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**ESSAYS ON THE EMERGING MARKET PLATFORM'S PERFORMANCE AND
INTERNATIONALIZATION**

LI YANG

NANYANG BUSINESS SCHOOL

2021

**ESSAYS ON THE EMERGING MARKET PLATFORM'S PERFORMANCE AND
INTERNATIONALIZATION**

LI YANG

NANYANG BUSINESS SCHOOL

**A thesis submitted to the Nanyang Technological
University in partial fulfilment of the requirement for
the degree of Doctor of Philosophy
2021**

Statement of Originality

I hereby certify that the work embodied in this thesis is the result of original research, is free of plagiarised materials, and has not been submitted for a higher degree to any other University or Institution.

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I have reviewed the content and presentation style of this thesis and declare it is free of plagiarism and of sufficient grammatical clarity to be examined. To the best of my knowledge, the research and writing are those of the candidate with amendments, changes and improvements as suggested by me as the Supervisor. I confirm that the investigations were conducted in accord with the ethics policies and integrity standards of Nanyang Technological University and that the research data are presented honestly and without prejudice.

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The contributions of the co-authors are as follows:

- I conducted the literature review, model generation, data collection and analysis, and wrote the draft of the manuscript.
- Prof. Seung Ho Park assisted in the idea generation, theoretical framework and the revision of the manuscript.

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- I generated the idea, conducted the literature review, data collection, analysis and evaluation, and wrote the draft of the manuscript.
- Prof. Seung Ho Park assisted in the literature review, theoretical framework, and the revision of the manuscript.

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Summary

The rise of digital platforms (hereinafter referred to as “platforms”) has brought great changes to the modern business environment. The presence of network effects and the unique technical architectures make platforms different from traditional firms in the strategies to achieve market dominance and expand abroad. Although the emergence of platforms has attracted significant attention from scholars across various disciplines, existing platform studies provide little insight into the platforms that originated from emerging markets. Since recent years have witnessed the rapid development and international expansion of the emerging market platforms, it is necessary to investigate the factors that influence the development and internationalization of emerging market platforms to provide a more complete picture for platform studies. Therefore, this dissertation focuses on the platforms from emerging markets and studies the factors that influence the market dominance and international expansion of emerging market platforms.

Essay 1 focuses on the factors that influence the market dominance of emerging market platforms. This study questions the proposed “Winner-Take-All (WTA)” hypothesis in the existing platform studies that the platforms with the largest user base will ultimately dominate the market and digs deeper into the situations under which the WTA hypothesis is more likely to hold in the case of emerging market platforms. I argue that the installed base of a platform may contribute to the platform’s performance by attracting potential users. The installed base can attract potential users by providing valuable information and sending positive signals about the future dominance of the platform. However, the positive relationship between the installed base and the platform performance is contingent on the value of the information, the motivation of potential users to seek signals and the strength of the positive signals. I argue that the positive relationship is conditioned on the level of ambiguity of existing users’ evaluation of the platform and the economic policy uncertainty (EPU) in the external environment. I tested the hypothesis using a sample of Chinese Peer-to-Peer (P2P) lending platforms from 2017 to 2019. The results confirm that the installed base

of a platform can contribute to the platform's performance. Such positive relationship will be weakened when the existing users provide more ambiguous information and strengthened in the external environment with a higher level of EPU. This study contributes to the existing platform studies by highlighting the importance of information quality and external environment on the market dominance of emerging market platforms and provides managerial implications for emerging market platforms to leverage the installed base and achieve desired market performance.

Essay 2 focuses on the role of communication channels in the international penetration process of emerging market platforms. While existing platform studies have suggested that the diffusion of innovation theory can help us to gain a better understanding of how platforms can build the user base in a host country and successfully penetrate the host country with the help of communication channels, few existing studies have empirically investigated whether and how communication channels in the host country influence the platform's penetration performance. Based on the diffusion of innovation theory, this study investigates how digital communication channels in the host country influence the platform's penetration performance. I argue that the development of social media in the host country contributes to the platform's penetration in the host country by spreading the existence of the platform to the potential users in the host country. However, such positive relationship is influenced by two underlying mechanisms: 1) the platform can use the social media to spread the information and 2) the potential users will choose to adopt the platform when they know the platform via the social media in their country. Therefore, I propose two moderators that influence these two underlying mechanisms: cultural distance between the host and the home country of the platform and the positivity of the evaluation information provided by the existing users of the platform. Cultural distance influences the platform's efficiency to communicate information to potential users via social media in the host country, and the positivity of users' evaluation information influences the formation of the potential users' attitude towards the platform and thus influences the potential users' adoption of the platform. In this way, the positive relationship

between the social media development and the platform's penetration in the host country will be weakened when there is a longer cultural distance between the platform's host and home country and the existing users provide more negative evaluation information about the platform. In addition, I take into consideration the heterogeneity among existing users by separate the evaluation information into evaluation information from the platform's home country existing users and evaluation information from the platform's host country existing users. I argue that potential users in the host country value the evaluation information from the platform's home country existing users due to their expertise, and they value the evaluation information from the platform's host country existing users due to their similarity in value and beliefs. Using a sample of Chinese listed platforms from 2013 to 2019, I confirm most of my predictions. The results show that the social media penetration rate in a host country is positively associated with the platform's penetration in the host country and the positive relationship will be weakened when there is a longer cultural distance between the home and the host country of the platform and when the host country existing users provide more negative evaluation information about the platform.

Essay 3 focuses on the platform-specific advantages that may contribute to the platform's international penetration. While existing platform studies from IO economics focus on the user side and mainly investigate how a platform's network advantages help the platform to attract potential users and achieve better performance, the studies from the technology management perspective focus on product side and mainly investigate the impact of a platform's product advantages on the potential user's adoption choice and the platform performance, few studies combine these two theoretical perspectives together, take into consideration both network advantages and product advantages and investigate the situations under which the impact of these two types of platform-specific advantages may be different. This essay considers the role of both network advantages and product advantages in the internationalization process of emerging market platforms. I argue that both the network advantages and the product advantages may contribute to the platform's penetration in the host

country, however, the impacts of network advantages and product advantages are contingent on the host country's market environment. The level of market dominance in the host country will influence the potential users' perceived network value of the platform and therefore influence the impact of network advantages on the platform's penetration, while the digitalization distance between the platform's host and home country will condition the potential users' perceived product value of the platform and thus influence the contribution of product advantages to the platform's penetration. Using a sample of Chinese leading social media platforms from 2016 to 2020, I confirm all the hypotheses. I find that both the network size and the addition of product features will contribute to the platform's penetration in the host country. The impact of network size will be weakened when the host country is already dominated by the incumbents and the impact of platform feature updates will be strengthened when there is a longer digitalization distance between the platform's host and home country.

The three essays will be elaborated respectively in the next three chapters by discussing the existing literature, the theoretical framework and hypothesis, the empirical settings and methodology, the contributions and managerial implications, and the limitations and directions for future studies.

Platform Competition: Boundary Conditions of the Winner-Take-All Hypothesis

ABSTRACT

This study explores the validity of Winner-Take-All (WTA) hypothesis and the underlying mechanisms that condition the relationship between the installed base of a platform and the platform's performance in the context of emerging markets. I propose a positive relationship between the existing user base of a platform and the platform's performance and explore the moderating effects of two boundary conditions: existing users' evaluation ambiguity and economic policy uncertainty (EPU). By utilizing a longitudinal sample of 124 Chinese peer to peer lending (P2P) platforms from 2017 to 2019, I confirm the positive relationship between the installed base of a platform and the platform's performance, however, the positive relationship will be weakened when the existing users provide ambiguous evaluation information and will be strengthened when the level of EPU is high in the external environment.

Keywords:

Platforms; installed base; user evaluation; economic policy uncertainty; emerging markets

1. INTRODUCTION

According to the 2021 digital overview provided by the Datareportal, around 59.5% of the world's population has the access to the internet (Hootsuite & We Are Social, 2021). The rapid expansion of the internet contributes to the rise and proliferation of digital platforms (hereinafter referred to as "platforms") across different industries and the world (Dushnitsky, Piva, & Rossi-Lamastra, 2020; McIntyre & Srinivasan, 2017; Rietveld & Schilling, 2021). In 2020, many of the world's biggest companies such as Apple, Amazon, Alibaba, Google, Facebook, and Tencent are now based on a platform business model.

A growing number of studies have started to investigate the platform strategies that contribute to the platform performance (Rietveld & Schilling, 2021). These strategies can be associated with complementors, users, and platform owners. A fundamental characteristic of a platform is its

reliance on the existence of network effects (McIntyre & Srinivasan, 2017), that is, the larger the installed base of a platform, the larger value that a user can gain from the platform, the more likely that the platform can achieve the desired performance. Therefore, existing studies on the platform strategies and platform performance proposes a winner-take-all (WTA) hypothesis where the platform with the largest user base will ultimately gain a larger market share and dominate the market (Eisenmann, Parker, & Van Alstyne, 2011; Eisenmann, Parker, & Van Alstyne, 2006; Katz & Shapiro, 1994; Lee & O'Connor, 2003). Based on the WTA hypothesis, existing studies have investigated various platform strategies that help to the growth of the user base. For instance, Lee and O'Connor (2003) show that the size of the installed base plays an important role in a platform's long-term performance. Eisenmann et al. (2011) suggest that the value that potential users can gain from a platform is subject to the number of other users with whom they can interact and therefore platform envelop strategies can help the platform to attract potential users through its existing user base and win the market competition. Huang, Henfridsson, Liu, and Newell (2017) have identified three mechanisms (i.e., data-driven operation, instant release, and swift transformation) by which platforms can rapidly build their user base.

Although existing studies have investigated various issues associated with platform strategies related to user base growth, several areas remain under-explored. First, existing studies on platform strategies and platform performance take for granted that the installed base of a platform can contribute to the platform's performance and market dominance. However, recent studies show that the WTA hypothesis is not always supported. For example, Zhu and Iansiti (2012) find that a large installed base of existing platforms may not be a barrier for new entrants to gain market share. We can also observe controversial cases in the reality. For instance, the dominance of Taobao in the Chinese E-commerce market has not blocked the new entrants like Pinduoduo, and Pinduoduo has successfully captured the market share and ranked by Hurun Research Institute as the fourth most valuable E-commerce companies in China in 2020. However, only a limited number of studies have

investigated the boundary conditions that condition the relationship between the installed base and platform performance. Therefore, more studies need to be done to test the validity of the WTA hypothesis. Second, existing studies focus little on the impact of external environment on the platform's performance (McIntyre & Srinivasan, 2017). Third, existing platform studies focus mainly on western economies and therefore more studies need to be done to expand the geographic scope and enhance the robustness of existing platform research (Rietveld & Schilling, 2021).

The purpose of current study is to address the mentioned gaps in the existing literature by investigating the information-related and external environment-related boundary conditions of the WTA hypothesis. I am guided by the following research question: whether and how does the installed base of an emerging market platform contribute to the platform's performance? I hypothesize that the installed base of a platform contributes to the platform's performance, however, such positive relationship is conditioned by the level of ambiguity of the evaluation information provided by the existing users and the level of economic policy uncertainty (EPU) in the external environment. The empirical findings confirm that the installed base of a platform is positively associated with the platform's performance, however, the positive relationship will be weakened when the existing users provide more ambiguous evaluation information. Regarding the impact of EPU, the positive relationship between the installed base of a platform and the platform's performance will be strengthened when the level of EPU is higher in the external environment. This study contributes to the existing platform studies. First, I relax the assumption in many of existing studies that the installed base of a platform will contribute to the platform's performance and test the validity of the WTA hypothesis by investigating the impact of evaluation information provided by the installed base. Second, I have investigated the impact of the external environment on the relationship between the installed base and the platform performance. In this way, I respond to the call of McIntyre and Srinivasan (2017) that more studies of networks and platforms need to investigate the contextual factors that determine the strength of the direct network effects. Third, I

use a sample of Chinese online Peer to Peer (P2P) lending platforms to test the hypothesis, in this way, this study helps to broaden the geographic scope of existing platform studies.

The paper proceeds as follows. In the next section, I provide a literature review on platform strategies and platform performance. I then come up with the theoretical arguments and propose the hypotheses. Following the theory and hypothesis, I describe the research setting and analytic strategies in the methodology section. After the methodology section, I present the result of the empirical analysis. Finally, in the discussion section, I present the contribution, managerial implications, limitations, and future research directions of this study.

2. LITERATURE REVIEW

The increasingly important role played by the platforms in the modern business environment has received significant attention from scholars across different disciplines, including marketing, international business, management, information systems, and economics, to investigate various platform strategies that may influence a platform's performance (Rietveld & Schilling, 2021). Existing literature on such platform strategies can be categorized into three perspectives: (a) complementor management; (b) user management; and (c) platform capability building. Complementors are the third-party developers that provide complementary products and services for the platform. Existing platform studies have shown that complementors directly influence the platform's innovation performance and indirectly influence the platform's market performance. Since complementors' innovation efforts directly influence the platform's innovation performance, therefore, platforms can adopt various strategies such as platform competition, platform evolution, and platform design, to manage complementors and achieve desired innovation performance. Platform competition influences platform innovation performance by influencing the innovation incentives of complementors (Boudreau, 2012; Foerderer, Kude, Mithas, & Heinzl, 2018; Wen & Zhu, 2018). For example, Boudreau (2012) find that platforms can influence the complementors' innovation efforts by increasing the number of complementors, and the relationship between the

number of complementors and the platform innovation performance is conditioned by the complementors similarity. In addition to inducing competition among complementors, platform owners can adjust innovation efforts by directly entering into the complementors' market and such entry will make complementors reallocate innovation efforts from affected areas to unaffected areas, which may, in turn, reduce wasteful innovation efforts when there are already a great number of complementors offer similar features on the platform (Wen & Zhu, 2018). Platform evolution and platform design strategies influence platform innovation performance by influencing complementors innovation capability of. For example, a platform's introduction of next-generation technologies will pose challenges for complementors to learn and adapt to the new technologies, which in turn, influence the capability of the complementors to develop products for the platform (Ozalp, Cennamo, & Gawer, 2018). Platform design may influence the level of difficulty for other parties to add complementary products and services (Adner & Kapoor, 2010; Helfat & Raubitschek, 2018; Tiwana, 2015) and the knowledge sharing among complementors (Boudreau, 2010; Parker & Van Alstyne, 2018; Zhang, Li, & Tong, 2020), which may, in turn, influence the complementors' capability to provide innovative products and services for the platform. Complementors may indirectly influence the market performance of a platform by influencing the potential users' perception of the product value of the platform. Existing studies suggest that the volume, variety, and quality of the complementary products and services available on the platform may influence the potential users' perception of the platform's product value and therefore influence the platform's market performance (Cennamo, 2018, 2019; Cennamo & Santalo, 2013; Cui, Li, & Li, 2020; Geva, Barzilay, & Oestreicher-Singer, 2019; Lee, 2013; Li & Agarwal, 2016). For instance, Lee (2013) and Cennamo and Santalo (2013) suggests that platforms can attract potential users and achieve higher market share by signing exclusive deals with popular complementors and offering exclusive products, services, and technologies provided by these complementors. Cennamo (2018) finds that the number and activity level of complementors influence the variety and quality of the

complements of a platform and thus influence the platform's market penetration.

The users in the platform-mediated networks can be both firms and individuals that use the networks to interact with each other. The motivation of potential users to join a platform-mediated network depends on the utility they can gain from the network. Direct network effects emerge when a potential users' value of joining a platform is positively affected by the number of other users that join the platform-mediated network (Katz & Shapiro, 1994; McIntyre & Srinivasan, 2017). Indirect network effects emerge when the number of users who join a platform influence the availability of the complementary products and services and further influence the potential users' motivation to join the platform (Katz & Shapiro, 1994; McIntyre & Srinivasan, 2017). Since the installed base of a platform influences both the availability of the complementary products and services and the potential users' motivation to join the platform, existing studies predict a "winner-take-all" (WTA) outcome that the platforms with the largest number of users will ultimately achieve the market dominance (Katz & Shapiro, 1994; McIntyre & Srinivasan, 2017). Based on the WTA hypothesis, existing studies on platforms and network effects have investigated various platform strategies to attract users, build the user base and achieve the WTA outcome (Dushnitsky, Piva, & Rossi-Lamastra, 2020; Eisenmann, Parker, & Van Alstyne, 2011; Fuentelsaz, Garrido, & Maicas, 2015). Such strategies can be either pricing strategies or non-pricing strategies. Pricing strategies are strategies that related to the fees a platform charge to its users. Such strategies influence the potential users' adoption decision by influencing their costs of adoption, which, in turn, influence the market leadership of the platform (Dushnitsky et al., 2020). Such pricing strategies can be strategies related to subscription fees, transaction fees, and fee allocation towards different groups of users with different levels of price sensitivity (Basu, Bhaskaran, & Mukherjee, 2019; Dushnitsky et al., 2020; Halaburda, Jan Piskorski, & Yildirim, 2018). Non-pricing strategies are strategies beyond fee-setting and such strategies can be related to the platform design (Dushnitsky et al., 2020; Fuentelsaz et al., 2015). Existing literature has identified various strategic choices related to the platform design

that may contribute to the user base growth and platform market performance. Platform design for user management can be sorted into two types: inter-platform design and intra-platform design. Inter-platform design is related to a platform's compatibility with other platforms. The level of compatibility of a platform with other platforms will influence users' expectations of costs and benefits of adopting the platform. A lower level of compatibility leads to potential users' expectations of higher switch costs and possible opportunistic behavior of the platform, making potential users reluctant to adopt the platform, while a higher level of compatibility will positively influence the users' expectation by lowering the communication and coordination costs between platforms and thus motivate potential users to adopt the platform (Eisenmann et al., 2011; Fuentelsaz et al., 2015). Intra-platform design is related to the accessibility of a platform (i.e., numbers of language offered by the platform and number of regions penetrated by the platform) and the scope of product and services offered by the platform. Such intra-platform design influences the perceived value of the platform to potential users and helps the platform to target different types of potential users (Brouthers, Geisser, & Rothlauf, 2016; Dinerstein, Einav, Levin, & Sundaresan, 2018; Dushnitsky et al., 2020; Fuentelsaz et al., 2015; Kumar, Nim, & Agarwal, 2020).

Recent studies have started to investigate platform capability-building strategies that may influence the platform performance. For instance, Helfat and Raubitschek (2018) propose that a platform's integrative capabilities for ecosystem orchestration help the platform to achieve the market leadership. Based on an inductive study, Shi, Li, and Chumnumpan (2020) find that the dynamic capabilities of a platform (i.e., innovation leverage, market exploration, quality control, and appropriation) are the key to the platform's revenue and market growth.

Existing studies have also investigated the boundary conditions that influence the efficiency of the various platform strategies for better platform performance. First, the combination of multiple strategies may not lead to better platform performance. For instance, Cennamo and Santalo (2013) and Cennamo and Santaló (2015) suggest that platforms pursuing both user base growing strategy

and locking in strategy may diminish the benefits of both strategies and lower the platform's market performance. Second, the efficiency of various platform strategies is conditioned by the development cycle of the platform. Specifically, in different stages of the platform cycle, different platform strategies may have different levels of impact on the platform's performance. For example, Teece (2017) suggests that the requirement of platform capabilities (i.e., sensing, seizing, and transforming) is different at each stage (i.e., birth, expansion, leadership, and self-renewal) of the platform lifecycle. Third, the efficiency of platform strategies is influenced by the demand heterogeneity such as heterogeneous preferences for variety and quality (Hagiu, 2009), differences in risk preferences (Rietveld & Eggers, 2018), and different level of sensitivity to price and ratings (Kübler, Pauwels, Yildirim, & Fandrich, 2018), and the platform-mediated network structure such as tie strength (Suarez, 2005), ways of interaction (Lee, Lee, & Lee, 2006) and degrees of separation among network members (Lee, Song, & Yang, 2016).

To conclude, while various issues have been investigated associated with the platform strategies and platform performance, several gaps exist. First, most of the existing studies assume that user base is the key for the platform performance due to platform's reliance on the network effects, therefore, these studies mainly investigate the strategies related to complementors, users, and the platform owners that contribute to the user base growth.

Exceptions include Lee et al. (2006), Suarez (2005), and Lee et al. (2016), who highlight that the platform strategies focused on the user base growth may not always contribute to the platform's performance by investigating the network structure-related factors as the boundary conditions. Since it is suggested by existing literature that potential users' adoption choice can be significantly influenced by the evaluation information provided by the existing users in the platform-mediated network (Allard, Dunn, & White, 2020; Chevalier & Mayzlin, 2006; Rosario, de Valck, & Sotgiu, 2020), it is necessary to investigate how the evaluation information provided by the existing users may condition the relationship between the size of existing user base and the platform's

performance. Second, existing platform studies mainly focus on the impact of users, complementors and platform owners on the platform performance, little has been mentioned on the influence of the external environment. Third, the geographic scope of existing studies on platform competition and network effects mainly focuses on the western economies and the emerging markets remain under-explored. Therefore, more studies on emerging markets may help to test the robustness of existing platform.

3. THEORY AND HYPOTHESIS

3.1 Installed base and platform performance

A potential user's choice of adopting a platform is influenced by the installed base of the platform in two ways. First, according to the diffusion of innovation theory, potential users are facing uncertainty about the expected consequence of the adoption of a given innovation. Therefore, they need to seek information to learn about the innovation and reduce such uncertainty to a tolerable level before making the adoption decision (Rogers, 2003). In the case of platforms, the existing users of a platform act as the source of the information about the platform that can help potential users to reduce the uncertainty about the platform. A larger size of the installed base will provide a larger volume of information about the platform that is valued by the potential users. In this way, a larger installed base can contribute to the platform's performance by providing valuable information and attracting potential users.

