $NonSocialCat_{i,t}$  which captures those social apps locating outside the home market.  $UserBase$  and  $UserEngage$  are two dependent variables in our paper. By taking the monthly value of user base and user engagement in logarithm form, the model captures the effect of bundling and piggybacking on platform growth.  $\Phi_i$  represents app fixed effects,  $T_t$  the set of dummies for time fixed effects,  $X_{i,t}$  the vector of the control variables, and  $\xi_{i,t}$  the specific residuals. App fixed effects capture unobserved heterogeneity across apps that are constant over time, such as differences in resources and capability of developers or initial technological architecture configuration. These app-specific features, although not observed by the researchers, are likely to influence app growth

and the adoption of specific strategic moves by a given app. The app fixed effects estimation method solve these issues and its association with any other model variables (Greene 2003).

With this methodology, we are in fact exploiting within-app variation to identify the effect of platform distinctiveness strategies on the variation in user base and user engagement. As for our main independent variables, a social app entrant's bundling move is captured by the synergy effect of non-social functionalities update integrated with social functionalities in the home market, represented by both *NonSocialF* and *SocialF*  $\times$  *NonSocialF* variables; The piggybacking move, on the other hand, is captured by the API connections with incumbents in the home market, represented by *APIConnection*. The interaction term *NonSocialF*  $\times$  *APIConnection* further tests the moderating role of platform piggybacking in early saturated markets. We also rerun the model for the subset *NonSocialCat<sub>it</sub>* equaling zero as a control group, which captures the apps keeping competing in the home market over a period of time.

## Results

Results from the formal test of the hypotheses are presented in Table 6. All models provide adjusted errors that are robust to arbitrary heteroskedasticity and autocorrelation. Without any strategic move at an app, we observe significant and negative network effects in the saturated market characterized by the lagged app age ( $\beta = -0.032$ ,  $p < 0.01$ ). For a social app entrant in iOS store, we expect that a distinctive strategic move through platform bundling will help it grow in user base. Specifically, for a social app entrant positioning in non-social markets, the native functionality (i.e. social function) in the home market becomes the edge for developing distinctiveness when bundled with other non-social functionalities as core offerings.

This manifests in three dimensions of our result: First, while users consuming non-social functionalities had converged to local incumbents in adjacent markets, analogous functionalities offering at the social app entrant still significantly facilitates use base growth ( $\beta = 0.026$ ,  $p < 0.01$ ) because novel and superior value propositions are generated upon its baseline social functionalities (i.e., social functions were always integrated firstly in an app's core offerings). Second, this positive relationship between non-social functionalities offering and user base growth will be further strengthen as more social functionalities are added, explained in the interaction term *SocialF*  $\times$  *NonSocialF* ( $\beta = 0.001$ ,  $p < 0.01$ ). Last, the social functionality might serve more as a leverage for exploiting the shared users relationships across markets than as the main traction for stimulating user growth in non-social market, since we found no evidence that social functionality (*Social F*) directly contributes to user growth. We infer from the test that hypothesis 1 is confirmed.

On the contrary, while platform piggyback is considered as a more flexible and efficient means for stimulating new entrant growth through boundary resources connection, we found a different result for the social app entrants positioning in non-social market. Specifically, channeling to the existing user base of incumbents in the home market, there was no evidence that *APIConnection* alone directly impacts user growth at app. Our estimates allow us to rule out effects larger than 1% increase in user base. This echoes to existing literature in platform launching strategy (Parker et al. 2016) in the way that platform connections must come with attractive platform-specific functionalities (i.e., non-social functions outside the home market) in order to recruit incumbents' users to participate on platform. For instance, Youtube rode the Myspace growth wave through providing its powerful video tools to those indie bands in the social network.