Second, users need to learn about how to use a platform before gaining utility from the platform, therefore, users face learning costs when choose to adopt a platform and such learning costs may lead to sunk costs and switch costs associated with the failure of the platform and the switch from one platform to another. In this way, potential users have the motivation to seek positive signals about the long-term survival of the platform to avoid possible costs (Fuentelsaz, Garrido, & Maicas, 2015). The installed base can help potential users to estimate the platform's future market share. Specifically, when a platform has a larger number of existing users, potential users may perceive that the platform is more likely to dominant the market in the future. In this way, a larger installed

base may contribute to the platform's performance by positively influence the potential users' expectation of the future market dominance of the platform.

Platforms act as a mediator that facilitates transactions between different parties and benefit from the transaction fees. The more users join a platform, the larger the transaction amount the platform can gain and the better performance the platform may achieve. Based on the above argument, I hypothesize that:

H1: The size of the installed base of a platform positively affects the platform's performance.

3.2 Boundary Conditions of the User Base-Performance Relationship

Although I have proposed that the size of the installed base of a platform can positively affect the platform's performance, there are two underlying mechanisms behind my arguments: (a) the potential users value the information provided by the existing users and the larger the installed base, the more valuable information they think they can gain from the platform; and (b) potential users perceive that there is a positive linkage between the installed base of the platform and the future dominance of the platform. Therefore, I propose two moderators that condition the value of the information provided by the installed base and the potential users' perceived strength of the linkage between the installed base of a platform and the platform's future dominance.

3.2.1 Moderating effect of evaluation ambiguity on the user base-performance relationship

I have suggested that the installed base act as the source of information and a larger installed base will positively influence the potential users' motivation to adopt the platform by providing a larger volume of information valued by the potential users. The underlying mechanism is that the information provided by the installed base is valued by the potential users, however, the value of the information is conditioned by the content of the information.

According to the accessibility-diagnostics model, not all the accessible information can be considered as input for evaluation and decision making, and it depends on whether the information is

diagnostic or ambiguous. A piece of information can be conceptualized as diagnostic when “it helps the consumer assign a product to one (and only one) cognitive category” and the information is perceived as ambiguous when it has multiple interpretations (Herr, Kardes, & Kim, 1991). The value of the ambiguous information will be discounted due to both cognitive and motivational reasons (Shafir, 1994; Tversky & Shafir, 1992; Van Dijk & Zeelenberg, 2003). First, ambiguous information “tends to blur the picture and makes it harder for people to see through the implication of each outcome” (Tversky & Shafir, 1992), therefore, it will be cognitively too complex for people to decide based on the ambiguous information. Second, before making a decision, a person needs to consider the anticipated outcomes of the decision (Shafir, 1994) and when making a decision based on the ambiguous information, the ambiguous information “requires people to assume momentarily as true something that may in fact be false” (Shafir & Tversky, 1992), therefore, people are less motivated to make a decision based on ambiguous information.

In the case of platforms, when the evaluation information provided by the existing users of the platform is ambiguous, the potential users of the platform may find it difficult for them to assign the platform to a clear cognitive category based on the ambiguous information. Therefore, it is cognitively too complex for the potential users to make the adoption decision based on such ambiguous information and they also lack the motivation to think through such ambiguous situations as it requires them to make assumptions that may not be true. In this way, the value of the information provided by the existing users will be discounted when the information provided by them is ambiguous and the positive relationship between the installed user base and the platform’s performance will be weakened.

Based on the above arguments, I hypothesize that:

H2: The ambiguity of the existing users’ evaluation about the platform will negatively moderate the relationship between the installed base and the platform’s performance.

3.2.2 Moderating effect of economic policy uncertainty on the user base-performance relationship

While I have suggested that the installed base of a platform contributes to the platform’s

performance by sending positive signals about the future dominance of the platform and therefore positively influence the potential users' adoption of the platform, the positive relationship between the installed base of a platform and the potential users' adoption of the platform depends on a) the potential users' motivation to seek the signal about the future dominance of the platform and b) the potential users' perception of the positive linkage between the installed base and the platform's future dominance.

Economic policy uncertainty (EPU), defined as the economic risk originated from unpredictable changes in the future government economic policies and regulatory frameworks (Al-Thaqeb and Algharabali 2019), may influence risks of investments and spending, increase the market uncertainty and thus influence the firms' survival in the market. EPU is the mainly concern of firms in the emerging markets as emerging markets are characterized as markets with underdeveloped institutions (Kim & Song, 2017; Kingsley & Graham, 2017). Such underdeveloped institutions may contribute to the rapid development of firms in emerging industries; however, the development of these firms can come to an abrupt end when facing a sudden policy change. For example, in China, during the early growth stage of peer-to-peer lending (P2P) lending platforms, there were no government regulations about the compliance operations of P2P lending platforms, leading to a great number of P2P lending platforms illegally raise funds from individuals and causing the loss of the lenders' life savings. Due to these negative events, the Chinese government started to regulate the behavior of P2P lending platforms and forced P2P lending platforms to change their operational modes. Such policy change negatively influenced the P2P platforms' viability as they could not meet the new requirements, which led to the closure of hundreds of P2P lending platforms.

EPU may influence the relationship between the installed base of a platform and the platform's performance in two ways. First, the disjunction effect suggests that people are facing greater decision-making comprehensiveness and tend to remain undecided in situations when the outcomes of their decision are unknown (Shafir, 1994; Tversky & Shafir, 1992). Therefore, in the situation of

economic policy uncertainty, potential users are more motivated to seek positive signal about the future development of the platform before making decision. Second, while institutions help to regulate firms' behavior, changes in regulatory policies may obsolete the existing advantage of the firm and make firms difficult to maintain a long-term competitive advantage. In terms of platforms, EPU may disrupt platforms' established routines and dissipates their competitive advantages. In this way, even when a platform has a large installed user base, the platform may not survive in the future due to the change of policies. Therefore, EPU may weaken the strength of the installed base as a positive signal of platform's future dominance.

Combining the above arguments, on the one hand, EPU may strengthen the positive relationship between the installed base of a platform and the platform's performance by increasing potential users' motivation to seek positive signal about the platform's future dominance. On the other hand, EPU may weaken the positive relationship between the installed base of a platform and the platform's performance by weakening the potential users' perception of the strength of the signal sent by the installed base about the platform's future dominance.

Therefore, I hypothesize that:

H3a: The policy uncertainty will positively moderate the relationship between the installed base and the platform's performance.

H3b: The policy uncertainty will negatively moderate the relationship between the installed base and the platform's performance.

4. METHODS

4.1 Research setting

I tested the hypotheses using a sample of online P2P lending platforms in China from 2017 to 2019 due to the following reasons.

First, online P2P lending platforms are typical transaction platforms that facilitate the transactions between borrowers and lenders. Lenders join the platform to seek opportunities to invest money and

benefit from the interests of lending while borrowers join the platform to seek sources of liquidity (Bachmann et al., 2011). Second, P2P lending platforms are required to monthly disclose their performance data since 2017 and these platforms have various size and age, which ensures the diversity of information, limits the age and size-related biases, and provides a reliable context for platform research. Third, the rise and fall of P2P platforms in China can be an important lesson for other emerging markets about how to balance the development of digital platforms and the risks brought by the digital platforms. China was one of the largest online lending markets for P2P platforms from 2015 to 2017 but experienced great shrink of the online lending market since 2018. In 2017, China account for 86% market share of the global lending market. In 2019, the Chinese lending market only hold 48% of the global volume, and in 2020 the share of Chinese lending market further decreased to less than 1% of the global volume (Ziegler, Suresh et al. 2020). The rise of Chinese P2P platforms is mainly resulted from the lack of regulations in the industry and the fall of the Chinese P2P platforms is originated from Chinese Government's introduction of tightening regulations (Ziegler, Suresh et al. 2020). Since emerging markets share the commonality of institutional voids, the platforms in other emerging markets may also face similar conditions with P2P platforms in China and the factors that influence the performance of P2P platforms in China may also influence the survival of platforms in other emerging markets. In this way, P2P platforms in China can be representative research context and the implications gain from the P2P platforms in China can have referencesignificance to other platforms in other emerging markets.

4.2 Data and sample

User-evaluation data and platform-associated data were obtained from monthly reports disclosed by each P2P lending platform on their websites and Wangdaitianyan, an integrated portal for P2P lending platforms (<https://www.p2peye.com>). EPU data was got from the <http://www.policyuncertainty.com/>, a website that provide the global economic policy uncertainty index developed by Baker, Bloom, and Davis (2016) based on newspaper's coverage frequency related to EPU in the South China Morning Post (SCMP). Industry- associated data was obtained

from Wangdaizhijia, an integrated portal that provided all the industrial information about the P2P lending platforms in China (<https://www.wdzj.com/>).

In total, an unbalanced sample of 158 P2P lending platforms with 3982 platform-month observations was obtained. After dropping the missing values, a final sample of 124 P2P lending platforms with 1683 platform-month observations was obtained after dropping the missing values. Table 1 lists the final sample of the P2P platforms and Table 2 lists the descriptive statistics of the total sample and the final sample. Since there are only small differences in the mean and standard deviation between the total sample and the final sample, there is little concern that the dropping values may influence the validity of the analysis results.

Insert Table 1 about here

Insert Table 2 about here

4.3 Measures

Dependent variable. Platform performance. Since the P2P platforms play the role of a mediator between the lenders and borrowers, they mainly earn benefits from the successfully realized transactions (Bachmann et al., 2011). Therefore, the platform performance is measured as the log-transformed transaction amount of the P2P platform i in month $t+1$.

Independent variables.

Installed base. Lenders is the source of funding of P2P platforms (Chen, Lai, & Lin, 2014).

Borrowers join the P2P platform to borrow money and therefore borrowers are more motivated to join the platform when the platform has a larger lender base. P2P platforms benefit from a larger lender base as a larger lender base increase the possibility of success transaction and P2P platforms mainly benefit from the matchmaking between lenders and borrowers. In this way, lenders play the role as the users of one side of the platform that can attract the users from another side and contribute to the platform's performance. Therefore, this study focuses on the lender side and measures the installed base as the log-transformed number of lenders of the P2P platform i in a given month t .

Evaluation ambiguity. A piece of information will be perceived as ambiguous when it has multiple interpretations and cannot help the potential users to assign the platform to a clear cognitive category (i.e. Bad, good and indifferent-neutral) (Herr et al., 1991), therefore, I employ the Herfindahl-Hirschman Index (HHI) to measure the evaluation ambiguity. The HHI can help to calculate the level of the dispersion of the existing users' evaluations among the cognitive categories. Therefore, the larger the score, the lower level of the dispersion of the evaluations among the categories, the less ambiguous the information. The evaluation ambiguity of a platform i in time t is measured as:

Evaluation ambiguity _{it}

$$= 1 - \text{Good percentage}_{it}^2 + \text{indifferent neutral percentage}_{it}^2 + \text{Bad percentage}_{it}^2$$

EPU. According to Baker et al (2016), the EPU index of China is measured as the monthly frequency count of the articles that talked about China's economic policy uncertainty in the South China Morning Post (SCMP) (http://www.policyuncertainty.com/scmp_monthly.html). As there are hundreds of articles talked about the EPU, the EPU is measured as the original EPU index in a given month t divided by 100 to keep the consistency of the scale.

Control variables. I have controlled platform-related and market-related factors that may influence the platform's performance.

Platform size. I have controlled the platform size as the size of a P2P platform may influence its capability to facilitate the transaction, which, in turn, influence its attractiveness to potential lenders and the platform's performance (Yang, Fan, & Yang, 2020). The platform size is measured as the loan balance of the platform as the loan balance of a P2P platform can represent the operational size of a P2P platform in a given month t .

Platform age. I have controlled the platform age since it is suggested by existing studies that the entry time may influence a platform's advantages to build the user base and dominate the market (Fuentelsaz et al., 2015). The platform age is measured as the log-transformed number of months since the founding of the focal P2P platform in a given month t .

Platform's relative interest rate. Since lenders join the P2P platform to invest and benefit from the interests of lending (Bachmann et al., 2011), the interest rate provided by the focal P2P platform may influence a lender's motivation to join the P2P lending platform. Therefore, I have controlled the platform's relative interest rate and measured it as the focal P2P lending platform's interest rate minus the average interest rate of all P2P lending platforms in the P2P lending market in a given month t .

Platform's bank depository. I have controlled for the P2P platform's bank depository since the P2P platform's bank depository sends the positive signal about the financial security of the platform, which may influence potential lenders' motivation to join the platform (Yang et al., 2020). The platform's bank depository is measured as a dummy variable with 1 for the P2P platform with a bank depository and 0 for the platform without a bank depository in a given month t .

Venture capitalist's certification of the platform. I have controlled the VC certification of the focal platform since the certification of VCs may send the positive signal about the growth potential of the platform and may influence the potential users' adoption of the platform (Li, Liao, Wang, & Xiang, 2020). The VC certification of the platform is measured as a dummy variable with 1 for the

platform with the backup of VCs and 0 for the platform without the backup of VCs in a given month t .

Platform's membership of the national financial association. I have controlled for the P2P platform's membership of the national financial association since the membership of the national financial association signals that the P2P platform is under regulation by the authority and positively influences the potential users' adoption of the platform. The platform's membership of the national financial association is measured as a dummy variable with 1 for the P2P platform with the membership of the national financial association and 0 for the platform without the membership of the national financial association.

Platform Initial Public Offering (IPO) status. Existing studies suggest that companies at the IPO stage provide more detailed information about their financial situation, the composition of management teams, corporate governance structure to potential investors (Zheng, Piao, & Park, 2021), therefore, P2P platforms that are held by listed companies are more likely to attract potential users since their shareholders can provide more complete information and help to mitigate the potential lenders' perceived risk of adoption. In this way, I have controlled the IPO background of the focal P2P platform and measure it as a dummy variable with 1 for the platform whose holding company is a listed company.

Bad percentage of user evaluations. I have controlled the bad percentage of existing users' evaluations since negative comments are more likely to be attributed to the performance of the product itself compared with positive comments (Mizerski, 1982), which may influence the potential users' perception of the platform. I measure the bad percentage of user evaluations as a percentage of the number of bad comments over the sum of all the comments.

Percentage of problematic platforms. I have controlled percentage of problematic platforms in the market since the number of problematic platforms can be a signal of the market trend that may

influence the lenders' perceived risk of joining a P2P platform. The problematic platforms are the platforms in problematic situations including absconding platform operator, fund withdraw issues, financial crime investigation, deferred payments, and website offline (wdzj.com). The percentage of problematic P2P platforms in the market is measured as the number of P2P platforms that have operational problems divided by the total number of P2P platforms in the market.

4.3 Results

The descriptive statistics in Table 3 provide the descriptive statistics and correlations of all variables in the full model. The VIF value for the coefficients of all variables in the full model is less than 10 (mean VIF: 2.08; maximum VIF: 4.13), suggesting that there is little concern about the multicollinearity issue.

Insert Table 3 about here

I tested the hypothesis using panel data analysis with platform-fixed effect and year-fixed effect by STATA. I adopt robust estimates of variances using the cluster option in STATA and clustered the data by the platform. I employed a hierarchical approach to run the fixed-effects models: Model 1 includes only the control variables, while Models 2-6 include the independent and interaction variables. Model 7 is the full model, including all independent and interaction variables. Table 4 presents the regression results.

Insert Table 4 about here

In Model 2 of Table 4, I tested Hypothesis 1 by introducing the installed base of the platform. The result shows that the installed base is positively associated with the platform's performance ($b=0.237$, $p=0.003$), thus supporting H1. In terms of the economic value, a 1% increase in the existing user base raises the platform's performance by 0.24%. In Model 3, I introduced the main effect of evaluation ambiguity and found the main effect of evaluation ambiguity to be insignificant ($b=0.228$, $p=0.378$). In Model 4, I tested Hypothesis 2 by adding the interaction term between the installed base and the evaluation ambiguity. The results show that the coefficient of the interaction term is significantly negative ($b=-0.515$, $p=0.016$), supporting Hypothesis 2. In Model 5, I introduced the main effect of EPU and found that EPU is negatively and significantly related to the platform's performance ($b=-0.048$, $p<0.0001$). In Model 6, I tested Hypothesis 3a and Hypothesis 3b and by adding the interaction term between the installed base and EPU. The results show that the coefficient of the interaction term is positive and statistically significant ($b=0.020$, $p=0.015$), therefore, Hypothesis 3a is supported and Hypothesis 3b is not supported. The moderation effect of evaluation ambiguity is graphed in Figure 1 and the moderation effect of EPU is graphed in Figure 2. The independent variables have been centered in the figures to make it easier for interpretation. Model 7 is the full model, including all control, independent, and interaction variables and all results from Model 2, Model 3, Model 4, Model 5 and Model 6 hold.

Regarding the impact of control variables, I found that the bank depository is positively and significantly associated with the platform's performance ($b=0.152$, $p=0.003$) both in the partial models and in the full model. The bank deposit can protect the funds of the lenders and therefore lower the potential users' perceived risk about the platform, and therefore, positively influence the platform's performance.

4.4 Robustness Test

I have run the sensitivity tests to test the robustness of the results.

First, according to previous literature (Lee, E., & Lee, B., 2012, Ma et al., 2017), market share can be

an important indicator of P2P lending platform's performance. Therefore, I used the platform's market share instead of the absolute transaction amount as an alternative measurement of the platform's performance. The market share of the focal platform is measured as the transaction amount of the platform divided by the total transaction amount of all the P2P lending platforms in the industry in a given month t . The results are shown in Table 5. I found that the effect of the installed base ($b=0.227$, $p=0.005$) is positive and statistically significant. Regarding the moderating effect of evaluation ambiguity, I found the impact of the interaction term between the installed base of the focal platform and the level of evaluation base ambiguity ($b=-0.520$, $p=0.015$) is negative and statistically significant and the effect of the interaction term between the installed base of the focal platform and EPU is positive and statistically significant ($b=0.019$, $p=0.020$). All results from the partial models hold in the full model. Therefore, the results remain robust.

 Insert Table 5 about here

Second, according to Tang et al (2014), indifferent-neutral user-generated content is neither positive nor negative, provide less diagnostic information and little useful information for users to evaluate a product. In this way, I used the percentage of indifferent-neutral user-generated content as the alternative proxy of evaluation ambiguity and measured it as the number of indifferent-neutral evaluations over the total number of evaluations in a given month t . The results are shown in Table 6. I found that the interaction term between the percentage of indifferent-neutral evaluations and the installed base is negative and statistically significant both in the partial model ($b=-0.600$, $p=0.083$) and in the full model ($b=-0.534$, $p=0.082$). In this way, the results remain robust.

 Insert Table 6 about here

5. CONCLUSIONS AND DISCUSSIONS

5.1 Conclusions

The rise of platforms has brought great changes to the modern business environment. Compared with traditional firms, platforms are unique due to the presence of network effects. The presence of network effects makes existing platform studies predict a winner-take-all (WTA) outcome that the platform with the largest installed base will dominate the market and investigate various platform strategies that can contribute to the user base growth and the platform's performance. However, there are two basic assumptions underlying the relationship between the installed base of a platform and the potential users' decision to adopt the platform. First, potential users will be attracted by the installed base of a platform. Second, the value of each existing user in the installed base is the same for the potential users. In this study, I relax these assumptions and investigate the boundary conditions of the relationship between the installed base of the platform and the platform's performance. I argue that the positive relationship between the installed base of a platform and the platform's performance is conditioned on the value of the evaluation information provided by the installed base and the level of EPU in the external environment. Using a sample of Chinese P2P lending platforms, I confirm that the positive relationship between the installed base of a platform and the platform's performance will be weakened when the existing users provide more ambiguous evaluation information about the platform and will be strengthened when the level of EPU in the external environment is higher. This study contributes to the existing platform studies.

5.2 Contributions

This study contributes to the existing platform studies in the following aspects.

First, since the value of the installed base to potential users is the opportunity for information exchange between the potential users and the existing users, it is necessary to study whether and how the content of information provided by the existing users may condition the installed base-

performance relationship. However, few platform studies investigate this issue. Therefore, I contribute to the existing platform studies by investigating how the level of ambiguity of the information provided by the existing users may condition the installed base-performance relationship.

Second, existing studies on platform performance focus little on the influence of the external environment. I bridge this gap by studying the impact of EPU on the efficiency of platforms' strategies and performance. This study suggests that the relationship between the installed base of a platform and the platform's performance is strengthened by a higher level of EPU in the emerging markets, suggesting that the WTA outcome is more likely to happen, and the get-big-and-fast strategies are more efficient in the emerging markets with a higher level of EPU.

Third, while existing studies on platforms mainly investigate the platforms in the western economies, I study the factors that influence platform competition in China, an emerging market that growing fast in digitalization. By doing this, I help to broaden the geographic scope of existing platform studies.

This study also provides implications for the platform operators in the emerging markets by pointing out how new entrants can earn market share even when the incumbents already have a large installed base and how incumbents can manage their installed base to achieve the desired performance. I highlight the importance of the evaluation information provided by the installed base of a platform and the importance of the external environment. Platforms with a larger user base need to timely check the evaluation information provided by the existing users, discover the points that receive ambiguous evaluations and adjust their products and services to reduce such ambiguity. As this study has shown that the user base advantage is more salient when the policy uncertainty is high in the external environment. As new incumbents do not have a larger user base, they need to adopt strategies to signal their capability to deal with the external policy uncertainty to mitigate potential users'

concern about the policy uncertainty.

5.3 Limitations

This study has several limitations. First, I use a sample of P2P lending platforms in China to investigate the boundary conditions of the relationship between the installed base and the platform's performance. Future studies should explore related issues using other types of platforms in other emerging markets to test the validity of the results.

Second, I mainly focus on the user side to investigate the boundary conditions. As complementor side is also important for the emergence of indirect network effects and may contribute to the platform's market performance. Future studies may investigate the situations under which the installed base may not positively contribute to the availability of complementors and thus make the WTA hypothesis less valid.

Third, I mainly focus on the number of the given type (i.e., good, bad, indifferent-neutral) of the evaluations to measure the evaluation ambiguity. As it is suggested by the existing literature on electric word of mouth, the content of the evaluation is also important in influencing users' adoption choice (Allard, Dunn et al.2020), future studies may use machine learning or other measures to investigate how the content ambiguity, or the sentiment ambiguity of the users' evaluations may influence the performance of a platform.

APPENDIX

Table 1 List of the final sample P2P lending platforms

P2P lending platform	website
100lending	https://100lending.p2peye.com/
33lend	https://33lend.p2peye.com/
51jiecai	https://51jiecai.p2peye.com/
51qianba	https://51qianba.p2peye.com/
51rzy	https://51rzy.p2peye.com/
88bank	https://88bank.p2peye.com/
91hc	https://91hc.p2peye.com/
91wangcai	https://91wangcai.p2peye.com/
babymoney	https://babymoney.p2peye.com/
baicaif	https://baicaif.p2peye.com/
bjdp2p	https://bjdp2p.p2peye.com/
cashlai	https://cashlai.p2peye.com/
daokoudai	https://daokoudai.p2peye.com/
dezhong365	https://dezhong365.p2peye.com/
dhibank	https://dhibank.p2peye.com/
dianrong	https://dianrong.p2peye.com/
dib66	https://dib66.p2peye.com/
eloancn	https://eloancn.p2peye.com/

eweidai	https://eweidai.p2peye.com/
fengjr	https://fengjr.p2peye.com/
fuqinjinrong	https://fuqinjinrong.p2peye.com/
guoer	https://guoer.p2peye.com/
gzdai	https://gzdai.p2peye.com/
hanxinbank	https://hanxinbank.p2peye.com/
hengyirong	https://hengyirong.p2peye.com/
hhlcw	https://hhlcw.p2peye.com/
hoomxb	https://hoomxb.p2peye.com/
huaxiaoxia	https://huaxiaoxia.p2peye.com/
hudai	https://hudai.p2peye.com/
huienziben	https://huienziben.p2peye.com/
huifusihai	https://huifusihai.p2peye.com/
huiyingdai	https://huiyingdai.p2peye.com/
hurbao	https://hurbao.p2peye.com/
hyzhifu	https://hyzhifu.p2peye.com/
hzdjr	https://hzdjr.p2peye.com/
hzed	https://hzed.p2peye.com/
i2p	https://i2p.p2peye.com/
iafclub	https://iafclub.p2peye.com/

ifcar99	https://ifcar99.p2peye.com/
irongbei	https://irongbei.p2peye.com/
izhicai	https://izhicai.p2peye.com/
jia16	https://jia16.p2peye.com/
jigoon	https://jigoon.p2peye.com/
jintouxing	https://jintouxing.p2peye.com/
jinzhucaifu	https://jinzhucaifu.p2peye.com/
jkd	https://jkd.p2peye.com/
jpjbp	https://jpjbp.p2peye.com/
jyblc	https://jyblc.p2peye.com/
jyc99	https://jyc99.p2peye.com/
lantouzi	https://lantouzi.p2peye.com/
lianlianmoney	https://lianlianmoney.p2peye.com/
lianzidai	https://lianzidai.p2peye.com/
lljr	https://lljr.p2peye.com/
lsydai	https://lsydai.p2peye.com/
lu	https://lu.p2peye.com/
lujinsuop2p	https://lujinsuop2p.p2peye.com/
madailicai	https://madailicai.p2peye.com/
mannyi	https://mannyi.p2peye.com/

mindai	https://mindai.p2peye.com/
miuzone	https://miuzone.p2peye.com/
mizlicai	https://mizlicai.p2peye.com/
myerong	https://myerong.p2peye.com/
myzhongjin	https://myzhongjin.p2peye.com/
newup	https://newup.p2peye.com/
niiwoo	https://niiwoo.p2peye.com/
niwodai	https://niwodai.p2peye.com/
penging	https://penging.p2peye.com/
ppdai	https://ppdai.p2peye.com/
ppmoney	https://ppmoney.p2peye.com/
puhuijia	https://puhuijia.p2peye.com/
puhuilicai	https://puhuilicai.p2peye.com/
qhziben	https://qhziben.p2peye.com/
qiandw	https://qiandw.p2peye.com/
qianpen	https://qianpen.p2peye.com/
qianxiangbank	https://qianxiangbank.p2peye.com/
qilerong	https://qilerong.p2peye.com/
qingyidai	https://qingyidai.p2peye.com/
qingyujf	https://qingyujf.p2peye.com/

rjb777	https://rjb777.p2peye.com/
rjs	https://rjs.p2peye.com/
rmbbox	https://rmbbox.p2peye.com/
rongxin365	https://rongxin365.p2peye.com/
sh	https://sh.p2peye.com/
shoujins	https://shoujins.p2peye.com/
shoujinwang	https://shoujinwang.p2peye.com/
sifangqian	https://sifangqian.p2peye.com/
socian	https://socian.p2peye.com/
souyidai	https://souyidai.p2peye.com/
sunfobank	https://sunfobank.p2peye.com/
taishanjinrong	https://taishanjinrong.p2peye.com/
vc265	https://vc265.p2peye.com/
wangcaigu	https://wangcaigu.p2peye.com/
we	https://we.p2peye.com/
wefax	https://wefax.p2peye.com/
weidai	https://weidai.p2peye.com/
wiuidai	https://wiuidai.p2peye.com/
wlgyjr	https://wlgyjr.p2peye.com/
xiangshang360	https://xiangshang360.p2peye.com/

xiaojilicai	https://xiaojilicai.p2peye.com/
xiaoniu88	https://xiaoniu88.p2peye.com/
xiaoshushidai	https://xiaoshushidai.p2peye.com/
xiaoying	https://xiaoying.p2peye.com/
xihuanqian	https://xihuanqian.p2peye.com/
xinhedai	https://xinhedai.p2peye.com/
xitouwang	https://xitouwang.p2peye.com/
xmjr	https://xmjr.p2peye.com/
xwsd	https://xwsd.p2peye.com/
xyb100	https://xyb100.p2peye.com/
yangqianguan	https://yangqianguan.p2peye.com/
yaoyuefu	https://yaoyuefu.p2peye.com/
yesvion	https://yesvion.p2peye.com/
yigoudai	https://yigoudai.p2peye.com/
yinchengpai	https://yinchengpai.p2peye.com/
yinxinsirencaihang	https://yinxinsirencaihang.p2peye.com/
yiqiandai	https://yiqiandai.p2peye.com/
yirendai	https://yirendai.p2peye.com/
yooli	https://yooli.p2peye.com/
yumaomoney	https://yumaomoney.p2peye.com/

yyfax	https://yyfax.p2peye.com/
zhenrongbao	https://zhenrongbao.p2peye.com/
zhifu360	https://zhifu360.p2peye.com/
zonefang	https://zonefang.p2peye.com/
zrbao	https://zrbao.p2peye.com/
zyxr	https://zyxr.p2peye.com/

Table 2 Total sample vs final sample

	Total sample			Final sample		
	N	Mean	S.D.	N	Mean	S.D.
1. Platform performance	3165	4.1	.886	1683	3.941	.84
2. Platform size	3147	4.911	12.383	1683	3.594	12.352
3. Platform age	3981	1.618	.177	1683	1.613	.158
4. Relative interest rate	2306	.004	.217	1683	.008	.221
5. Bank deposit	3982	.622	.485	1683	.62	.486
6. IPO	3982	.13	.336	1683	.109	.311
7. VC	3982	.009	.092	1683	.007	.081
8. National association membership	3982	.287	.452	1683	.247	.431
9. %Bad evaluation	3982	.141	.13	1683	.136	.121
10. %Problematic	3982	.347	.051	1683	.348	.05
11. Installed base	3051	3.873	.899	1683	3.717	.83
12. Evaluation ambiguity	3982	.288	.172	1683	.268	.16
13. EPU	3982	4.917	2.205	1683	4.881	2.142

Table 3 Descriptive statistics

	N	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12
1. Platform performance	1683	3.941	.84												
2. Platform size	1683	3.594	12.352	0.456*											
3. Platform age	1683	1.613	.158	0.173*	0.303*										
4. Relative interest rate	1683	.008	.221	-0.145*	-0.075*	-0.024									
5. Bank deposit	1683	.62	.486	-0.052*	0.030	0.257*	-0.162*								
6. IPO	1683	.109	.311	0.042	0.016	-0.025	-0.144*	0.116*							
7. VC	1683	.007	.081	0.090*	0.095*	0.059*	-0.019	-0.058*	0.019						
8. National association membership	1683	.247	.431	0.249*	0.268*	0.276*	-0.224*	0.105*	0.243*	0.073*					
9. %Bad evaluation	1683	.136	.121	0.027	0.048*	0.096*	-0.027	-0.028	-0.135*	-0.034	-0.069*				
10. %Problematic	1683	.348	.05	-0.088*	0.035	0.529*	-0.197*	0.418*	0.036	0.014	0.093*	-0.012			
11. Installed base	1683	3.717	.83	0.723*	0.500*	0.278*	-0.100*	-0.025	0.077*	0.108*	0.287*	-0.043	0.052*		
12. Evaluation ambiguity	1683	.268	.16	0.081*	0.108*	0.085*	-0.052*	-0.011	-0.125*	-0.017	-0.004	0.844*	-0.031	0.054*	
13. EPU	1683	4.881	2.142	-0.138*	0.010	0.357*	-0.132*	0.259*	0.027	0.033	0.078*	0.021	0.803*	0.001	-0.010

Table 4 Regression results

DV: Platform performancet+1	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Platform-fixed effect	Included	Included	Included	Included	Included	Included	Included
Year-fixed effect	Included	Included	Included	Included	Included	Included	Included
Platform size	.004 (.005)	.003 (.004)	.003 (.004)	.002 (.005)	.004 (.004)	.003 (.004)	.003 (.004)
Platform age	.484 (.639)	.335 (.638)	.332 (.628)	.392 (.595)	-.001 (.528)	.027 (.529)	.093 (.496)
Relative interest rate	-.134 (.185)	-.12 (.18)	-.11 (.183)	-.078 (.183)	-.077 (.19)	-.075 (.19)	-.038 (.192)
Bank deposit	.148*** (.053)	.143*** (.052)	.144*** (.051)	.165*** (.051)	.131*** (.05)	.131** (.05)	.152*** (.05)
IPO	.145*** (.042)	.127*** (.041)	.143*** (.042)	.101** (.04)	.121*** (.041)	.047 (.049)	.033 (.048)
VC	.065 (.06)	.06 (.065)	.06 (.063)	.047 (.069)	.074 (.064)	.055 (.066)	.044 (.07)
National association membership	.287** (.134)	.303** (.135)	.309** (.129)	.256** (.128)	.248* (.138)	.207 (.126)	.172 (.116)
%Bad evaluation	.022 (.286)	-.001 (.301)	-.257 (.222)	-.243 (.226)	.065 (.299)	.146 (.292)	-.118 (.231)
%Problematic	-2.554*** (.816)	-2.268*** (.81)	-2.23*** (.82)	-2.455*** (.795)	.558 (1.045)	.348 (1.053)	.056 (1.006)
Installed base		.237*** (.079)	.241*** (.077)	.401*** (.097)	.24*** (.076)	.141* (.08)	.297*** (.101)
Evaluation ambiguity			.228 (.258)	2.079** (.88)			1.898** (.818)
Installed base× Evaluation ambiguity				-.515** (.211)			-.462** (.197)
EPU					-.048*** (.012)	-.12*** (.031)	-.111*** (.033)
Installed base× EPU						.02** (.008)	.018** (.009)
Cons	3.854*** (.794)	3.121*** (.851)	3.068*** (.835)	2.48*** (.811)	2.909*** (.684)	3.304*** (.687)	2.698*** (.681)
Observations	1683	1683	1683	1683	1683	1683	1683
R-squared	.823	.826	.826	.829	.83	.831	.834

Robust standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

Figure 1 Moderation effect of evaluation ambiguity

Figure 2 Moderation effect of EPU

Table 5 Regression result: Market share as DV

DV: Market share+1	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Platform-fixed effect	Included	Included	Included	Included	Included	Included	Included
Year-fixed effect	Included	Included	Included	Included	Included	Included	Included
Platform size	.004 (.005)	.003 (.004)	.003 (.004)	.002 (.005)	.004 (.004)	.003 (.004)	.003 (.004)
Platform age	.484 (.633)	.341 (.632)	.339 (.623)	.399 (.59)	.028 (.532)	.055 (.533)	.121 (.501)
Relative interest rate	-.132 (.183)	-.119 (.178)	-.11 (.181)	-.078 (.181)	-.078 (.187)	-.077 (.187)	-.041 (.19)
Bank deposit	.151*** (.053)	.147*** (.052)	.148*** (.051)	.169*** (.051)	.136*** (.05)	.136*** (.05)	.157*** (.05)
IPO	.141*** (.042)	.124*** (.04)	.138*** (.041)	.095** (.039)	.118*** (.041)	.048 (.048)	.032 (.047)
VC	.074 (.06)	.07 (.066)	.069 (.063)	.057 (.07)	.083 (.064)	.065 (.066)	.054 (.071)
National association membership	.289** (.129)	.305** (.13)	.31** (.125)	.257** (.124)	.253* (.133)	.214* (.122)	.178 (.112)
%Bad evaluation	.046 (.286)	.024 (.301)	-.202 (.223)	-.188 (.228)	.086 (.3)	.163 (.292)	-.072 (.233)
%Problematic	.073 (.813)	.346 (.806)	.38 (.816)	.154 (.791)	2.985*** (1.045)	2.785*** (1.054)	2.487** (1.006)
Installed base		.227*** (.079)	.231*** (.077)	.392*** (.096)	.23*** (.076)	.136* (.079)	.295*** (.102)
Evaluation ambiguity			.202 (.259)	2.069** (.878)			1.9** (.821)
Installed base× Evaluation ambiguity				-.52** (.211)			-.47** (.197)
EPU					-.044*** (.012)	-.113*** (.031)	-.104*** (.033)
Installed base× EPU						.019** (.008)	.017** (.009)
Cons	-4.237*** (.787)	-4.94*** (.842)	-4.987*** (.828)	-5.579*** (.805)	-5.137*** (.685)	-4.762*** (.688)	-5.373*** (.685)
Observations	1683	1683	1683	1683	1683	1683	1683
R-squared	.829	.832	.832	.835	.835	.836	.839

Robust standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

Table 6 Regression result: percentage of indifferent-neutral evaluations as the alternative measurement of evaluation ambiguity

DV: Platform performancet+1	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Platform-fixed effect	Included	Included	Included	Included	Included	Included	Included
Year-fixed effect	Included	Included	Included	Included	Included	Included	Included
Platform size	.004 (.005)	.003 (.004)	.003 (.004)	.002 (.005)	.004 (.004)	.003 (.004)	.003 (.004)
Platform age	.484 (.639)	.335 (.638)	.333 (.643)	.363 (.62)	-.001 (.528)	.027 (.529)	.067 (.52)
Relative interest rate	-.134 (.185)	-.12 (.18)	-.122 (.18)	-.092 (.183)	-.077 (.19)	-.075 (.19)	-.052 (.192)
Bank deposit	.148*** (.053)	.143*** (.052)	.142*** (.052)	.159*** (.051)	.131*** (.05)	.131** (.05)	.146*** (.05)
IPO	.145*** (.042)	.127*** (.041)	.125*** (.04)	.136*** (.041)	.121*** (.041)	.047 (.049)	.057 (.046)
VC	.065 (.06)	.06 (.065)	.06 (.065)	.041 (.067)	.074 (.064)	.055 (.066)	.038 (.068)
National association membership	.287** (.134)	.303** (.135)	.299** (.135)	.28** (.135)	.248* (.138)	.207 (.126)	.19 (.124)
%Bad evaluation	.022 (.286)	-.001 (.301)	-.553 (.794)	-.158 (.789)	.065 (.299)	.146 (.292)	.012 (.779)
%Problematic	-2.554*** (.816)	-2.268*** (.81)	-2.279*** (.816)	-2.418*** (.799)	.558 (1.045)	.348 (1.053)	.092 (1.029)
Installed base		.237*** (.079)	.236*** (.079)	.326*** (.093)	.24*** (.076)	.141* (.08)	.222** (.093)
Evaluation ambiguity			.604 (.935)	2.287 (1.513)			2.024 (1.408)
Installed base× Evaluation ambiguity				-.6* (.343)			-.534* (.305)
EPU					-.048*** (.012)	-.12*** (.031)	-.117*** (.031)
Installed base× EPU						.02** (.008)	.02** (.008)
Cons	3.854*** (.794)	3.121*** (.851)	3.131*** (.858)	2.804*** (.838)	2.909*** (.684)	3.304*** (.687)	3.024*** (.693)
Observations	1683	1683	1683	1683	1683	1683	1683
R-squared	.823	.826	.826	.828	.83	.831	.832

Robust standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

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Internationalization of digital platforms: role of communication channels

ABSTRACT

The rapid growth of digital platforms has brought changes to firms' internationalization process. Drawing on the diffusion of innovation theory, this study posits that the development of social media in the host countries contributes to emerging market platforms' international penetration. I focus on the cultural distance between the home and host country of the platform and the existing users' evaluation of the platform to assess the boundary conditions of the relationship between the host country's social media penetration rate and the platform's penetration performance in the host country. I empirically test the hypothesis utilizing the archival data of Chinese listed platforms from 2013 to 2019. The results confirm that social media penetration rate positively influences a platform's penetration in the host country. Such influence is weakened by the cultural distance between the home and the host country of the platform and strengthened by the positivity of the host country's existing users' evaluation of the platform. This study contributes to the existing understanding of the internationalization of digital platforms and the diffusion of innovation.

Keywords:

Platforms; International penetration; cultural distance; user evaluation; diffusion of innovation

1. INTRODUCTION

The modern environment is transformed by the emergence of digital platforms (hereinafter referred to as “platforms”) (Alcácer, Cantwell, & Piscitello, 2016; Chen, Shaheer, Yi, & Li, 2019; Nambisan, Zahra, & Luo, 2019). Platforms are conceptualized as technological architectures that facilitate transactions between different parties and the success of platforms is subject to the presence of network effects. Network effects emerge when the potential users' adoption choice of a platform and the innovation incentive of third-party developers

(hereinafter referred to as “complementors”) are influenced by the installed user base of the platform. In this way, platforms can benefit from the positive feedback loop generated by the emergence of network effects, that is, the more users a platform has, the more potential users and complementors it can attract, and the more likely it can dominate the market (Brouthers, Geisser, & Rothlauf, 2016).

The emergence and development of platforms have brought about great changes to the existing studies on the internationalization of firms. First, compared with traditional multinational enterprises (MNEs), platforms encounter lower transaction costs in asset transfer and management when expanding abroad as their internationalization mainly focuses on the intangible flows of data and information. Second, platforms have unique interactive systems such as online feedback systems, instant communication systems, and rating systems that help to facilitate platform-user and inter-user communication. Such systems help the users to gain more platform-related knowledge and reduce the host country potential users’ perceived uncertainty of adopting the platform information asymmetry. Third, the success of platforms lies in the emergence of network effects and the network effects occur when the platforms build their user base to a critical mass. Therefore, platforms’ internationalization strategies are more user-driven. (Brouthers et al., 2016).

Growing attention has been paid to the rise of platforms in the International Business (IB) literature. Existing IB studies have investigated both contextual and platform-specific factors that influence the success of platforms’ international penetration. For instance, Kumar, Nim, and Agarwal (2020a) find that host countries with a high level of individualism and uncertainty avoidance may have a lower level of mobile payments adoption rate. Chen et al. (2019) has investigated how two types of platform-specific advantages, i.e. global installed user base and user-defined platform quality, influence the international penetration of health

and fitness mobile apps.

Diffusion of innovation theory (DOI) focuses on the process through which innovation can reach the potential users in a social system, make the potential users gain the basic understanding of the innovation, form an attitude towards the innovation, and make the decision to adopt or reject the innovation (Rogers, 2003). In this way, DOI can help us identify the factors that influence the adoption choice of potential users in the host countries and therefore better understand the internationalization processes of platforms (Brouthers et al., 2016). However, existing studies on the platforms' internationalization have rarely used DOI to explain the process of platforms' international penetration.