Further, the smooth multihoming with incumbent platforms in the home market through API connection provides a superior user experience (e.g., the number of users they can interact, established function with high quality) comparing with the native functionalities available at the app. Consequently, platform piggyback makes the bundling between non-social functionalities and in-house social functionality less attractive for overlapping users than before. This was shown in a negative moderating effect of *APIConnection* on the relationship between *NonSocialF* and *UserBase* ( $\beta = -0.001$ ,  $p < 0.1$ ), where *NonSocialF* represents an increasing bundling move with an app's baseline social function offering. On that basis, we accept H2.

In the test of hypothesis 3, we found a positive and significant relationship between *APIConnection* and user engagement growth ( $\beta = 0.014$ ,  $p < 0.01$ ). In this regard, the long-term commitment of users to a new social app entrant highly depends on their social network cultivated on incumbents in the home market. Even with attractive value proposition offerings through platform bundling, on-boarding users still prefer to multihoming given their investment and benefit accumulated from having used the incumbent platforms.

This is further corroborated in the insignificant coefficient of non-social functionality offerings (*NonSocialF*), which allows us to rule out even modest effect of platform bundling on user engagement. We therefore accept H3.

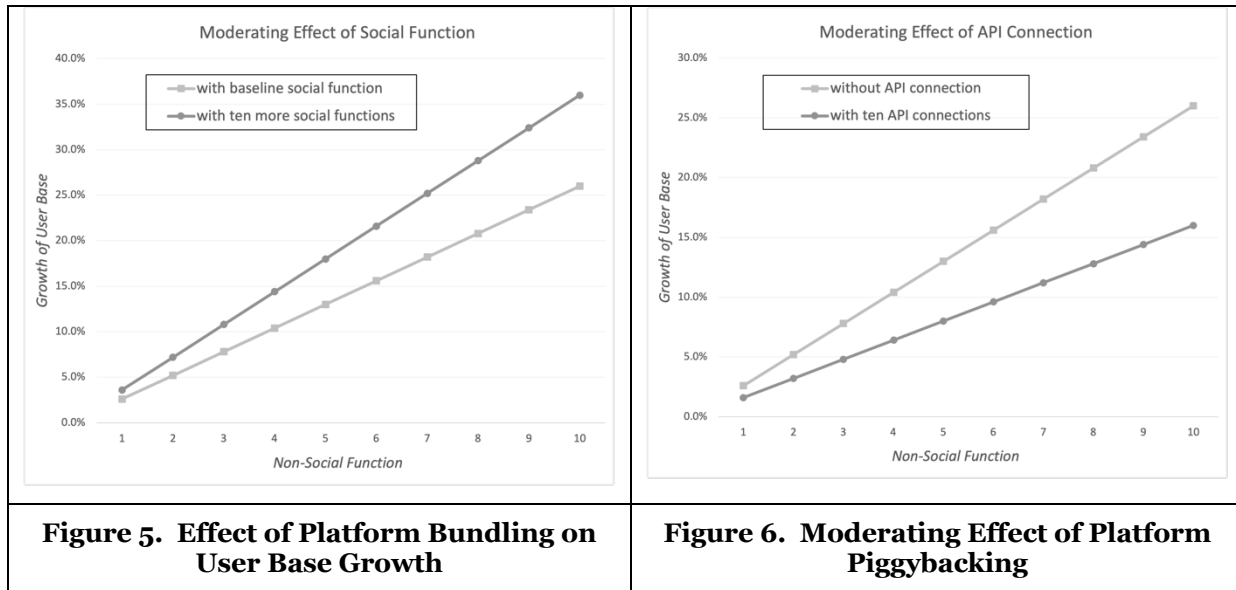
We also did extra test for the social apps located in the social category. The result showed that none of the terms is significantly correlated with user base growth at app. From the confidence intervals, we therefore find no evidence that functionality combinations and boundary resources use impact the growth of new entrants locating in the home market. One possible explanation is that most new entrants are confined to social functionality as the single most important value proposition in the social market. Non-social functionalities, in this case, are bundled mainly as the add-on which is barely distinct from the incumbents connected by an array of different apps across markets through boundary resources. In other words, they still stick to ‘winner-take-all’ logic by competing with incumbents in the same market, leaving little chance to grow.