To investigate how communication channels in the host countries contribute to the platforms' penetration in the host countries, this study is guided by the following research question: Whether and how do the host country's communication channels influence the emerging market platform's penetration performance in the host country? I argue that social media penetration in a host country can contribute to the penetration performance of emerging market platforms in the host country. The positive relationship between social media penetration and the success of the platform's penetration in the host country is contingent on the compatibility and the existing users' evaluation of the platform. The empirical study of Chinese public platforms' international penetration between 2013 and 2018 supports most of my predictions. The results confirm that the social media penetration in the host country positively and significantly contributes to the success of a platform's penetration in the host country. The positive relationship between social media penetration rate and the platform's international penetration success is significantly weakened by the cultural distance between the home and host country of the platform and significantly strengthened by the host country's existing users' rating of the platform. However, the home country's existing users' rating of the

platform does not have a significant impact on the relationship between social media penetration rate and the success of the platform's international penetration.

This study contributes to the existing platform studies. First, while existing literature on platforms mostly focuses on the platforms from developed regions, I investigate the international expansion of emerging market platforms. Compared with developed market firms, emerging market firms are facing great barriers to building a positive reputation among the potential users in the host countries due to the less developed institutional environment of their home countries (Cuervo-Cazurra & Genc, 2008). However, recent years have witnessed the rapid international expansion of emerging market platforms (Evans & Gawer, 2016). Therefore, it is necessary to investigate the factors that may influence the success of the emerging market platforms' international expansion to provide a deeper understanding of the platforms' internationalization. Second, while recent platform studies have theoretically highlighted the important role of communication channels in the platform's internationalization processes (Brouthers et al., 2016), few existing studies have empirically tested the impact of communication channels on the success of the international expansion of platforms. Therefore, I build on the diffusion of innovation theory and empirically investigate how the digital communication channels in the host countries influence platforms' penetration in the host countries. Third, while existing studies on the platforms' internationalization have investigated the impact of existing users' evaluation on the success of platforms' international penetration (Chen et al., 2019), little has been known on how evaluation of different groups of users influence the platforms' internationalization differently. I take into consideration the impact of user heterogeneity and investigate how existing users from the home and host country of a platform may influence the platforms' penetration in the host country differently.

This paper proceeds as follows. In the next section, I provide a comprehensive literature

review on platform internationalization. I then build the theoretical arguments and propose the hypotheses. Following the theoretical arguments and hypotheses, I describe my research setting, measurement, and analytic strategies in the methodology section, and the results section presents the results of the empirical analysis. In the end, I present this study's contribution, managerial implications, limitations, and directions for future research in the discussion section.

2. LITERATURE REVIEW

Existing IB studies on the internationalization of MNEs have mainly investigated the MNEs' internationalization strategies, internationalization performance, and the factors that influence the international expansion strategies and the associated performance.

Regarding the MNEs' internationalization strategies, following the internationalization processes, extant literature has investigated the firms' internationalization decisions, expansion patterns, and adaption strategies. Internationalization decisions are associated with the location choices (Buckley, Chen, Clegg, & Voss, 2018; Cordero & Miller, 2019; Li, Meyer, Zhang, & Ding, 2018; Li & Bathelt, 2018) and the type of activities such as the formation of cross-border R&D alliance (Joshi & Lahiri, 2015), Initial Public Offering (Humphery-Jenner & Suchard, 2013), foreign divestment (Iurkov & Benito, 2018), foreign investment (Li & Bathelt, 2018; Nguyen, Kim, & Papanastassiou, 2018; Shi, Sun, Yan, & Zhu, 2017), R&D internationalization (Papanastassiou, Pearce, & Zanfei, 2020), and cross-border M&A (Santangelo & Stucchi, 2018). Patterns of international expansions are related to the speed and scope during the process of internationalization (Hutzschenreuter & Harhoff, 2020; Kim, Wu, Schuler, & Hoskisson, 2019; Kumar, Singh, Purkayastha, Popli, & Gaur, 2020b; Maitland & Sammartino, 2015; Monaghan & Tippmann, 2018). Adaptation strategies are the strategies adopted by MNEs to adapt to the host countries' environment and overcome the liability of foreignness to better penetrate the host countries. Scholars have investigated both the MNEs'

social adaption strategies, such as CSR reporting (Marano, Tashman, & Kostova, 2017; Zhao, Park, & Zhou, 2014) and CSR decoupling (Tashman, Marano, & Kostova, 2019) and their economic adaption strategies, such as local responsiveness (Zhao et al., 2014), resource commitment (Malhotra & Hinings, 2010; Surdu, Mellahi, & Glaister, 2019), subsidiary autonomy (Wang, Luo, Lu, Sun, & Maksimov, 2014).

In terms of internationalization performance, extant studies have investigated the MNEs' financial performance (Kim et al., 2019; Sharma, Kumar, Yan, Borah, & Adhikary, 2019), marketing performance (Magnusson, Westjohn, & Sirianni, 2019; Mandler, Bartsch, & Han, 2020; Zhou, Barnes, & Lu, 2010), innovation performance (Xie & Li, 2018) and survivability of foreign subsidiaries (Gaur, Pattnaik, Singh, & Lee, 2019; Sui & Baum, 2014; Zhong, Lin, Gao, & Yang, 2019).

Existing studies have investigated various factors that condition the efficiency of internationalization strategies. These factors can be categorized into three types: external environmental factors, firm characteristics, and network/relationship-related factors. Extant IB literature has mainly investigated the impact of both formal and informal institutional environments on the MNEs' international penetration. The factors related to the formal institutional environment can be institutional development (Banalieva, Cuervo-Cazurra, & Sarathy, 2018; Dau, 2013; Eddleston, Sarathy, & Banalieva, 2019; Surdu et al., 2019), and institutional voids (Marano et al., 2017; Shi et al., 2017; Zhong et al., 2019). Apart from these formal institutional environment-related factors, various factors associated with the informal institutional environment in the home and host countries have been studied, such as trust (Gregorič, Rabbiosi, & Santangelo, 2020), use of superstition (Andrews, Nimanandh, Htun, & Santidhirakul, 2020), and public sentiment (Yiu, Wan, Chen, & Tian, 2021). Considering the firm characteristics that influence MNEs' internationalization, extant studies have studied the

influence of firm experience (Buckley et al., 2018; Kumar, Borah, Sharma, & Akella, 2021), top management teams (Chandra, 2017; Maitland & Sammartino, 2015), organization types (Malhotra & Hinings, 2010), geographical dispersion (Santangelo & Stucchi, 2018), and firm resources (Sui & Baum, 2014). In terms of network-associated factors, IB scholars have studied the impact of inter-firm, inter-country and firm-country relationships on MNEs' internationalization strategies and performance. Studies on the impact of inter-firm relationships have investigated the issues associated with the network of MNEs' value chain (Kano, Tsang, & Yeung, 2020), such as network structure (Sharma et al., 2019) and network governance (Zhang, Zhong, & Makino, 2015). Regarding the impact of the inter-country relationship, extant literature has studied the impact of geographic distance (Choi & Contractor, 2016; Hutzschenreuter & Harhoff, 2020), cultural distance (Beugelsdijk, Kostova, Kunst, Spadafora, & van Essen, 2018; Choi & Contractor, 2016), institutional distance (Choi & Contractor, 2016; Deng & Sinkovics, 2018), economic distance (Tsang & Yip, 2007) and diplomatic relations (Li et al., 2018) between the home and host country of MNEs. The studies on the impact of firm-country relationships mainly focus on the relationship between institutional embeddedness of MNEs in their home and host countries and their internationalization strategies and performance (Kumar et al., 2020b; Sun, Mellahi, & Thun, 2010; Zhang, 2020).

Compared with traditional MNEs, platforms are unique in the following aspects. First, their internet-based technical structure facilitates the efficient platform-user and inter-user information exchange, which reduces the level of information asymmetry between the platforms and their users (Brouthers et al., 2016; Chen et al., 2019; Coviello, Kano, & Liesch, 2017; Katsikeas, Leonidou, & Zeriti, 2019; Parente, Geleilate, & Rong, 2018; Zeng, Khan, & De Silva, 2019). For instance, the open rating system of a platform enables potential users to gain evaluation information about the platform from the platform's existing users, increase

their basic understanding of the platform, reduce their uncertainty about the platform, and make their decision on whether or not to adopt the platform (Parente et al., 2018). Second, a platform can be viewed as a collection of common technological elements that interact with each other through a set of simple interconnectivity rules (Gawer, 2014; McGrath, 1995). The commonality of these elements and the simple interconnectivity rules makes it easy for designers to modify the features of the platform, which enables the platform to continuously innovate to adapt to environmental changes and customer needs (Gawer, 2014; Katsikeas et al., 2019). Third, platforms rely on network effects to survive and succeed in the markets (Brouthers et al., 2016; Chen et al., 2019; McIntyre & Srinivasan, 2017; Parente et al., 2018; Zeng et al., 2019). Network effects emerge when the value of a good or service to a potential user depends on the number of other users of the good or service (Shapiro, Carl, & Varian, 1998). In the case of platforms, the existing user base of a platform may influence the value of the platform to potential users and complementors, and thus the platform with a larger user base will be more attractive to potential users and complementors (McIntyre & Srinivasan, 2017; Nambisan et al., 2019; Thies, Wessel, & Benlian, 2018). Therefore, existing platform studies predict a "winner-take-all" (WTA) outcome that the market will be ultimately dominated by the platform with the largest installed base (McIntyre & Srinivasan, 2017). Since the emergence of network effects depends on the growth of the user base of platforms, platforms need to focus on strategies to attract potential users and build the user base.

The emergence of platforms has brought changes to the firms' strategies when expanding abroad. First, since the assets owned by the platforms are mainly intangible data and information and such intangible assets are less constrained by national boundaries, platforms will face lower transaction costs when transferring assets across borders (Banalieva & Dhanaraj, 2019b; Nambisan et al., 2019). Second, the unique internet-based technical structure of a platform helps to reduce the communication costs between the platform and its users

through instant communication systems and user evaluation systems. Therefore, the efficiency and management of such interactive systems may significantly influence the platforms' internationalization performance. Third, the reliance of platforms on network effects makes the platforms more likely to adopt strategies focusing on the gaining of market shares and the building of the user base when expanding abroad (Parente et al., 2018). Therefore, the internationalization strategies of platforms are more user driven.

The changes brought by the rise of platforms have received growing attention in the IB field. IB scholars have studied two kinds of factors associated with the internationalization of platforms: contextual factors and platform-specific advantages. The contextual factors can be technical, institutional, and cultural factors in the host countries that influence the penetration of platforms in the host countries, such as technological and strategic bottlenecks in the markets (Ojala, Evers, & Rialp, 2018), regulatory support (Garud, Kumaraswamy, Roberts, & Xu, 2020), and cultural values and beliefs (Burtch, Ghose, & Wattal, 2014; Kumar et al., 2020a; Yamin & Sinkovics, 2006). In terms of platform-specific advantages, IB scholars have studied the impact of different types of platform-specific advantages on the success of platforms' internationalization and the transferability of platform-specific advantages across national borders. They have identified two types of platform-specific advantages, network advantages, and product advantages. Network advantages are the advantages associated with the characteristics of the user-network of the platforms, such as network size and network diversity, which help platforms to penetrate the host country through establishing links between their existing users and the potential users in the host country (Brouthers et al., 2016; Chen et al., 2019; Li, Chen, Yi, Mao, & Liao, 2019). Product advantages are the advantages associated with the product and services provided by the platform, such as product quality and variety, which help platforms to penetrate the host country by influencing the potential users' perceived product value of the platform (Chen et al., 2019). Regarding the transferability of platform-

specific advantages in the platforms' internationalization process, extant studies have investigated how platform design and platform type influence the costs and difficulties associated with the transferring of the platform-specific advantages across borders (Banalieva & Dhanaraj, 2019a; Li et al., 2019; Stallkamp & Schotter, 2019).

Although growing attention has been paid to the emergence of platforms in the IB literature, several areas remain under-explored. First, although existing literature has theoretically investigated the internationalization progress of platforms and highlighted the changes brought by the emergence of platforms (Alcácer, Cantwell, & Piscitello, 2016; Nambisan et al., 2019), only a limited number of studies have empirically investigated the factors that influence the international penetration of platforms. Second, although existing literature has suggested that the platforms' internationalization are more user-driven and highlighted the importance of communication channels in influencing the potential users' adoption choice in the host countries (Brouthers et al., 2016), few studies have investigated the impact of communication channels on the international penetration of platforms and therefore little is known on whether and how communication channels contribute to the platforms' internationalization. Third, while IB scholars have investigated the impact of existing users' evaluations on platforms' international penetration (Chen et al., 2019), these studies mainly assume that the evaluation from any existing users has the same impact on the platform's penetration performance and few studies consider the impact of user heterogeneity.

3. THEORY AND HYPOTHESIS

3.1 Social media penetration rate and the platform's penetration in the host country

As I have mentioned before, a platform's internationalization is more user-driven, and therefore it is important to figure out how to become embedded in the host country's user network and build a critical mass of users (Brouthers et al., 2016). Diffusion of innovation theory (DOI) focuses on the mechanisms by which firms can convince potential users to adopt their products

and therefore can help us to better understand the platform's internationalization by identifying the factors that influence the platform's internationalization performance (Brouthers et al., 2016; Li et al., 2019; Rogers, 2003).

According to DOI, diffusion of an innovation is "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003). Therefore, the innovation diffusion process is composed of four main elements: the innovation, the communication channels, the time, and the social system (Rogers, 2003), where the communication channels play a central role in linking the innovation to the social system and enabling the innovation to reach potential users in the social system.

According to Rogers (2003), the communication channels can be categorized into two types, mass media channels, and interpersonal channels. Mass media channels are the means that help to transmit messages via a mass medium such as TV, newspaper, and radio (Bhattacharjee, 2000; Lina Wu, 2015; Rogers, 2003), while interpersonal channels help to persuade a potential user to adopt an innovation through the social influence of important others such as the user's relatives, friends, colleagues, and superiors (Lina Wu, 2015; López - Nicolás, Molina -Castillo, & Bouwman, 2008; Premkumar, Ramamurthy, & Liu, 2008; Venkatesh, Morris, Davis, & Davis, 2003). Studies on the mass media channels mainly focus on the relationship between the content (e.g., reports and advertisements) and the availability of mass media, and the diffusion of new products (Peres, Muller, & Mahajan, 2010; Tellefsen & Takada, 1999). On the other hand, studies on the interpersonal channels have investigated the impact of individual differences of potential users such as age (Venkatesh et al., 2003; Yu, 2012), gender (Venkatesh et al., 2003), and experience (Arora, Malik, & Chawla, 2020; Venkatesh et al., 2003), network structure such as network position and tie strength (Katona, Zubcsek, & Sarvary, 2011), and the type of interpersonal networks (Premkumar et al., 2008; White, Daniel, Ward, & Wilson, 2007) on the interpersonal channels' effectiveness in innovation diffusion.

Consumers' increasing exposure to the social media communication channels such as Youtube, Facebook, Twitter, WhatsApp, and Instagram have attracted growing attention from scholars (Borah, Banerjee, Lin, Jain, & Eisingerich, 2020; Lamberton & Stephen, 2016; Olaniran, 2018; Tellis, MacInnis, Tirunillai, & Zhang, 2019). Social media is the internet-based platform that facilitates both the firm-customer and inter-customer communications (Ma, Lee, & Goh, 2014; Zhang, Chintagunta, & Kalwani, 2020). Compared with traditional communication channels, social media communication channels are unique as they are combinations of mass media channels and interpersonal channels. On the one hand, social media platforms help firms to disseminate information about the firm's products and services and thus increase the awareness of the firms' brand awareness (Olaniran, 2018; Tellis et al., 2019; Zhang et al., 2020). On the other hand, social media platforms enable users to share content, evaluate products and interact with each other (Ma et al., 2014; Tellis et al., 2019). Therefore, such dual role of social media makes social media play an increasingly important role in the diffusion process of innovation within a certain market (Naylor, Lamberton, & West, 2012; Stephen, 2016).

The influence of social media on the diffusion of innovation in a certain market depends on the accessibility of social media in this market (Olaniran, 2018). Therefore, the penetration of social media in a country influences potential users' access to social media, the scope of innovation diffusion, and the success of a platform's penetration in the country.

When social media is highly penetrated in a host country, the focal platform can spread its product information via social media and reach a larger scope of potential users in the host country. As the growth of user base is the key to the emergence of network effects and the success of a platform's penetration in a new foreign market is subject to the emergence of network effects, a higher level of social media penetration rate in a host country will contribute to the success of the platform's penetration in the host country.

Therefore, I hypothesize that:

H1: Social media penetration rate in a host country is positively related to the platform's penetration performance in the host country.

3.2 Moderating the relationship between social media penetration rate and the platform's penetration in the host country

While I have argued that the social media communication channels in the host country act as both the mass media communication channels and the interpersonal communication channels that can help to diffuse the information about the focal platform and enable communication between existing users and potential users in the host country, the degree to which the communication channels can contribute to platform's performance depends on 1) the efficiency of the social media as the mass media communication channel to communicate the platform's information to potential users in the social system and 2) the positivity of information communicated by the social media as the interpersonal communication channel from the platform's existing users to the potential users in the social system. Therefore, I focus on two factors, the platform's compatibility with the social system and the positivity of the existing users' evaluation, to investigate how the relationship between the social media penetration rate and the platform's penetration in the host country may be influenced.

3.2.1 Moderation effect of cultural distance on the relationship between social media penetration rate and the platform's penetration in the host country

While I have argued that social media may help a platform to penetrate the host country by acting as the mass media communication channel that helps the platform to transmit awareness information to potential users in the host country, the influence of social media on the penetration of the platform in the host country depends on the platform's capability to leverage the social media and effectively communicate product messages to the potential users (Olaniran, 2018). A nation's culture refers to the patterns of values and beliefs shared by the individuals in the nation (Hofstede, Neuijen, Ohayv, & Sanders, 1990; Pothukuchi, Damanpour, Choi, Chen, & Park, 2002) and defines a range of behavior patterns that are perceived to be tolerable in the social system. Existing studies suggest that a nation's culture

plays an important role in influencing how people interpret information from social media (Olaniran, 2018; Pentina, Zhang, & Basmanova, 2013; Ya-Wen Teng, 2007). For instance, Ya-Wen Teng (2007) has shown that US participants were more open to online communication, while Taiwanese participants were more conservative in posting messages online. Pentina et al. (2013) investigated the process of trust transfer in social media using a sample of Twitter members from the US where the culture favors direct and explicit communication and Ukraine where the culture makes communication more indirect and implicit. They found that, compared with Twitter users from the US, Twitter users from Ukrainian are more likely to transfer their trust on Twitter to the brand hosted by Twitter. Since cultural differences may lead to differences in the ways people use social media and attribute meanings to the messages broadcasted by the social media (Pentina et al., 2013), cultural differences may influence the platform's capability to effectively use the social media and transmit clear messages about its product and services to potential users in the host country. When there are larger cultural differences between the home and the host country of a platform, the platform may face difficulties to communicate information to the potential users in the host country because of different value systems and thus fail to efficiently use the social media to attract potential users. Therefore, even when the social media is highly penetrated in the host country, the focal platform may fail to build a user base and successfully penetrate the host country due to the lower communication efficiency caused by the cultural distance between its home and host country. Based on the above arguments, I hypothesize that:

H2: Cultural distance between the home and the host country of the focal platform will negatively moderate the relationship between the social media penetration rate and the platform's penetration in the host country.

3.2.2 Moderating effect of user evaluation on the relationship between social media penetration rate and

platform performance

According to the DOI, users' decision of adoption of innovation will go through three steps: knowledge, persuasion, and decision (Rogers, 2003). The knowledge step occurs when a user is reached by innovation and acquires some basic understanding of the innovation. After that, the persuasion step occurs when the user forms an attitude (i.e., favorable or unfavorable) towards the innovation. Finally, the decision step occurs when the user decides to adopt or reject the innovation (Rogers, 2003). While the communication channels play an important role in the knowledge step by providing the basic understanding of the innovation, potential users' decision on whether to adopt the innovation depends on the potential users' attitude towards the innovation, and such attitude is formed in the step of persuasion. When processing to the stage of persuasion, potential users seek to get the evaluation information about the advantages and disadvantages of the innovation to form the attitude towards the innovation and make the adoption decision (Rogers, 2003). When the potential users gain positive evaluation information about the innovation, they are more likely to form a favorable attitude towards the innovation and make the adoption decision. Potential users gain evaluation information by interacting with other individuals that have already adopted the innovation as these individuals have more information and knowledge about the innovation.

While I have argued that social media also act as the interpersonal communication channel that enables the information exchange between the existing users and potential users in the host country and therefore help the focal platform build a user base and penetrate the host country, the underlying assumption is that potential users will choose to adopt the platform when they gain information from the existing users of the platform. However, the adoption decision of potential users is conditioned by the positivity of the information potential users gained from the existing users of the focal platform. When existing users provide positive evaluation information of the platform, potential users will be more likely to form a favorable

attitude towards the platform and adopt the platform.

Potential users mainly gain the evaluation information from two groups of existing users, existing users from the home country of the platform and existing users from the host country of the platform. The evaluation information from these two groups of existing users influences the potential users' adoption decision in different ways. According to the DOI, the adoption decision of potential users may be influenced by the individuals who own the knowledge and information valued by the potential users or the individuals similar with the potential users (Rogers, 2003).

The evaluation information provided by the existing users from the home country of the platform influences the potential users' adoption decision through their knowledge of the platform. It is suggested by existing literature that the competency of digital innovations lies in the various intellectual and cultural elements that tailor to the need of users, and platforms have a better understanding of users in their home country as they are rooted in their home country (Boudreau, 2012; Shaheer & Li, 2020). Therefore, platforms can better instruct the home country users to use the platform, making home country users have a better understanding of the platform's functionality. In this way, the existing users from the home country of the platform are more expertise in using the platform. Therefore, potential users may perceive the evaluation information provided by the existing users from the home country of the platform as valuable and the positivity of such evaluation information may influence the potential users' attitude towards the platform. Positive evaluation information provided by the home country's existing users may positively influence the potential users' attitude towards the platform and motivate the potential users to adopt the platform, whereas negative evaluation information may motivate the potential users to reject the platform.

The evaluation information provided by the platform's existing users from the host country

influences the potential users' adoption decision through their similarity with the potential users. Specifically, existing users from the host country have similar values and beliefs with the potential users in the home country, therefore, potential users may perceive that the existing users have similar needs and judgment criteria. Therefore, the positive evaluation information from existing users from the host country may positively influence the potential users' attitude towards the platform and motivate the potential users to adopt the platform, whereas negative evaluation information may motivate the potential users to reject the platform.

Thus, I argue that:

H3a: Existing home country users' rating of the platform will positively moderate the relationship between social media penetration rate in the host country and the platform's penetration in the host country.

H3b: Existing host country users' rating of the platform will positively moderate the relationship between social media penetration rate in the host country and the platform's penetration in the host country.

4. METHODS

4.1 Research setting

I tested the hypotheses in an empirical study of Chinese public platform firms listed in the US, Hong Kong, and mainland China and have internationalization activities from 2013 to 2019. I choose Chinese public platform firms for two reasons. First, according to the global platform survey (Evans & Gawer, 2016), 4 out of 25 top-ranking publicly traded platforms come from China, which shows the important position of Chinese platforms in the world. Second, public platform firms must disclose their financial information and international activities, which helps us to gain data to empirically investigate the relationships I have hypothesized. Since I

want to investigate the impact of the host country's social media penetration on the emerging market platform's penetration in the host country and such social media are mainly social media platforms, I only include non-social media Chinese platforms running the business in information service, finance, e-commerce, entertainment, travel, game and education in the sample to avoid the impact of the competition between the social media in the host country and the focal Chinese platform on the focal platform's penetration in the host country. The countries or regions penetrated by the sample platforms are Australia, Brazil, Canada, Czech Republic, Denmark, Egypt, Finland, France, Germany, Hong Kong China, India, Indonesia, Israel, Italy, Japan, South Korea, Malaysia, Mexico, Netherlands, New Zealand, Philippines, Poland, Russia, Singapore, Spain, Switzerland, Chinese Taipei, Thailand, Turkey, United Kingdom, and the United States.

4.2 Data and sample

My study period is from 2013 to 2019 and I have included all the listed non-social media platforms that have international activities including cross-border strategic alliances, cross-border strategic investments, cross-border acquisition, and establishment of international websites and foreign subsidiaries in countries or regions outside mainland China. I have tracked historical alliances and strategic investments back to the year 2010 to ensure all the active alliances and strategic investments were covered in the alliance portfolios from 2013 to 2019. As most of the alliances and strategic investments do not have an exact termination date, I followed the conventional assumption in previous alliance literature and adopted this 3-year window. The records of alliances were collected from the SDC platinum, the records of M&A and strategic investments were collected from the Crunchbase and the SDC platinum, the records of international websites and foreign subsidiaries were collected from the annual report of the sample platform firms. The data of firm size, R&D expenditure, slack, and percentage of dependent entries are got from the annual reports of the sample platform firms. The data of host

countries' institutional environment, digitalization, and competition are got from the global competitive report provided by the World Economic Forum (Schwab & Sala-i-Martin, 2013; Schwab & Sala-i-Martin, 2014; Schwab & Sala-i-Martin, 2015; Schwab & Sala-i-Martin, 2016; Schwab & Sala-i-Martin, 2017; Schwab, 2018) and the network readiness report provided by Portulans Institute (Dutta, Lanvin, Rossini, & Bratt, 2019). The platform penetration data is got from <https://www.qimai.cn/>. The data of social media accounts and internet accounts are got from the digital reports provided by the data reportal (<https://datareportal.com/library>). The population data is got from the (<https://www.worldometers.info/>), the website providing world real-time statistics. The cultural distance data is got from the world value survey, the website provided by Muthukrishna et al (2020) (<http://culturaldistance.muth.io/>), and the globe project (<https://globeproject.com/>).

A total sample of 25 platforms and 369 platform-year-host country observations were obtained. After dropping the missing values, a final unbalanced sample of 20 platforms and 259 platform-year-host country observations were obtained. Table 1 lists the name and type of business operated by the platform firm. Table 2 presents the descriptive statistics of the total sample and the final sample. There are only small differences in the mean and standard deviation between the total sample and the final sample, suggesting that the final sample does not introduce selection biases from observations that are dropped due to missing data.

Insert Table 1 about here

Insert Table 2 about here

4.3 Measures

Dependent variable. The platform's penetration in the host country. I first got the ranking of the focal platform's app in the host country in year $t+1$. For the platforms with multiple apps, I identified the platform's dominant app that is mentioned in the platform's annual report as the core business of the platform. The penetration of the focal platform in the host country is then measured as the log-transformed reciprocal of the ranking of the platform's dominant app.

Independent variables.

Social media penetration rate. I calculated the social media penetration rate in the host country as the number of social media accounts divided by the population in the host country.

Cultural distance. I got the cultural distance score from (<http://culturaldistance.muth.io/>), a website provided by (Muthukrishna et al., 2020), which measures the cultural distance between countries (regions) by applying fixation index (FST) to the World Values Survey of cultural beliefs and behaviors. The cultural distance between the platform's home and host country is then calculated as the cultural distance score between China and the host country entered by the focal platform.

Home country existing users' rating of the platform. I measured the existing home country users' rating of the platform as the average evaluation score of the platform's dominant app on the Apple store in the platform's home country.

Host country existing users' rating of the platform. I measured the existing host country

users' rating of the platform as the average evaluation score of the platform's dominant app on the Apple store in the platform's host country.

Control variables. I have controlled platform-level factors and host country-related factors that may influence the platform's penetration in the host country.

Platform age. I included platform age as a control variable to control firm experience, which may influence the capability and efficiency of a firm to go abroad. Platform age was measured as the log-transformed number of years since the founding of the focal platform.

Platform size. I included platform size as a control variable since the size of the platform size may influence the internationalization performance of a platform by influencing the resource base of the firm. Platform size was measured as the log-transformed total number of employees of the focal platform firm.

Platform R&D expenses. As technology is important for the platforms, I included the R&D expenses of the focal platform as a control variable to control the focal platform's innovation capability. Platform R&D expenses are measured as the log-transformed R&D expenditure of the focal platform.

Platform slack. I controlled for the platform's slack resources as slack resources may influence the focal platform firm's available resources and capability to manage the activities abroad. Platform slack is measured as the log-transformed ratio of cash to long-term debt.

The existing user base of the platform in the home country. I controlled for the existing user base of the platform in the home country as the existing user base of the platform may influence the host country-potential users' adoption choice through sending a positive signal to potential users in the host countries about the future dominance of a platform. The existing user base of the focal platform firm is measured as the number of evaluations of the focal platform firm's app on the Apple store in the platform's home country in a given time t . For platform firms with multiple apps, I used the number of evaluations of the dominant app of the platform

firms. This measurement is suitable as I have argued that the adoption choice of potential users in the host countries is influenced by the information given by the existing users of the focal platform firm and the number of evaluations can represent the existing user base that acts as the source of information.

The total number of social-media apps owned by the focal platform firm. Since I use a sample of non-media platform firm to investigate how the social media penetration rate in the host country may influence the focal platform firm's penetration performance in the host country and measure the focal platform firm's penetration performance as the ranking of the platform firm's focal app, the focal platform firm may own multiple apps and may also own social media apps. To avoid the possible noises brought by this situation, I have controlled the number of the focal platform's social media apps in the Apple store.

Percentage of dependent entries. Since the focal platform may choose different forms of entries when expanding abroad and different forms of entries may bring about different costs, I divide the entries of the platform firms into two types, dependent entries, and independent entries. Dependent entries are the entries into the host countries by the focal platform firm with the help of incumbents in the host countries (Stallkamp & Schotter, 2019). In contrast, independent entries are the entries into the host countries by the focal platform firm independently (Stallkamp & Schotter, 2019). In this study, alliances, strategic investments, and mergers and acquisitions are categorized as dependent entries, while the establishment of international websites and foreign subsidiaries are categorized as independent entries. The percentage of dependent entries is calculated as the number of dependent entries divided by the number of total entries.

Host country's market competition. I controlled the market competition in the host countries of the focal platform, which may influence the difficulty of the focal firm to expand into the markets and build the user base. I measured the host country's market competition as

the log-transformed score of the intensity of local competition of the host country. The score of the intensity of local competition is got from the survey done by the world economic forum and the survey question for this score is “In your country, how intense is competition in the local markets? [1= not intense at all; 7 = extremely intense]”.

Digitalization distance between the host and the home country. I controlled the digitalization distance between the host and the home country of the focal platform firm since potential users’ perception of the platform is influenced by their perceptions of the platform’s home country’s strengths in digitalization due to the country-of-origin effect (Bilkey & Nes, 1982; Roth & Romeo, 1992; Zhang, 1996), and such perception may influence the potential users’ adoption of the platform and the platform’s penetration in the host country. I first got the value of digitalization level of the host and the home country of the focal platform from the global competitiveness reports from 2013 to 2017 and the value is the overall scores of the survey questions associated with the availability of latest technologies, firm-level technology absorption, FDI and technology transfer, internet users, fixed-broadband Internet subscriptions, internet bandwidth, mobile-broadband subscriptions (Schwab & Sala-i-Martin, 2013; Schwab & Sala-i-Martin, 2014; Schwab & Sala-i-Martin, 2015; Schwab & Sala-i-Martin, 2016; Schwab & Sala-i-Martin, 2017; Schwab, 2018). The 2018 data is got from the network readiness index 2019 since the World Economic Forum decided to hand over the production of the network readiness index to the Portulans Institute. I then measure the digitalization distance between the host and the home country as:

$$Digitalization\ distance_i = Technological\ readiness_i - Technological\ readiness_c$$

where $Technological\ readiness_i$ is the technological readiness score of the host country i and the $Technological\ readiness_c$ is the technological readiness score of China, the home country of the focal platform.

Institutional environment similarity between the home and the host country of the

platform. I controlled for the institutional environment similarity between the home and host country of the focal platform firm since the capability fostered by the focal platform to survive and succeed in its home country's institutional environment may be useful for it to survive in other countries with similar institutional situations and problems (Cuervo-Cazurra & Genc, 2008). I first got the value of institutional environment of the home and host country of the focal platform from the global competitiveness reports from 2013 to 2018 and the value is the overall scores of the survey questions associated with property rights, intellectual property protection, diversion of public funds, public trust in politicians, irregular payments and bribes, judicial independence, favoritism in decisions of government officials, efficiency of government spending, burden of government regulation, efficiency of legal framework in settling disputes, efficiency of legal framework in challenging regulations, transparency of government policymaking, business costs of terrorism, business costs of crime and violence, organized crime, reliability of police services, ethical behavior of firms, strength of auditing and reporting standards, efficacy of corporate boards, protection of minority shareholders' interests, strength of investor protection (Schwab & Sala-i-Martin, 2013 ; Schwab & Sala-i-Martin , 2014; Schwab & Sala-i-Martin , 2015; Schwab & Sala-i-Martin, 2016; Schwab & Sala-i-Martin, 2017; Schwab, 2018). I then measured the institutional environment similarity as the log-transformed absolute value of differences between the institutional environment score of the host and the home country of the focal platform firm.

Host country's market size. Since it is suggested by existing platform studies that the emergence of network effects need a critical mass of users, and the market size of the host country may decide whether the potential users in the host countries can achieve the critical mass of users for the platform to benefit from the network effects (Brouthers et al., 2016). Therefore, I included the host country's market size as a control variable and measure the host country's market size as the number of internet accounts in the host country.

Geographic distance between the home country and the host country of the platform. As people prefer to interact with close others than the distant ones, the geographic distance may influence the motivation of potential users in the host countries to adopt the platform (David Laniado et al, 2018). Therefore, I have controlled the geographic distance between the home country and host country of the focal platform and measured it as the log-transformed distance differences between the capital of the home country and the host country of the platform.

4.4 Data analysis

I have presented the descriptive statistics of all the variables in Table 3, which provided detailed information on means, standard deviations, and paired correlation. Regarding the concerns associated with multicollinearity, I have adopted the linear regression collinearity diagnostics to check the value of the variance inflation factor (VIF) for all variables of this study. I found the VIF value (mean VIF: 2.38. max VIF: 4.75) well below the rule-of-thumb cutoff of 10 (Hair Jr, Anderson, Tatham, & Black, 1995), which indicates that multicollinearity is not a concern. I tested the hypotheses through panel data analysis with platform-fixed effect, year-fixed, and business-fixed effect by STATA. The business is the type of business run by the focal platform (i.e., financial service, information service, education, shopping, and entertainment). In addition, I employed robust estimates of variances using the cluster option in STATA and clustered the data by the platform.

Insert Table 3 about here

I ran fixed-effects models following a hierarchical approach: Model 1 includes only the control variables, while Model 2 to Model 8 includes the independent and interaction variables. Model 9 is the full model, including all independent and interaction variables. The regression results are reported in Table 4.

Insert Table 4 about here

4.5 Results

In Model 2 of Table 4, I tested Hypothesis 1 by introducing the independent variable social media penetration rate of the host country. The result shows that the social media penetration rate of the host country is positively and significantly associated with the focal platform's penetration in the host country ($b = 1.478$, $p = 0.004$), suggesting that Hypothesis 1 is supported. In terms of the economic value, I can see that for a 0.1 unit increase in the social media penetration rate in the host country, it is expected to see about a 33.8 % increase in the ranking of the focal platform in the host country. In Model 3, I introduced the main effect of cultural distance and found that cultural distance is negatively and significantly associated with the focal platform's penetration in the host country ($b = -4.23$, $p < 0.0001$). In Model 4, I tested Hypothesis 2 by introducing the interaction term between the social media penetration rate and the cultural distance between the home and the host country of the platform. The results show that the effect of the interaction term is negative and statistically significant ($b = -18.614$, $p = 0.002$). Therefore, Hypothesis 2 is supported. In Model 5, I introduced the main effect of the home country existing users' rating of the platform and did not find a significant impact of the home country existing users' rating on the platform's penetration ($b = -0.02$, $p = 0.502$). In Model 6, I tested Hypothesis 3a by adding the interaction term between the social media penetration rate of the host country and the home country's existing users' rating of the platform. The results show that the effect of the interaction term is positive but not significant ($b = 0.758$, $p = 0.131$). Therefore, Hypothesis 3a is not supported. In Model 7, the main effect of the host country's existing users' rating of the platform was introduced and found to be insignificant ($b = 0.013$, $p = 0.533$). In Model 8, I tested Hypothesis 3b by adding the interaction

term between the social media penetration rate of the host country and the host country's existing users' rating of the platform. The results show that the interaction term is positively and significantly associated with the focal platform's penetration in the host country ($b = 0.423$, $p = 0.01$). Therefore, Hypothesis 3b is supported. The moderation effects of cultural distance, home country users' evaluation and host country users' evaluation are graphed in Figure 1, Figure 2 and Figure 3 separately. The independent variables have been centered in the figure to make it easier for interpretation. Model 9 is the full model, including all control, independent, and interaction variables, and all the results from Model 2 and Model 8 remain consistent except the main effect of social media penetration rate. The main effect of social media penetration rate is found to be insignificant in Model 6, Model 8, and Model 9 due to the addition of the interaction term between the social media penetration rate of the host country and the home country existing users' rating of the platform and the interaction term between the social media penetration rate of the host country and the host country existing users' rating of the platform.

Insert Figure 1 about here

Insert Figure 2 about here

Insert Figure 3 about here

Regarding the control variables, I found some host country-related factors significantly

influence the platforms' penetration in the host country both in the partial models and in the full model. Specifically, the institutional environment similarity between the host and the home country of the focal platform is significantly and positively contribute to the platform's ranking in the host country, however, the digitalization distance between the host and the home country of the focal platform, the market size of the host country and the geographical distance between the host and the home country are negatively and significantly associated with the platform's penetration in the host country. Institutional environment similarity contributes to the platform's penetration in the host country as the ability that the platform has fostered to survive in its home country's institutional environment can be helpful for them to deal with the similar institutional environment in other countries (Cuervo-Cazurra & Genc, 2008). In terms of the negative impact of digitalization distance on the platform's penetration, a longer digitalization distance between the host and home country of the platform means that the host country has a higher level of digitalization relative to the home country of the platform, therefore, potential users may treat the platform as less advanced compared with the domestic platforms. Since potential users are motivated to adopt the platform as they want to interact with people from the superordinate group (Nejad, Sherrell, & Babakus, 2014), a longer digitalization distance will discourage the potential users to adopt the focal platform, which, in turn, negatively influence the platform's penetration in the host country. Since the market size is not a sufficient factor to explain the firm's international expansion (Rothaermel, Kotha, & Steensma, 2006), the negative impact of the host country's market size may be caused by various factors. For example, although a larger market may offer more potential opportunities, it may also attract more competitors to enter the market, making it more difficult for the focal platform to penetrate the host country. The negative impact of geographic distance suggests that platforms are to some extent constrained by the geographic distance when expanding abroad since users in the host country are more motivated to interact with close others than the distant ones.

4.6 Robustness Test

To test the robustness of my results, I have conducted several sensitivity tests.

First, I adopted the instrumental variable method to deal with the possible endogeneity threat. I introduced three instrumental variables: extreme weather events, press freedom, and gender ratio. Existing literature suggests that people are more motivated to use social media to get information and communicate with others when extreme weather events occur (Roxburgh et al, 2019). A country with a lower level of press freedom may enact tighter regulations on social media use and therefore discourage people's motivation to adopt social media (Pearson, M., 2013). As women are more likely to share emotions and personal thoughts with others on social media (Shahghasemi & Emamzadeh ,2019), the gender ratio in a host country may influence the social media penetration in the host country. Therefore, extreme weather events, press freedom, and gender ratio in the host country may indirectly influence the platform's penetration in the host country by influencing the social media penetration in the host country. I got the data of extreme weather events from the global climate index 2013 to 2020 and measured the extreme weather events in the host country by the Climate Risk Index score of the host country. The data of press freedom was got from the website of Reporters Without Borders (<https://rsf.org/en/ranking>) and the press freedom in a host country is measured as the score of the Press Freedom Index of the host country. The data of gender was got from the World Bank and the gender ratio in a host country is measured as the percentage of females divided by the total population in the host country. As the full model in this study involves the interactions between the cultural distance, user evaluations, and the potentially endogenous social media penetration rate, I would require twelve instrumental variables: three main effects and nine interactions. As having so many instruments may lead to highly suspect results (Hoetker, & Mellewig, 2009), I ran the partial models and the full model with only the main effects using the three instruments for social media penetration rate, and the results are shown in Table 5. I adopted limited information maximum likelihood (LIML) estimation with platform-fixed effect,

year-fixed, and business-fixed effect by STATA and clustered the data by the platform. As the existence of weak instruments can be worse than the situation of no instruments, I use the LIML estimation to rectify potentially weak instruments (Hill et al, 2021). The results show that all the instruments in the models are suitable instrumental variables as the model passes the under-identification test (Kleibergen-Paap rk LM statistic chi-sq <0.1), weak identification test (all critical values (10% maximal LIML size critical values) < Cragg-Donald Wald F statistic) and overidentification test (Hansen J statistic chi-sq>0.1). The effect of social media penetration (b= 2.010, p= 0.051) is found to be positive and statistically significant in the full model. Therefore, the results remained robust.

Insert Table 5 about here

Second, I further tested the robustness of the results by adopting the alternative measurement of cultural distance and the results are shown in Table 6. I first got the cultural dimension data from the Globe Project. Then I calculated the cultural distance between the home and the host country of the platform based on the cultural distance index from Kogut and Singh (1988). The cultural distance is calculated as:

$$Cultural\ distance_i = \sum_{i=1}^9 \{(I_{ij} - I_{ic})^2 / V_i\} / 9$$

where I_{ij} is the value of the i th cultural dimension (i.e., Uncertainty Avoidance, Future Orientation, Power Distance Institutional Collectivism, Humane Orientation, Performance Orientation, In-group Collectivism, Gender Egalitarianism, and Assertiveness) of the j th country, I_{ic} represents the value of the i th cultural dimension of China, V_i stands for the variance of the

index of the i^{th} dimension. I found that both the main effect of cultural distance ($b=-0.088$, $p=0.028$) and the interaction between the cultural distance and the social media penetration ($b=-0.616$, $p=0.059$) is negative and statistically significant, which lend support to the robustness of the results. The results are consistent in the partial models and the full model. Therefore, the results remained robust.