	(1)	(2)	(3)	(4)	(2)
Variables	ln(UserBase)	ln(UserBase)	ln(UserBase)	ln(UserBase)	ln(UsereEngage)
<i>SocialF</i>		0.004 (0.005)	-0.007 (0.006)	-0.104 (0.007)	-0.003 (0.002)
<i>NonSocialF</i>		0.028*** (0.003)	0.024*** (0.004)	0.026*** (0.004)	0.002 (0.002)
<i>SocialF</i> × <i>NonSocialF</i>			0.001** (0.0001)	0.001*** (0.0001)	
<i>APIConnection</i>		-0.014 (0.012)	-0.012 (0.012)	0.010 (0.017)	0.014*** (0.005)
<i>APIConnection</i> × <i>NonSocialF</i>				-0.001* (0.0001)	
<i>FuncMaintenance</i>	0.016*** (0.002)	0.003 (0.003)	0.004 (0.003)	0.004 (0.003)	-0.0002 (0.01)
<i>AppAge</i>	-0.029*** (0.002)	-0.032*** (0.002)	-0.031*** (0.002)	-0.032*** (0.002)	0.002* (0.001)
<i>NumSisterApps</i>	0.008*** (0.002)	0.006*** (0.002)	0.006*** (0.002)	0.006*** (0.002)	-0.001 (0.001)
<i>Rating</i>	0.032*** (0.012)	0.029*** (0.011)	0.029*** (0.011)	0.029*** (0.011)	0.011** (0.005)
<i>Review</i>	0.00002** (8.80e-06)	0.00002*** (8.23e-06)	0.00002*** (8.29e-06)	0.00002*** (8.35e-06)	5.95e-06 (5.60e-06)
<i>ln(CategoryRanking)</i>	-0.197*** (0.017)	-0.175*** (0.017)	-0.178*** (0.017)	-0.175*** (0.017)	0.005 (0.001)
<i>ln(OverallRanking)</i>	-0.184*** (0.038)	-0.210*** (0.036)	-0.210*** (0.036)	-0.212*** (0.036)	-0.007 (0.014)
<i>_cons</i>	5.485*** (0.240)	5.567*** (0.228)	5.620*** (0.230)	5.607*** (0.230)	-0.210 (0.262)
N obs	57660	57660	57660	57660	57660
Within R <sup>2</sup>	0.19	0.21	0.21	0.22	0.01
Between R <sup>2</sup>	0.26	0.25	0.26	0.26	0.001
F	83.68***	67.95***	64.78***	60.16***	4.79***

Notes: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ ; Number of panel (apps) =1402

**Table 6. Result from Fixed-Effect Model Estimation**

In sum, our results indicate that platform bundling is an effective means to facilitate new entrant growth in user base, whereas app developers have to make more trade-off in platform piggyback with regard to its effect on user base and user engagement. Figure 5 and 6, which use the coefficients obtained in the models, graphically represent these effects.



Several additional checks were conducted to ensure confidence in our results. First, we investigated the robustness of our results to the use of alternative measures for the dependent variables *user engagement*. We tried average open times of an app per user per month and got results consistent with our hypotheses. Second, in Oct 2017, iOS store announced a change in the app category rule, after which the catalogs category became unavailable and integrated into shopping category. As a major external shock to the platform, the market landscape change influenced the market shift decision of all apps and had potential implications for both predictors and outcomes in our model. We therefore reran the analysis using the above date as a cutoff for subset analysis of apps before and after the market landscape change, and achieved consistent results. Third, we explored potential issues with the direction of causality between app function update and platform growth. We address it by using a one-month lag between the independent and dependent variables.