Insert Table 6 about here

5. CONCLUSIONS AND DISCUSSIONS

5.1 Conclusions

Although IB scholars have paid growing attention to the emergence of platforms, little has been investigated on the role of communication channels in influencing the international penetration of platforms. In this study, I try to investigate whether and how the communication channels in the host countries influence the international penetration of the emerging market platforms. I argue that the development of social media in a host country influences the penetration of the platform in the host country and such impact is influenced by the platform's compatibility with the social system of the host country and the existing users' evaluation of the platform. Using a sample of Chinese listed platform firms, I confirm that social media penetration rate positively and significantly contributes to the platform's ranking in the host country. The positive relationship between the social media penetration rate and the platform's ranking in the host country is significantly weakened by the cultural distance between the home and the host country of the platform and significantly strengthened by the host country's existing users' rating of the platform. This work contributes to the existing studies on the internationalization of platforms and the diffusion of innovation.

5.2 Contributions

My work contributes to the existing IB literature on the internationalization of platforms.

First, while recent years have witnessed the rise of emerging market platforms, such as Alibaba, Wechat, and Naspers, existing literature on the internationalization of platforms mainly focuses on platforms in developed countries. To provide a more complete picture of the platform's internationalization, I use a sample of emerging market platforms to investigate how emerging market platforms expand abroad.

Second, while it is suggested by existing literature that the key to the success of a platform's international penetration is the platform's embeddedness in the user-network in host countries and the DOI helps to deepen my understanding of how platforms overcome the liability of outsidership through taking advantages of the communication channels in the host countries, few existing studies have investigated the impact of communication channels in the host countries. I fill in this gap by investigating whether and how digital communication channels in the host countries influence the success of the platform's international penetration.

Third, compared with traditional MNEs, platforms confront lower communication costs due to their unique review system. This study has highlighted the impact of the review system on the internationalization of platforms to see whether and how such a review system will contribute to the international penetration of platforms. In addition, although existing literature on platforms' internationalization has investigated the impact of the review system by taking into consideration the impact of user evaluation on the platform's penetration in the host country, few studies have considered the heterogeneity among the existing users' evaluation. This study explores how the home and the host country existing users' evaluation of the platform influence the platform's penetration in the host country differently.

My work also sheds light on the existing studies on the diffusion of innovation. First, the original diffusion of innovation theory only mentions about two types of communication channels: the mass media channels and the interpersonal channels (Rogers, 2003). Existing studies based on the diffusion of innovation theory mainly investigate the role of mass media channels and the interpersonal channels in the process of innovation diffusion separately. Since the emergence of social media has brought changes to the diffusion of innovation theory due to its dual role as both mass media channels and interpersonal channels and consumers are increasingly relying on social media to learn about new products, it is necessary to learn about how social media communication channels contribute to the process of innovation diffusion. In this way, this study complements the existing studies on the diffusion of innovation by investigating the relationship between the host country's social media development and the platform's penetration performance in the host country and identifying the boundary conditions under this relationship.

Second, extant studies mainly investigated the diffusion process of industrial innovations and limited attention has been paid to the diffusion of digital innovations (Shaheer, 2019). While a few studies that have investigated the diffusion of digital innovations, such as instant messaging and mobile apps (Arora, Malik, & Chawla, 2020; Premkumar, Ramamurthy, & Liu, 2008), these studies all investigate the diffusion process of digital innovations in a single-country context, and little has been studied about the diffusion of digital innovations across different countries. Therefore, this study helps to provide a more complete picture of the diffusion of digital innovations across different countries by investigating the international penetration of emerging market digital platforms.

This study also has some managerial implications for the internationalization of emerging markets platform firms. Since my findings confirm that the development of social media in

the host country can contribute to the success of the platform's international penetration, emerging market platforms may choose the countries with higher social media penetration rates to enter. As the influence of social media is conditioned by the compatibility and existing users' evaluation of the platform, platforms need to adopt a localization strategy to reduce the possible incompatibility due to cultural distance between their home and host countries and proactively improve the users' perception of their platform quality. Besides, even though the platform has already had a good reputation in the home country, the significant impact of evaluation information from host country users and the insignificant impact of evaluation information from home country users suggest that the platform's established home country advantage may not be transferred across borders and highlight the importance to manage the reputation in the host country.

5.3 Limitations

This study has several limitations. First, I use a sample of Chinese listed platform firms to investigate the international penetration of emerging market platforms. According to the global platform survey, platforms from India and South Africa are growing aggressively (Evans & Gawer, 2016). Therefore, future studies should explore related issues using platforms in other emerging markets.

Second, while according to Rogers (2003), the potential users' decision to adopt an innovation is conditioned by the compatibility, complexity, relative advantage, and observability of the innovation, my study only focuses on the moderating effect of compatibility and relative advantage of the platform. Future studies may investigate the impact of all these four features on the success of international penetration of platforms.

Third, while I only investigate the international expansion of platforms, future studies might fruitfully dig deeper to incorporate both platforms and traditional MNEs to compare how

platforms differ from traditional MNEs in international expansion.

Fourth, due to the issue of small sample and data limitation, I can only use the app ranking as the proxy of the penetration performance of the focal platform, future studies may use other proxy to measure the platform's penetration in the host countries to test the validity of the results in this study.

Finally, while platforms are treated as two-sided markets, I only investigate the factors that may influence the user's adoption choice in the host countries. Future research may investigate the factors that may influence the behavior of potential complementors in the host countries and the associated influence on the performance of platforms.

APPENDIX

Table 1 List of the sample platform-firms

Platform-firm	Type of business
9F Inc	Financial service
Alibaba	Shopping
JD.com	Shopping
LightInTheBox Holding	Shopping
Secoo	Shopping
Alibabapictures	Entertainment
Baidu	Information service
Douyu	Entertainment
Jianpu	Finance
Netdragon	Game
Xiaomi	Shopping
58	Information service
Fang.com	Information service
Netease	Information service
Meituandianping	Information service
Qutoutiao	Information service
Ctrip	Travel
Mysteel.com	Information service
New Oriental Education & Technology	Education
Vipshop	Shopping

Table 2 Total sample vs final sample

	Total sample			Final sample		
	N	Mean	S.D.	N	Mean	S.D.
1. Platform performance	273	-2.452	.645	259	-2.456	.656
2. Firm age	369	1.183	.184	259	1.141	.19
3. Firm size	369	1.683	2.384	259	2.049	2.429
4. Firm R&D expenses	369	5.746	1.62	259	6.056	1.465
5. Firm slack	369	.636	1.33	259	.525	1.372
6. User base	369	3.24	1.84	259	4.016	1.12
7. Number of social media Apps	369	1.07	1.619	259	1.29	1.795
8. Percentage of dependent entries	369	.471	.358	259	.49	.376
9. Market competition	369	.748	.035	259	.75	.032
10. Digitalization distance	369	1.321	.979	259	1.298	.97
11. Institutional environment similarity	369	.692	.069	259	.697	.066
12. Market size	369	.929	1.201	259	1.001	1.303
13. Geographic distance	369	3.729	.301	259	3.725	.287
14. Social media penetration	364	.635	.158	259	.637	.157
15. Cultural distance	358	.155	.037	259	.159	.035
16. Evaluation score (home)	369	3.907	1.454	259	4.341	.626
17. Evaluation score (host)	369	2.163	2.057	259	2.965	1.855

Table 3 Descriptive statistics

	N	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Platform performance	259	-2.456	.656																
2. Firm age	259	1.141	.19	0.177*															
3. Firm size	259	2.049	2.429	0.311*	0.295*														
4. Firm R&D expenses	259	6.056	1.465	0.422*	0.423*	0.386*													
5. Firm slack	259	.525	1.372	0.005	-0.469*	-0.135*	-0.303*												
6. User base	259	4.016	1.12	0.288*	0.167*	0.498*	0.612*	-0.097											
7. Number of social media Apps	259	1.29	1.795	0.324*	0.058	0.347*	0.471*	-0.312*	0.217*										
8. Percentage of dependent entries	259	.49	.376	0.366*	0.187*	0.081	0.456*	-0.092	0.174*	0.449*									
9. Market competition	259	.75	.032	0.212*	0.013	-0.090	-0.107	0.026	-0.113	-0.028	-0.042								
10. Digitalization distance	259	1.298	.97	0.093	0.143*	0.013	-0.009	-0.137*	-0.034	0.058	-0.108	0.678*							
11. Institutional environment similarity	259	.697	.066	0.230*	0.145*	-0.037	-0.038	-0.093	-0.095	0.080	0.017	0.519*	0.740*						
12. Market size	259	1.001	1.303	-0.249*	-0.039	-0.036	0.026	-0.055	0.075	0.074	0.093	-0.246*	-0.365*	-0.308*					
13. Geographic distance	259	3.725	.287	-0.479*	0.089	0.013	-0.002	-0.107	0.065	-0.131*	-0.179*	-0.230*	0.138*	-0.068	0.202*				
14. Social media penetration	259	.637	.157	0.266*	-0.001	-0.106	-0.089	-0.004	-0.165*	-0.008	-0.040	0.420*	0.376*	0.336*	-0.580*	-0.109			
15. Cultural distance	259	.159	.035	-0.399*	-0.029	-0.037	0.026	-0.028	0.061	-0.047	0.008	-0.439*	-0.183*	-0.174*	0.326*	0.592*	-0.282*		
16. Evaluation score (home)	259	4.341	.626	-0.004	-0.009	0.158*	0.185*	-0.108	0.581*	0.115	-0.149*	-0.002	0.097	-0.004	0.029	0.062	-0.070	0.019	
17. Evaluation score (host)	259	2.965	1.855	0.289*	0.212*	0.144*	0.200*	-0.217*	0.169*	0.090	-0.035	0.346*	0.324*	0.340*	-0.013	-0.030	0.048	-0.204*	-0.025

Table 4 regression results

DV: Platform performance _{t+1}	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Platform-fixed effect	Included	Included	Included	Included	Included	Included	Included	Included	Included
Year-fixed effect	Included	Included	Included	Included	Included	Included	Included	Included	Included
Business-fixed effect	Included	Included	Included	Included	Included	Included	Included	Included	Included
Firm age	- 2.415*** (.716)	- 2.025*** (.648)	-1.749** (.684)	-1.555** (.67)	-2.17*** (.709)	- 2.207*** (.732)	- 2.083*** (.699)	-1.41 (1.148)	-1.169 (.766)
Firm size	-.647** (.24)	-.459** (.192)	-.248 (.194)	-.263 (.186)	-.51** (.225)	-.493* (.238)	-.475** (.201)	-.742 (.452)	-.51* (.269)
Firm R&D expenses	.273* (.156)	.119 (.149)	.08 (.154)	.068 (.145)	.129 (.15)	.103 (.147)	.12 (.151)	.11 (.149)	.045 (.15)
Firm slack	.001 (.022)	-.001 (.021)	-.003 (.021)	-.01 (.021)	-.001 (.021)	.004 (.021)	-.0003 (.022)	-.0003 (.028)	-.002 (.022)
User base	.045 (.051)	.038 (.049)	.039 (.043)	.032 (.047)	.05 (.051)	.065 (.055)	.035 (.047)	.001 (.046)	.028 (.051)
Number of social media Apps	-.041** (.016)	-.032** (.013)	-.024** (.01)	-.023** (.011)	-.032** (.014)	-.03* (.015)	-.029** (.012)	-.022 (.035)	-.015 (.011)
Percentage of dependent entries	-.227 (.274)	-.33 (.305)	-.281 (.319)	-.399 (.324)	-.329 (.303)	-.324 (.299)	-.319 (.314)	-.316 (.32)	-.345 (.317)
Market competition	4.055** (1.729)	2.308 (1.552)	1.318 (1.542)	2.509 (1.592)	2.327 (1.56)	2.636* (1.502)	2.053 (1.352)	2.827 (2.043)	3.036* (1.485)
Digitalization distance	-.201* (.105)	-.285* (.15)	-.339** (.154)	-.32** (.15)	-.286* (.151)	-.292* (.157)	-.285* (.146)	-.276*** (.088)	-.326** (.146)
Institutional environment similarity	2.68** (.952)	3.179** (1.414)	3.765** (1.486)	3.464** (1.406)	3.183** (1.417)	3.21** (1.522)	3.076** (1.406)	2.945*** (.907)	3.49** (1.357)
Market size	-.111*** (.034)	-.035 (.026)	-.023 (.023)	-.055** (.02)	-.035 (.026)	-.038 (.026)	-.036 (.025)	-.056** (.022)	-.062*** (.016)
Geographic distance	-.657*** (.139)	-.656*** (.141)	-.351** (.125)	-.201* (.108)	-.655*** (.142)	-.653*** (.147)	-.654*** (.143)	-.632** (.231)	-.239** (.113)
Social media penetration		1.478*** (.451)	1.492*** (.453)	4.263*** (.567)	1.476*** (.451)	-1.873 (2.214)	1.495*** (.449)	.11 (.496)	-1.387 (2.573)
Cultural distance			-4.23*** (.8)	7.727** (3.587)					3.045 (2.452)
Social media penetration × Cultural distance				- 18.614*** (5.295)					- 11.303*** (3.701)
Evaluation score (home)					-.02 (.03)	-.535 (.324)			-.526 (.328)
Social media penetration × Evaluation score (home)						.758 (.481)			.756 (.491)
Evaluation							.013	-.254**	-.236***

score (host)							(.021)	(.101)	(.068)
Social media penetration × Evaluation score (host)								.423***	.373***
								(.152)	(.11)
Cons	-2.135	-1.921	-2.551	-5.624***	-1.687	.442	-1.612	-1.344	-1.894
	(1.51)	(1.547)	(1.668)	(1.505)	(1.472)	(1.985)	(1.573)	(2.259)	(2.074)
Observations	259	259	259	259	259	259	259	259	259
R-squared	.699	.751	.774	.786	.751	.757	.752	.774	.808

Robust standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

Figure 1 Moderation effect of cultural distance

Figure 2 Moderation effect of home country users' evaluation score

Figure 3 Moderation effect of host country users' evaluation score

Table 5 Instrumental analysis

DV: Platform performancet+1	(1)	(2)	(3)	(4)	(5)
Platform-fixed effect	Included	Included	Included	Included	Included
Year-fixed effect	Included	Included	Included	Included	Included
Business-fixed effect	Included	Included	Included	Included	Included
Social media penetration	1.83* (.994)	2.032** (.96)	1.833* (.996)	1.809* (.996)	2.01* (.966)
Firm age	-1.932*** (.66)	-1.604** (.696)	-2.049** (.717)	-2.01** (.718)	-1.701** (.777)
Firm size	-.414** (.175)	-.178 (.19)	-.455** (.21)	-.439** (.189)	-.213 (.221)
Firm R&D expenses	.083 (.158)	.024 (.157)	.09 (.16)	.088 (.161)	.032 (.16)
Firm slack	-.002 (.022)	-.004 (.022)	-.002 (.022)	-.001 (.022)	-.003 (.022)
User base	.036 (.051)	.037 (.047)	.046 (.055)	.033 (.05)	.04 (.046)
Number of social media Apps	-.03* (.015)	-.02 (.013)	-.029* (.016)	-.027 (.016)	-.019 (.012)
Percentage of dependent entries	-.354 (.328)	-.318 (.346)	-.354 (.327)	-.339 (.335)	-.312 (.35)
Market competition	1.893 (1.744)	.673 (1.848)	1.903 (1.755)	1.642 (1.535)	.617 (1.669)
Digitalization distance	-.305 (.177)	-.371* (.182)	-.306 (.178)	-.303* (.171)	-.369* (.18)
Institutional environment similarity	3.297* (1.632)	3.952** (1.742)	3.302* (1.636)	3.163* (1.581)	3.893** (1.733)
Market size	-.017 (.031)	.005 (.032)	-.017 (.031)	-.021 (.031)	.003 (.032)
Geographic distance	-.655*** (.148)	-.348** (.15)	-.654*** (.148)	-.654*** (.149)	-.35** (.153)
Cultural distance		-4.263*** (.848)			-4.212*** (.823)
Evaluation score (home)			-.016 (.028)		-.009 (.025)
Evaluation score (host)				.016 (.021)	.006 (.017)
Observations	259	259	259	259	259
R-squared	.539	.574	.539	.541	.575
Underidentification test (Kleibergen-Paap LM statistic Chi-sq)	0.067	0.061	0.067	0.068	0.062
Overidentification test (Hansen J statistic Chi-sq)	0.172	0.202	0.172	0.180	0.196
Weak identification test (Cragg-Donald Wald F statistic)	25.355	25.407	25.306	25.454	25.649
Stock-Yogo weak ID test critical values (10% maximal IV size)	6.46	6.46	6.46	6.46	6.46

Robust standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

Table 6 Regression results: alternative measurement of cultural distance

DV: Platform performancet+1	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Platform-fixed effect	Included	Included	Included	Included	Included	Included	Included	Included	Included
Year-fixed effect	Included	Included	Included	Included	Included	Included	Included	Included	Included
Business-fixed effect	Included	Included	Included	Included	Included	Included	Included	Included	Included
Firm age	- 2.415*** (.716)	- 2.025*** (.648)	- 2.081*** (.66)	- 1.847** (.664)	-2.17*** (.709)	- 2.207*** (.732)	- 2.083*** (.699)	-1.41* (.759)	-1.418 (.978)
Firm size	-.647** (.24)	-.459** (.192)	-.442** (.181)	-.445** (.194)	-.51** (.225)	-.493* (.238)	-.475** (.201)	-.742*** (.252)	-.733** (.304)
Firm R&D expenses	.273* (.156)	.119 (.149)	.127 (.146)	.058 (.156)	.129 (.15)	.103 (.147)	.12 (.151)	.11 (.159)	.04 (.166)
Firm slack	.001 (.022)	-.001 (.021)	-.003 (.021)	.001 (.022)	-.001 (.021)	.004 (.021)	0 (.022)	0 (.023)	.007 (.022)
User base	.045 (.051)	.038 (.049)	.039 (.053)	.036 (.055)	.05 (.051)	.065 (.055)	.035 (.047)	.001 (.053)	.024 (.06)
Number of social media Apps	-.041** (.016)	-.032** (.013)	-.033** (.015)	-.032** (.013)	-.032** (.014)	-.03* (.015)	-.029** (.012)	-.022 (.013)	-.021 (.015)
Percentage of dependent entries	-.227 (.274)	-.33 (.305)	-.313 (.293)	-.366 (.343)	-.329 (.303)	-.324 (.299)	-.319 (.314)	-.316 (.314)	-.344 (.341)
Market competition	4.055** (1.729)	2.308 (1.552)	2.017 (1.447)	1.482 (1.488)	2.327 (1.56)	2.636* (1.502)	2.053 (1.352)	2.827* (1.472)	2.477 (1.527)
Digitalization distance	-.201* (.105)	-.285* (.15)	-.246* (.14)	-.278* (.154)	-.286* (.151)	-.292* (.157)	-.285* (.146)	-.276* (.136)	-.28* (.145)
Institutional environment similarity	2.68** (.952)	3.179** (1.414)	2.658* (1.287)	3.02** (1.397)	3.183** (1.417)	3.21** (1.522)	3.076** (1.406)	2.945** (1.24)	2.899** (1.382)
Market size	-.111*** (.034)	-.035 (.026)	-.051* (.029)	-.023 (.027)	-.035 (.026)	-.038 (.026)	-.036 (.025)	-.056*** (.019)	-.047** (.021)
Geographic distance	-.657*** (.139)	-.656*** (.141)	-.474*** (.16)	-.482*** (.158)	-.655*** (.142)	-.653*** (.147)	-.654*** (.143)	-.632*** (.123)	-.501*** (.145)
Social media penetration		1.478*** (.451)	1.411*** (.408)	2.568** (.917)	1.476*** (.451)	-1.873 (2.214)	1.495*** (.449)	.11 (.444)	-2.199 (3.049)
Cultural distance			-.088** (.037)	.294* (.164)					.247 (.151)
Social media penetration ×Cultural distance				-.616*					-.504*
Evaluation score (home)				(.307)	-.02 (.03)	-.535 (.324)			-.516 (.368)
Social media penetration ×Evaluation score (home)						.758			.741
Evaluation score (host)						(.481)	.013 (.021)	- (.071)	(.55) (.07)
Social media penetration × Evaluation score (host)								.254*** (.423***)	-.243*** (.401***)
Cons	-2.135	-1.921	-1.853	-2.188	-1.687	.442	-1.612	(.106) -1.344	(.102) .612

	(1.51)	(1.547)	(1.484)	(1.593)	(1.472)	(1.985)	(1.573)	(1.111)	(1.957)
Observations	259	259	259	259	259	259	259	259	259
R-squared	.699	.751	.754	.762	.751	.757	.752	.774	.788

Robust standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

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International Penetration of Emerging Market Platforms: role of platform network, product innovation and the host country characteristics

ABSTRACT

The rise of digital platforms has changed the firms' internationalization process. This study posits that platform-specific advantages, such as platform network and product innovation, contribute to the platform's international penetration. I focus on the host country's characteristics to assess the boundary conditions of the relationship between these platform-specific advantages and the success of the platform's international penetration. The empirical testing utilizes the archival data of Chinese leading social media platforms for 2016-2020. The results show that both platform network and product innovation may contribute to the success of a platform's international penetration by influencing the potential users' perceived network value and product value of the platform. The host country's market dominance will weaken the relationship between the platform network and the platform's penetration success while the digitalization distance between the host and the home country of the platform will strengthen the relationship between the product innovation and the platform's penetration success. The study provides valuable insights for theory and practice in the internationalization of digital platforms.

Keywords:

Platforms; network; innovation; emerging markets

1. INTRODUCTION

The emergence and development of digital platforms enabled significant changes in the world's business environment (Chen, Shaheer, Yi, & Li, 2019; Kumar, Nim, & Agarwal, 2020; McIntyre & Srinivasan, 2017; Nambisan, Zahra, & Luo, 2019). Digital platforms increase productivity by efficiently matching supply and demand and improving asset

utilization (Evans & Gawer, 2016). McKinsey reports that platform-based companies may earn an additional ten percent in earnings before interest and taxes (EBIT) over five years (Bughin, Catlin, & Dietz, 2019).

The significant opportunities enabled by digital platforms soon caught the attention of scholars. A burgeoning body of research investigates platform-related issues in different settings. Studies conceptualize the nature and operation of digital platforms from the industrial organization (IO) economics and the technology management perspectives. The IO economics perspective conceptualizes platforms as conduits that facilitate transactions among parties and emphasizes the platform's agent role, while the technology management perspective views platforms as technological foundations for building complementary or innovative products and services (Bughin et al., 2019; McIntyre & Srinivasan, 2017). The IO economics perspective explores economic issues such as network effects (Evans & Gawer, 2016; McIntyre & Srinivasan, 2017), while the technology management perspective focuses on platform design and innovation.

Studies originated from IO economics mainly investigate the emergence of network effects, the value of those effects, and their impact on platform performance. Direct network effects emerge when a platform's perceived value to a potential user depends on its number of existing users. The value a potential platform user derives from current users can be viewed as the network value. Indirect network effects arise when the existing installed base of a platform may influence the motivation of complementors to join the platform. In this way, product value is the value a potential user can derive from the products and services provided by the platforms and complementors. Extant studies have investigated how different platform strategies influence the emergence of the direct network effect and associated platforms' network value. For instance, Fuentelsaz, Garrido, and Maicas (2015) suggest that entry time, level of internationalization, and switch costs may influence potential users' expectations

about a platform, further influencing the network value of the platform. Eisenmann, Parker, and Van Alstyne (2011) have modeled the platform envelope process and argued that the platform envelope could help a platform successfully enter a market by leveraging the existing user base to attract potential users. Scholars have also investigated the emergence of the indirect network effect and the associated product value of a platform. For example, Boudreau and Jeppesen (2015) investigated the impact of increasing platform usage on incentives for complementors to innovate. Panico and Cennamo (2020) explain how users' preference for innovation influences the strategic interaction between platform complementors and platform owners.

Existing platform literature from the technology management view mainly discusses platform design, platform innovation, and the associated platforms' product value. Cennamo and Santaló (2019) use a sample of video game platforms to illustrate how platform generativity influences users' perceived product value of the platform. Tiwana (2015) investigates how the interplay between modularization and input control influences the platform's product value and the number of active users.

While a burgeoning body of research has investigated the issues related to platforms in various contexts, several areas remain underexplored. First, while existing studies on digital platforms mainly focus on the impact of complementors, users, or platform owners on the emergence of network effects, little has been mentioned on the external contextual factors that condition the relationship between the network value of a platform and the platform's performance (McIntyre & Srinivasan, 2017). Second, while most extant studies originated from technological management investigate various factors that influence the product innovation of a platform, little has been mentioned on whether and how product innovation influences a platform's performance. Third, while existing literature has investigated platform strategies related to platform network and platform innovation, most studies focus

on either network or innovation. Therefore, it is necessary to consider the impact of both platform network and platform innovation and investigate the conditions that influence the relative importance of platform network and product innovation to a platform's performance. Fourth, while research publications and industry reports suggest that the rapid growth of platforms significantly reduces communication and coordination costs, leading to changes in the process of firms' internationalization (Alcácer, Cantwell, & Piscitello, 2016; Brouthers, Geisser, & Rothlauf, 2016; Evans & Gawer, 2016; Nambisan et al., 2019; Stallkamp & Schotter, 2019). Few studies have empirically investigated the international penetration of digital platforms. Finally, according to the global platform survey, emerging markets have shown rapid digital transformation, and Indian and Chinese platforms are aggressively growing (Evans & Gawer, 2016). However, little has been investigated on the international penetration of emerging market platforms.

The purpose of this study is to address the mentioned gaps in the extant literature by investigating how the platform network, product innovation, and external environmental factors influence the potential user's perceived network value and product value of an emerging market platform, and further influences the international penetration of the emerging market platform. This study is guided by the following research questions: Whether and how do a platform's existing user base influence the potential users' perceived network value of the platform and the success of the platform's international penetration? Whether and how do a platform's feature updates influence the potential users' perceived product value of the platform and the success of the platform's international penetration? I argue that the size of the existing user base will contribute to a platform's penetration in a host country through influencing the potential users' perceived network value of the platform, and such impact is contingent on the level of incumbents' market dominance in the host country. The number of a platform's feature updates will positively influence the

platform's penetration in a host country by influencing the potential users' perceived product value of the platform and such influence is conditioned by the digitalization distance between the host and the home country of the platform. The empirical study of Chinese social platforms' international penetration between 2016 and 2020 supports all the predictions. The results confirm that both the size of the existing user base and the number of feature updates will contribute significantly to the platform's penetration in a host country. The level of incumbents' market dominance in the host country negatively moderates the relationship between the platform's existing user base and its penetration success and the digitalization distance between the host and the home country of the platform positively moderates the relationship between the number of the platform's feature updates and the platform's penetration success.

This study extends the current understanding of digital platforms in the following aspects. First, I combine the IO economics perspective and technology management perspective to provide a comprehensive view of platforms' internationalization. Second, I examine the impact of external environmental factors that influence the relative importance of the platform network and product innovation. Third, I empirically investigated the international penetration of platforms. Fourth, while existing literature on platforms mainly uses developed countries' platforms as the research object and little attention has been paid to emerging market platforms, I investigate the international penetration of Chinese platforms to better understand the internationalization of emerging market platforms.

The paper proceeds as follows. In the next section, I provide a comprehensive literature review of existing platform literature. I then build my theoretical models and propose hypotheses. Following the theoretical arguments, the methodology section describes the setting, data, and analytic strategies, and the results section presents the result of the empirical analysis. Finally, we present the paper's contribution, managerial implications,

limitations, and directions for future research in the discussion section.

2. LITERATURE REVIEW

2.1 Platform conceptualizations, platform value, and platform strategies

Existing literature on platforms mainly originates from two theoretical perspectives, the IO economics perspective, and the technology management perspective. These two perspectives emphasize the different functions of platforms and conceptualize platforms differently.

Platform studies from the IO economics perspective conceptualize platforms as interfaces that facilitate transactions between two or more sides (Gawer, 2014; McIntyre & Srinivasan, 2017), and emphasize the role of network effects. Platform studies from the technology management perspective view platforms as technological architectures that can be modified by removing or adding features (Gawer, 2014; McIntyre & Srinivasan, 2017) and focus on the platform design.

Essential to platform studies from the IO economics perspective is the existence of network effects. Network effects fall into two types, direct and indirect. Direct network effects emerge when the value a user can derive from a platform depends on the number of other users with whom they can interact through the platform. In contrast, indirect network effects arise when one side of a platform can benefit from the other side's size and characteristics (McIntyre & Srinivasan, 2017). The value a user derives from the other users of a platform can be referred to as the platform's network value. In contrast, the value a user derives from the complementors of a platform can be conceptualized as the platform's product value.

Existing literature on platforms and network effects has investigated various factors that influence a user's perceived network value, the growth of direct network effect, and the associated platform performance. For example, Eisenmann, Parker, and Van Alstyne (2011) theoretically present how platforms use bundling strategies to leverage existing user base, increase the potential users' perceived platform network value, and successfully enter a new

market. Fuentelsaz, Garrido, and Maicas (2015) suggest that a platform's compatibility with other platforms will influence users' expectations of its network value. A high level of compatibility will positively influence the users' expectations by lowering communication and coordination costs between platforms and thus motivate potential users to adopt the platform to interact with users from other platforms. Brouthers, Geisser, and Rothlauf (2016) use a case study to illustrate that E-business platforms can attract potential users in new foreign markets by leveraging the existing user network, such as providing incentives for current users to recommend the platform. Chen, Shaheer, Yi, and Li (2019) have shown that a platform will be more likely to succeed in international penetration when more existing users from high-clout countries as potential users in the host countries are more motivated to contact users from superordinate groups.

Extant platform studies have also investigated how platforms influence the attractiveness of the platform to potential users, the emergence of indirect network effects, and the product value of the platform through the management of the number, scope, and quality of their complementors (Boudreau, 2012; Cennamo & Santalo, 2013; Cennamo & Santaló, 2019; Zhu & Iansiti, 2012). For example, the platform owner's entry into complementors' market will make complementors reallocate innovation efforts from the affected areas to unaffected areas, thus reducing wasteful innovation efforts when there are already many complementors offering similar features on the platform (Wen & Zhu, 2018). By increasing the number of complementors and introducing competition among complementors in different contexts, platforms can influence the quality and prices offered by the complementors (Boudreau & Jeppesen, 2015; Panico & Cennamo, 2015). By lowering royalty fees and signing exclusive deals with popular complementors, platforms can attract potential users and outcompete rivals by offering exclusive products, services, and technologies and increasing the product value of the platforms to users (Cennamo & Santalo,

2013).

Since the technology management perspectives emphasize the role of platforms as building blocks on top of which other parties can add complementary products, services, and technology, the design of platforms may influence the level of difficulty for other parties to add complementary products, services, and technology, which in turn influence the product value of the platform (Adner & Kapoor, 2010; Gawer, 2009; Helfat & Raubitschek, 2018; Tiwana, 2015). For instance, Ozalp, Cennamo, and Gawer (2018) 's inductive case study shows that intergenerational transitions of a platform make it difficult for the developers to develop complementary products for the platform and thus influence the quality of complements, which may, in turn, influence the product value of the platform. Tiwana (2015) suggests that the extension modularization and input control of a platform owner influence the autonomy and quality of the developers of the platform, which further influences users' adoption choice of the platform. Cennamo (2019) suggests that a platform's generativity influences the variety of complementors and influences users' satisfaction with the platform.

While extant literature on platforms reports on investigations of network effects, platform design, and platform value, several areas remain under-explored. First, the value a user derives from a platform can include both network and product value. However, existing platform studies focus on one or the other form of value. Little published work considers both platform value types and their relative importance to potential users in a market. Second, while existing literature originated from technology management has investigated various complementor-management strategies to stimulate platform innovation. It remains unclear whether and how platform innovation may contribute to platform performance. Third, existing studies on platform strategies mainly focus on platforms from developed countries, and little has been investigated on the emerging market platforms, even though

China and India show aggressive platform growth in recent years.

2.2 Internationalization of digital platforms

The recent emergence of digital platforms received attention from international business (IB) scholars. Current literature on the internationalization of the platforms highlights three issues: the differences between international digital platforms and traditional multinational firms, the impact of the emergence of digital platforms on firms' internationalization processes, and the successful strategies used by platforms to penetrate new foreign markets. Digital platforms differ from traditional multinational firms in two important ways: their technological foundations and the central role of network effects. First, digital platforms rest on technological architectures comprised of technological assets and shared standards (Li, Chen, Yi, Mao, & Liao, 2019). Their core competitive advantages are derived from the flows of intangible data and information that enable them to offer their core products and services (Banalieva & Dhanaraj, 2019; Nambisan, Zahra, & Luo, 2019). Second, digital platforms provide interfaces to connect different groups of users and they derive advantages from both direct and indirect network effects. Specifically, each increase in the number of platform users attracts even more users and complementors. Therefore, existing literature on platforms predicts a "winner-take-all" (WTA) outcome that the platform with the largest user base will dominant the market (McIntyre & Srinivasan, 2017).

The emergence of digital platforms brought about significant changes to the ways of firm's internationalization. First, while traditional multinational firms generate value mainly from tangible flows of goods and services during the process of internationalization, digital platforms focus more on intangible flows of data and information due to their unique internet-based technological design (Banalieva & Dhanaraj, 2019; Nambisan, Zahra, & Luo, 2019). As intangible flows of data and information are less constrained by national boundaries, digital platforms face lower transaction costs towards assets management when

expanding abroad (Banalieva & Dhanaraj, 2019; Parente, Geleilate, & Rong, 2018). Second, the technological affordances of digitalization such as interactivity, flexibility, and responsiveness reduce the possible informational frictions (i.e., communication barriers and search costs) that may be encountered by firms when entering foreign countries (Brouthers, Geisser, & Rothlauf, 2016; Hortaçsu, Martínez -Jerez, & Douglas, 2009; Monaghan, Tippmann, & Coviello, 2020). Third, since the success of the platform depends on the growth of network effects generated by the widespread users' adoption (Parente et al., 2018), digital platforms are more user-driven compared with traditional multinational firms, and the WTA paradigm makes platforms more motivated to pursue aggressive strategies to expand their user base. Therefore, the key to the success of platforms' internationalization is to learn how to attract potential users in the market and build a user base in the host countries to benefit from network effects (Brouthers et al., 2016).

Platforms' internationalization strategies can be categorized into market strategies and non-market strategies (Garud, Kumaraswamy, Roberts, & Xu, 2020). Market strategies focus on user building in the host countries. Market strategies include making use of diffusion channels in the host countries, such as internet-based mass media, opinion leaders, and change agents (Brouthers et al., 2016; Chen, Shaheer, Yi, & Li, 2019; Garud et al., 2020), and providing economic incentives for users to recommend the platform to others (Brouthers et al., 2016; Garud et al., 2020). Non-market strategies mainly deal with the institutional factors (e.g., social norms and regulations) in the host countries that may impede the platforms' penetration (Garud et al., 2020; Logue & Grimes, 2019; Tan, 2019). Such non-market strategies can be associated with the cultivation of institutional infrastructures, such as the cultivation of institutional boundaries through multivocal identity claims, cultivation of institutional bridges through polysemy, and cultivation of institutional blue points through scripting (Logue & Grimes, 2019). Non-market strategies such as avoidance,

defiance, manipulation, and compliance may also be used to deal with regulatory resistance (Garud et al., 2020).

While the emergence of digital platforms has attracted IB scholars' growing attention, several areas remain under-explored. First, although existing literature has theoretically investigated the internationalization progress of digital platforms and highlighted the changes brought by the emergence of digital platforms (Alcácer, Cantwell, & Piscitello, 2016; Nambisan et al., 2019), only a limited number of studies have empirically investigated the factors that influence the international penetration of digital platforms. Second, while existing research on the internationalization of digital platforms has highlighted the technological affordances of platforms, little has been mentioned about how upgrading and evolution of technological affordances provided by digital platforms influence the international penetration of the platforms. Third, while scholars have emphasized the importance of contextual factors that influence the success of platform internationalization (Burtch, Ghose, & Wattal, 2014; Garud et al., 2020; Hortaçsu et al., 2009; Takhteyev, Gruzd, & Wellman, 2012), few studies have empirically investigated how external contextual factors in the host countries influence the strength of network effects and the success of platforms' entry. Although Kumar et al. (2020) has investigated how contextual factors in different countries influence the international penetration of the adoption of a specific platform-based technology (i.e., Mwallet), the focus of this study is one kind of platform technology, and little has been known about how such contextual factors influence the international penetration of different platforms.

3. THEORY AND HYPOTHESIS

The business network model of the internationalization process (Johanson & Vahlne, 2009) posits that firms that expand into new foreign markets may face the problem of liability of outsidership. Firms are involved in multiple types of relationships to run their business. They need to link with suppliers, channels, and consumers and these relationships represent the

business network of a firm. Therefore, a firm that is short of linkages with a relevant business network will be considered as an outsider, and the barriers brought by such status of an outsider can be considered as the liabilities of outsidership (Brouthers et al., 2016; Johanson & Vahlne, 2009). When a firm expands into a new foreign market, it will face the liability of outsidership due to the lack of linkages to the local suppliers, distributors, and consumers. Such a lack of linkages leads to the following difficulties of penetrating the foreign markets. First, the lack of linkages to local suppliers and distributors makes it challenging to manage the local supply chain and, therefore, difficult for the firm to sell products and services to the local consumers. Second, according to word-of-mouth (WOM) theory, consumers' adoption behavior can significantly influence the volume and valence of the opinions of others in their network. Therefore, the lack of connections to the local consumers is a barrier to the diffusion of the firm's product in local consumer networks.

The IB literature suggests that the internationalization of digital platforms mainly involves the transfer of the computer-based business model and virtual products and services (Brouthers et al., 2016), therefore, digital platforms may face lower barriers brought by the lack of connections to local suppliers and distributors. However, they still face the liability of outsidership due to the lack of connections to the local consumers. Digital platforms are unique as they act as two-sided markets composed of complementors and users, and they benefit from direct and indirect network effects. Direct network effects emerge when the perceived value of a platform to a potential user is contingent on the platform's number of existing users, and indirect network effects arise when the platform's existing users influence a complementor's motivation to join the platform. In this way, digital platforms mainly generate value from the adoption of a critical mass of users. Therefore, digital platforms need to figure out how to establish connections to the local user network, get the potential users to adopt, and build a new user base in the foreign market (Brouthers et al., 2016).

According to the technology acceptance literature, potential users' technology adoption choice is influenced by the potential users' perceived value of the technology (Kumar et al., 2020). In the case of digital platforms, the perceived value that potential users can gain from a platform is contingent on two aspects: the potential users' perceived network value come from the platform's existing network, and the potential users' perceived product value originated from the products and services provided by the platform. As a potential user's adoption choice is influenced by the perceived network value and product value of a platform and the key for a platform to expand into foreign markets successfully is to build a user base in the foreign markets, both the existing network of the platform and the products provided by the platform can play an important role in the success of a platform's international penetration. Therefore, in the following sections, I investigate whether and how the existing user base and platform feature updates influence potential users' adoption behavior and the success of the platform's international penetration by influencing the potential users' perceived network value and product value of the platform.

3.1 Existing user base, network value, and the platform's international penetration

The network value of a platform is the value a user can derive from the platform by interacting with other platform users (Fuentelsaz et al., 2015). The size of the existing user base influences the potential users' perceived network value of the platform and thus contributes to its international penetration through influencing the potential users' expectations and acting as opinion leaders.

First, since it is costly to switch from one platform to another due to possible learning costs (Fuentelsaz et al., 2015), users are motivated to join a platform that can survive in a long term. Therefore, potential users tend to seek positive signals about the long-term survival of a platform when making the adoption decision. Existing literature on network effects and platforms predicts a "winner-take-all" (WTA) outcome that the platform with the largest

user base will dominate the market due to the positive feedback loop generated by network effects (McIntyre & Srinivasan, 2017). In this way, a larger installed user base sends positive signals to potential users about the platform's future dominance, which positively influences potential users' expectations of the platform and thus motivates the potential users to join the platform.

Second, diffusion of innovation theory (DOI) holds that opinion leaders influence innovation diffusion by shaping the attitudes and adoption behaviors of the potential users in the target markets (Nejad et al., 2014; Rogers, 2003). Opinion leaders are initially defined as "the individuals who were likely to influence other persons in their immediate environment" (Katz & Paul, 1955; Watts & Dodds, 2007). Opinion leaders influence receivers' adoption behavior by acting as a source of messages valued by the receivers because of expertise, trustworthiness, and similarity (Pornpitakpan, 2004). Opinion leaders influence receivers through expertise when the receivers perceive that the opinion leaders have a better understanding of the innovation, through trustworthiness when the receivers believe in the opinion leaders, and through similarity when the receivers perceive that the opinion leaders have similar needs with them. Existing users of the platform act as opinion leaders towards potential users through expertise by providing information on the platform's quality of the focal platform and knowledge. In this way, potential users are more likely to adopt the focal platform when the focal platform has a larger user base as a larger user base can provide access to more information and knowledge valued by the potential users.

As I have argued before, the success of a platform's penetration in a host country depends on the potential users' adoption of the platform in the host country. In this way, the platform's existing user base contributes to the success of the platform's penetration in the host country.

Therefore, I argue that:

Hypothesis 1. The size of a platform's existing user base is positively associated with its penetration performance in the host countries.

3.2 Platform feature updates, product value and the platform's international penetration

According to the technology management perspective, platforms can be conceptualized as technological architectures that can be modified and improved through "the addition, substitution, or removal of features" to meet the need of users (Gawer, 2014; McIntyre & Srinivasan, 2017; Wheelwright & Clark, 1992). Therefore, the product value of a platform depends on the features of the platform. Feature updates are the updates that add new features to a product after the market release and during the use of the product (Förderer & Heinzl, 2017; Tian, Grover, Zhao, & Jiang, 2020). The number of a platform's feature updates may influence the platform's penetration in the host country by influencing the potential users' perceived product value of the platform in the following ways.

First, due to the possible preference heterogeneity among users in the host countries, a platform with more features is more likely to attract a larger scope of users since different users may value different features of the platform. Therefore, a larger number of platform feature updates helps the platform to target a broader potential user pool in the host countries and build a user base in the host countries.

Second, feature updates help to attract potential users by meeting the potential users' variety-seeking needs in the market. While potential users' preferences are not static but can be changed in the future due to internal motivation or external forces, potential users tend to seek variety to have a portfolio of options to prepare for the future uncertainty (Kahn, 1995). A larger number of feature updates show the platform's capability to meet the variety-seeking needs of potential users and therefore motivate the potential users to adopt the platform.

Third, due to bounded rationality and information asymmetry, potential users have limited information about the true product value of the platform. They need to seek a positive signal about the platform's product value before making the adoption decision to avoid adverse

selection problems. Since feature updates are related to the addition of platform features, a larger number of feature updates sends a positive signal about the platform's responsiveness to problems and requests (Zhou, Song, & Wang, 2018) and the platform's capability to continuously improve the value of the products to better meet the need of users, which helps to reduce the users' concerns about the possible issues of adverse selection, mitigate the users' uncertainty about the product value of the platform and increase the users' confidence in adopting the platform.