## Discussion and Implications

Competing in an early saturated market landscape, the dominant platform tactics based on winner-take-all logic (Eisenmann et al. 2006)---including pricing (Parker and Van Alstyne 2005; Rochet and Tirole, 2003), openness (Boudreau 2010; Parker et al. 2016), and envelopment (Eisenmann et al. 2011)--- are less effective and realistic for new entrant growth. While an alternative platform distinctiveness logic had been proposed in the platform competition literature (e.g. Cennamo 2021; Cennamo and Santalo 2013), there is still lack of empirical investigation into how new platform entrants leverage this strategic option for growing under the shadow of platform giants. To this end, we derived and tested the effect of two such tactics (platform bundling and platform piggyback) on new entrant growth in the early saturated mobile app marketplace. In what follows, we discuss the findings of our research.

First, platform bundling enables a new entrant spanning to an adjacent market to combine multi-market functionalities appreciated by overlapping users. Specifically, the native functionalities against incumbents in the home market become the technological edge for leveraging differentiation vis-à-vis established competitors in the adjacent market, which is highly effective for stimulating the switch of users who had been served separately in both markets. In this regard, platform bundling is distinct from the envelopment strategy (Eisenmann et al. 2011) that aims to harness the network effects generated in adjacent markets. Given the dominant position of incumbents as network centre and innovation hub (Gawer and Henderson, 2007; Hurni et al. 2022) in early saturated marketplaces, new platform entrants rather use platform bundling to search and redeem external resources and capabilities in adjacent markets for extending and differentiating their innovation habitat (cf. Selander et al. 2013).

Second, platform piggyback intends to access and recruit existing user networks of incumbents. By tapping into the functionality of incumbents through boundary resources use, a new entrant can not only take full

use of its scarce resources and capabilities in developing and niching its platform scope (c.f. Cennamo 2021; Selander et al. 2013), but also reinforce its complementarity to incumbents in their scope and diversity of innovation (Gawer 2014; Hukal et al. 2020; Teece 1986). While prior studies agree on the role of boundary resources use in facilitating third-party developer competitiveness (Ghazawneh and Henfridsson 2013; Henfridsson et al. 2018), our results present a mixed picture of platform piggyback. Specifically, the increasing dependency on the technical and network resources of incumbents in the home market further escalates their power asymmetry (Hurni et al. 2022), from which the edge of native functionalities in leveraging distinctiveness in an adjacent market will fade to some extent. At the same time, connecting to incumbents in the home market, users remaining on platform become more active as they can multi-home smoothly to back-feed the platforms on which they have invested and interacted mostly in early saturated markets. Consequently, boundary resource exploitations might come with friction (cf. Eaton et al. 2015; Karhu et al. 2018), in the sense that an optimal distinctiveness (Durand and Haans 2022) requires to build upon a balance between the short-term (i.e. user base) and long-term (i.e. user engagement) growth target for a new platform entrant in early saturated markets (cf. Tiwana 2013).

On a general level, both strategies build a distinct position in early saturated marketplaces. Underlying this distinctiveness logic, the competitive advantage of new platform entrants derives from the synergy between asymmetric market positioning and technical architecture configuration (vs. incumbents) over time in an open-ended value landscape of digital innovation (cf. Cennamo 2021; Henfridsson et al. 2018), which echoes an integrative view of digital platforms as evolving organizations (Gawer 2014; Bonina et al. 2021). We therefore add to the theoretical inquiry shift from the platform size to the level of platform system competitiveness (Cennamo and Santalo 2013) in platform competition and strategy literature.

## Limitations and Future Research

Our work is not without limitations. First, as the competition among social apps is extremely driven by the direct network effects, we choose them as a representative set to test the viability of platform distinctiveness moves against winner-take-all logic. Future research might tease out these effects for other types of platforms that focus more on innovation-driven competition. Second, the empirical evidence we provide in favour of our hypotheses may be market specific. The iOS platform marketplace has a well-established governance system with clear-cut market segments. This means that market positioning may be more important in our setting than in other digital marketplaces where market boundaries may be blurry and even not existed. Future research is therefore encouraged to examine our theory boundary at a more general level. As incumbent platform giants increasingly wield their domination power across diverse digital markets, the question of how new entrants grow up and become competitive in early saturated markets is highly relevant and deserves attention in future studies of competitive dynamics in platform context.

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