Fourth, according to the evolutionary selection theory, firms must continuously evolve to make themselves fit for the changing environment (Tiwana, Konsynski, & Bush, 2010). Since platforms are viewed as technological interfaces composed of common technological assets and standards on top of which other parties can add complementary services and products, platforms are characterized as open, editable, and reprogrammable (de Reuver, Sørensen, & Basole, 2018). These unique attributes facilitate innovation and development. These dynamics lead to the risk of platforms falling behind competitors if they do not continually upgrade. Thus, a higher volume of feature updates indicates the innovation efforts of the platform to adapt to the evolving technology environment. This sends a positive signal to potential users about the fitness of its product to the trend of technology development, which helps to mitigate the potential users' uncertainty about the long-term viability of the platform. I thus hypothesize that:

Hypothesis 2. The number of the platform's feature updates is positively associated with the international penetration of the platform.

3.3 Moderating effect of market dominance

While I have argued that the size of the existing user base of a platform contributes to the platform's international penetration by providing positive signals about the future dominance of the platform and valuable knowledge and information, the market dominance of incumbents in the host may condition the positive relationship between the existing user

base and the platform's penetration in the host country by influencing the potential users' motivation to seek signal and the potential users' perceived value of the knowledge and information provided by the existing users.

First, while I have argued that a larger user base will increase the potential users' perceived network value of the platform by sending a positive signal about the focal firm's future dominance, the underlying assumption is that potential users are uncertain about the market trend and therefore they have the need to seek the positive signals to make the adoption decision. However, potential users' uncertainty about the market trend depends on the level of incumbents' market dominance in the host countries. When the level of incumbents' market dominance in the host countries is low, potential users are uncertain about which platform will dominate the market. Therefore, they are motivated to seek positive signals about a given platform's future dominance to mitigate the uncertainty. When the level of incumbents' market dominance is high, potential users are less uncertain about the market trend and less likely to be motivated to seek positive signals to mitigate the uncertainty. Therefore, potential users' adoption behavior will be less influenced by the size of the existing user base of the platform.

Second, while I have argued that a larger installed user base will provide more network value to potential users in the host countries as existing users may add value as opinion leaders and a larger number of existing users can provide a larger volume of information and knowledge, the influence of the size existing user base of the focal platform depends on the existence and influence of other opinion leaders in the host countries. Since users living in the same country have similar cultural and social values, other users in the same country with the potential users may act as opinion leaders and influence potential users' adoption behavior through similarity. When the level of incumbents' market dominance in the host countries is low, different local users have different choices on similar types of platforms, the observed

relative popularity of existing platforms in the market is not evident, and therefore other users' adoption behavior is not sufficient to influence the potential users' adoption decision. However, when the level of incumbents' market dominance is high, which means a critical mass of local users have chosen the same platform, the users of the dominant platform act as opinion leaders that make the potential users adopt the dominant platform, which weakens the influence of the size of the user base of the focal platform entering the market.

Therefore, I hypothesize that:

Hypothesis 3. The level of incumbents' market dominance in the host countries will moderate the relationship between the size of the existing user base of a platform and the international penetration of the platform, such that the positive relationship will be weakened when the level of the incumbents' market dominance is higher in the host countries.

3.4 Moderating effect of digitalization distance between the host and home country of the platform

While I have argued that the number of a platform's feature updates will positively influence the platform's penetration in the host country by sending positive signals about the product value of the platform, the strength of such influence is conditioned by two factors: the potential users' uncertainty about the product value of the platform and the utility that the potential user can gain from the addition of new features. The digitalization distance between the host and the home country of the platform will influence these two factors and therefore condition the relationship between the number of the platform's feature updates and the platform's penetration in the host country.

First, the digitalization distance between the host and the home country of the platform influences the potential users' perceived uncertainty about the product value of the platform due to the country-of-origin effect. Country of origin can be defined as "information pertaining to where a product is made" (Zhang, 1996). Prior literature on the country-of-origin effect suggests that customers' perception of a product from a particular country is influenced by their perception of the country's strengths and weaknesses in this product's

category (Bilkey & Nes, 1982; Roth & Romeo, 1992; Zhang, 1996). Since digitalization distance shows the gap of digitalization level between the host and the home country of the platform, the potential users in the host country may perceive the home country of the platform as less advanced in digitalization when there is a longer digitalization distance between the host and the home country of the platform. Therefore, the potential users may perceive the platform as less advanced and valuable due to their country of origin. In this way, potential users in the host country that are more advanced in digitalization are more motivated to seek positive signals about the product value of the platform to mitigate the uncertainty brought by the platform's country of origin.

Second, the digitalization distance between the host and the home country of the platform influences the potential users' perceived learning costs of the new features generated by the platform's feature updates, and therefore influence the perceived utility the potential users can gain from the addition of new features of the platform. When a product adds some new features, users will confront some costs to learn and adapt to the new features (Förderer & Heinzl, 2017). In this way, while new features may attract potential users to adopt the product by fulfilling their variety-seeking needs, new features may also discourage potential users to adopt the product due to perceived learning costs (Förderer & Heinzl, 2017; Meyer, Zhao, & Han, 2008). When the host country is more advanced in digitalization compared with the platform's home country, potential users in the host country are more capable to learn and understand new technologies and may perceive lower costs to learn and adapt to the new features updated by the platform since the platform is from a country with a lower level of digitalization. Therefore, potential users in the host country with a higher digitalization level relative to the platform's home country will gain more utility from the new features updated by the platform, perceive the products provided by the platform as more valuable, and are more motivated to adopt the platform.

Therefore, I hypothesize that:

Hypothesis 4. The digitalization distance between the host and the home country of the platform positively moderates the relationship between the number of platform's feature updates and the platform's international penetration, such that the positive relationship will be strengthened when there is a longer digitalization distance between the host and the home country of the platform.

4. METHODS

4.1 Research setting

I tested the hypotheses in an empirical study of leading Chinese social media platform firms from 2016 to 2020. I choose the leading Chinese social media platforms due to the following reasons. First, the global platform survey shows that within the top 25 publicly traded platforms, 4 platforms come from China. Among the top 25 privately owned platforms, 10 platforms come from China (Evans & Gawer, 2016), demonstrating the important position of Chinese platforms in the world and making it meaningful to study Chinese platforms to provide a complete picture of the issues related to digital platforms. Second, different from other platforms that sell physical products to users, social media platforms generate value by facilitating information exchange between users, and therefore, the core offerings of social platforms are fully digital (Brouthers et al., 2016). This helps to rule out possible physical assets-related factors that may influence the internationalization performance of platforms. Moreover, the global platform survey shows that 12 out of the top 25 publicly traded platforms are transaction platforms, and all the top 25 privately owned platforms are transaction platforms. As social platforms are typical transaction platforms linking between different users, it is representative to study social platforms to investigate how digital platforms' internationalization differs from traditional multinational platforms. Lastly, as this study focuses on the internationalization of emerging market platforms, the basic

assumption is that the emerging market platforms have the intention to do internationalization activities. Since there are hundreds of small social-media platforms in China, they face fierce competition and struggle to survive in the Chinese market. In this way, they have limited attention and motivation to go abroad. In addition, small platforms in China do not provide complete and correct data, which may create some noises for the empirical analysis. Leading platforms in China have more resources and efforts to go abroad and provide more complete and accurate information. Therefore, I focus on the leading Chinese social media platforms rather than all Chinese social media platforms to empirically test the hypothesis.

4.2 Data and sample

The data set consists of monthly observations of leading Chinese social network platforms from October 2016 to December 2019. Here, I chose Chinese social network platforms that had ranked 10 for at least 12 months from 2016 to 2020 and have at least one foreign language as the platform language. My data came from multiple sources, the data of platform ranking, user base, updates came from <https://www.qimai.cn/>, a website that provides information on apps. The data of host countries' institutional environment, competition and digitalization were got from the global competitive report provided by the World Economic Forum (Schwab & Sala-i-Martin, 2016; Schwab & Sala-i-Martin, 2017; Schwab, 2018; Schwab, 2019) and the network readiness report provided by Portulans Institute (Dutta & Lanvin, 2019; Dutta, Lanvin, Rossini, & Bratt, 2019). The data of social media accounts and market dominance were got from the digital reports provided by the data reportal (<https://datareportal.com/library>). The cultural distance data was got from the globe project (<https://globeproject.com/>).

In total, 5 unique social network platforms (i.e., Weibo, Wechat, Yingke, Tantan, Soul) were identified with 9495 platform-month-host country observations. After dropping the missing

values, a final sample of 5 unique social network platforms (i.e., Weibo, Wechat, Yingke, Tantan, Soul) was identified with 5845 platform-month-host country observations. The host countries penetrated by the final sample platforms are Albania, Argentina, Australia, Austria, Bolivia, Brazil, Canada, Colombia, Costa Rica, Czech Republic, Denmark, Ecuador, Egypt, El Salvador, Finland, France, Germany, Greece, Guatemala, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Kazakhstan, Korea, Malaysia, Mexico, Namibia, Netherlands, New Zealand, Nigeria, Philippines, Poland, Portugal, Russia, Singapore, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, United Kingdom, United States, and Zimbabwe. Table 1 lists the descriptive statistics of the total sample and the final sample. Since there are only small differences in the mean and standard deviation between the total sample and the final sample, there is little concern that the dropping values may influence the validity of the analysis results.

Insert Table 1 about here

4.3 Measures

Dependent variable. International penetration of platforms in the host country. I first got the app ranking of the focal platform in the host country in month $t+1$, the penetration of the focal platform in the host country is then measured as the log-transformed reciprocal of the ranking.

Independent variables. Existing user base. I measured the existing user base of the focal social network platform as the log-transformed of the number of evaluations provided by existing users of the focal platform's app on the Apple store in a given month t .

Total feature updates of the platform. I first checked all the app update information of the focal social network platform and categorized the updates into feature updates and non-feature updates. Following Tian et al. (2020), we categorized feature updates as the updates associated with the addition of new features or functionalities to the platform, while non-feature updates are the updates that are not directly related to the addition of new features, such as updates related to flaw corrections, technical changes, and commercial activities. Then I measured the total feature updates of the platform as the total number of feature updates of the platform's app on the Apple store in a given month t .

Level of market dominance in the target country. I first checked the survey done by the global web index who ask the participants to indicate the social platforms they are using. Then, I identified the most mentioned platform, and finally, the market dominance was measured as the percentage of respondents that mention the platform in a given month t .

Digitalization distance between the home and host country of the platform. I first got the technological readiness score of the home and host country of the focal platform from the global competitiveness reports from 2016 to 2017 and the value is the overall scores of the survey questions associated with the availability of latest technologies, firm-level technology absorption, FDI and technology transfer, internet users, fixed-broadband Internet subscriptions, internet bandwidth, mobile-broadband subscriptions (Schwab & Sala-i-Martin, 2016; Schwab & Sala-i-Martin, 2017). The 2018 and 2019 data were got from the global information technology report 2019 and 2020 since the World Economic Forum decided to hand over the production of the technological readiness index to the Portulans Institute from 2018 and change the name of technological readiness index to network readiness index. I have lagged one year since the 2019 report records the digitalization level of a total of 134 economies in 2018 and the 2020 report records the digitalization level of from more than 120 economies in 2019 (Dutta & Lanvin, 2019; Dutta, Lanvin, Rossini, &

Bratt, 2019). Although the construct of technological readiness has been redesigned, it is proved to be highly correlated with the previous measurement, which suggests that it is aligned with the previous measurement (Dutta, Lanvin, Rossini, & Bratt, 2019). I then measure the digitalization distance between the home and host country i of the platform as:

$$\text{Digitalization distance}_i = \text{Technological readiness}_i - \text{Technological readiness}_c$$

where $\text{Technological readiness}_i$ is the technological readiness score of the host country i and the $\text{Technological readiness}_c$ is the technological readiness score of the platform's home country, China.

Control variables. I have also controlled platform-level factors and host country-related factors that may influence the success of platforms' international penetration.

The total number of platforms developed by the same developer of the focal platform. I have controlled the total number of platforms developed by the same developer of the focal platform as a control variable as platforms developed by the same developer can coordinate and create more value for potential users in the host countries, which may influence the potential users' perceived value of the platform and therefore influence the success of the focal platform's international penetration. I measured the total number of platforms developed by the same developer of the focal platform as the log-transformed total number of apps developed by the same developer of the app of the focal platform on the Apple store in a given month t .

The total number of platform updates. I have controlled the total number of platform updates since the total number of platform updates may also signal the efforts of the platform to improve its offerings and may influence the potential user's perception of the platform. I measured the total number of platform updates as the total number of feature updates and non-feature updates of the focal platform's app on the Apple store in a given month t .

Cultural distance between the home country and the host country of the platform. I included

the cultural distance between the home country and host country of the focal platform as the cultural distance may influence the focal platform's compatibility with the values and norms of the host countries and thus influence the adoption behavior of potential users in the host countries (Kumar et al., 2020). Based on Kogut and Singh (1988), I calculated the cultural distance as:

$$Cultural\ distance_i = \sum_{i=1}^9 \left\{ (I_{ij} - I_{ic})^2 / V_i \right\} / 9$$

where I_{ij} is the value of the i^{th} cultural dimension (i.e., Uncertainty Avoidance, Future Orientation, Power Distance Institutional Collectivism, Humane Orientation, Performance Orientation, In-group Collectivism, Gender Egalitarianism, and Assertiveness) of the j^{th} country, I_{ic} represents the value of the i^{th} cultural dimension of China, V_i stands for the variance of the index of the i^{th} dimension.

Geographic distance between the home country and the host country of the platform. I included the geographic distance between the home country and host country of the focal platform as it is suggested by existing studies that users prefer to interact with others located close to them and thus the geographic distance may influence the adoption behavior of potential users in the host countries (David Laniado et al, 2018). The geographic distance was calculated as the log-transformed distance differences between the capital of the home country and the host country of the platform in a given month t .

The similarity between the host and home country's institutional environment. It is suggested by existing literature that developing firms need to build the capability to survive in difficult institutional conditions due to the institutional voids existing in their home country, and such capability can help the firm to penetrate host countries with a similar institutional environment (Cuervo-Cazurra & Genc, 2008). Therefore, I have controlled the

similarity between the platform's host and home country's institutional environment as such institutional environment similarity may influence the capability of the platform to penetrate the host country. I first got the value of the institutional environment of the home and host country of the focal platform from the global competitiveness reports from 2017 to 2019. Then the host country's institutional environment was measured as the absolute value of differences between the value of the host country's institutional environment and the home country's institutional environment of the focal platform in a given month t .

Host country's market competition. I have controlled the market competition in the host country since the market competition may influence the market efficiency and thus influence the level of difficulty for the focal platform to do business in the host country. The host country's market competition was measured as the host country's market competition score generated by the global competitiveness report in a given month t .

Host country's market size. Since it is suggested by existing literature on network effects that the emergence of network effects need a critical mass of users, and the market size of the host country may decide whether the potential users in the host countries can achieve the critical mass of users for the platform to benefit from the network effects. Therefore, I included the host country's market size as a control variable and measured the host country's market size as the total number of social media accounts in the host country in a given month t .

4.4 Data analysis

I have shown the descriptive statistics of all the variables in Table 2, including detailed information on means, standard deviations, and paired correlation. Regarding the possible multicollinearity issue, I have adopted the linear regression collinearity diagnostics to check the value of the variance inflation factor (VIF) for all variables of this study. I found the VIF value (mean VIF: 1.54. max VIF: 2.41) well below the rule-of-thumb cutoff of 10 (Hair Jr,

Anderson, Tatham, & Black, 1995), which suggested that multicollinearity is not a concern. The hypotheses were tested using panel data analysis with platform-fixed effect, and month-fixed effect by STATA. I also employed robust estimates of variances using the cluster option in STATA and clustered the data by platform.

Insert Table 2 about here

I ran fixed-effects models following a hierarchical approach: Model 1 includes only the control variables, while Model 2 to Model 7 includes the independent and interaction variables. Model 8 is the full model, including all independent and interaction variables. The regression results are reported in Table 3.

Insert Table 3 about here

4.5 Results

In Model 2 of Table 3, I tested Hypothesis 1 by introducing the independent variable the size of the existing user base. The result shows that the size of the existing user base of the focal social media platform is positively and marginally significantly associated with the focal platform's penetration in the host country ($b = 0.59$, $p = 0.034$), suggesting that Hypothesis 1 is supported. In terms of the economic value, a 1% increase in the existing

user base raises the ranking of the platform's app penetration in the host country by 0.59%.

In Model 3, I tested Hypothesis 2 by introducing the independent variable the number of the platform's feature updates. The results show that the number of the platform's feature updates is positively and significantly associated with the focal platform's penetration in the host country ($b = 0.019$, $p = 0.027$), suggesting that a one-unit increase in the number of the platform's feature updates will increase the ranking of the platform's app penetration in the host country by 1.9 %. Therefore, Hypothesis 2 is supported.

In Model 4, I introduced the main effect of the level of the market dominance of incumbent social media platforms in the host country in the model. The results show that the main effect of the market dominance of incumbent social media platforms in the host country ($b = 1.139$, $p = 0.014$) is positive and statistically significant. According to Brouthers et al (2016), when entering a host country that already has dominant platforms, the focal platform can penetrate the host country by establishing linkages to the dominant platforms and attracting the current host country users directly from the existing dominant platform. In this way, the existence of dominant platforms in the host country may contribute to the focal platform's success penetration in the host country by lowering the search costs of the platform.

In Model 5, I tested Hypothesis 3 by adding the interaction term between the size of the existing user base of the focal social media platform and the level of the market dominance of the incumbent social media platforms in the host country. The results showed that the interaction term is negatively and significantly associated with the focal platform's penetration in the host country ($b = -0.554$, $p = 0.051$). Therefore, Hypothesis 3 is supported.

In Model 6, I added the digitalization distance between the host and the home country of the platform and the main effect of the digitalization distance between the host and the home country of the platform ($b = -0.072$, $p = 0.155$) is negative but statistically insignificant.

In Model 7, I tested Hypothesis 4 by adding the interaction term between the number of the platform's feature updates and the

digitalization distance between the host and the home country of the platform. The results showed that the interaction term is positive and marginally significant ($b = 0.033$, $p = 0.095$). Therefore, Hypothesis 4 is supported. The moderation effects of market dominance and digitalization distance are graphed in Figure 1 and Figure 2 separately. The independent variables have been centered in the figures to make it easier for interpretation. Model 8 is the full model, including all control, independent, and interaction variables, and the results are consistent in all models besides the impact of the number of platform's feature updates. The impact of the number of the platform's feature updates becomes insignificant in Model 7 and 8 after adding the interaction term between the number of the platform's feature updates and the digitalization distance between the host and the home country of the platform, which highlights the importance of taking into consideration the digitalization distance between the host and the home country of the platform as the boundary condition of the product value of the platform. Regarding the control variables, I found that the factors associated with the relationship between the host and the home country of the platform are playing critical roles in influencing the process of international penetration of digital platforms. Specifically, geographical distance, and cultural distance are negatively and significantly associated with the focal platform's ranking in the host country in all the partial models and the full model, while the similarity between the host and home country's institutional environment is positively and significantly associated with the focal platform's ranking in the host country. A longer geographical distance and a longer cultural distance will create communication barriers that negatively influence the international penetration of platforms. The similarity between the host and the home country's institutional environment influences the platform's capability to survive in the host country's institutional environment. Specifically, the more similarities between the host and the home country's institutional environment, the more likely it is that the platform can utilize the capability it

has fostered to survive in the home country’s institutional environment to deal with similar institutional problems in the host country.

Insert Figure 1 about here

Insert Figure 2 about here

4.6 Robustness Test

I have conducted the sensitivity tests to test the robustness of the results.

First, following Chen et al (2019), I used the survival of the focal platform in the top 50 list of the Apple App Store in the host country as the alternative measurement of the platform’s success of penetration in the host country. The platform’s penetration in the host country takes the value of 1 if the focal platform ranked top 50 in the time $t+1$ and 0 otherwise. I ran the probit regression with platform-fixed effect, month-fixed effect and clustered the data by platform. The results are shown in Table 4. I found that the existing user base ($b= 5.265$, $p =0.002$) is significantly and positively associated with the likelihood of the platform’s success of penetration in the host country. I found the impact of feature updates to be positive but insignificant ($b=0.064$, $p=0.362$), suggesting that the main effect of feature updates on the platform’s penetration performance is more likely to be conditioned by the digitalization distance when the platform wants to enter into a leadership position in the host country. I found that the effect of the interaction term between the size of the existing user base of the focal social media platform and the level of the market dominance of social media platforms in the host country is negative and statistically significant ($b=-6.953$,

$p < 0.0001$), and the effect of the interaction term between the number of the platform's feature updates and the digitalization distance between the host and the home country of the platform ($b = 0.304$, $p < 0.0001$) is positive and marginally significant. As is suggested by Hoetker (2007), the significance of coefficients of interaction terms is not sufficient to interpret the interaction effects in the probit models, I use the stata command "inteff" provided by Norton et al. (2004) to compute and graph the significance and magnitude of the interaction effects. The significance and magnitude of the interaction term between the existing user base and host country market dominance are shown in Table 5 and graphed in Figures 3 and 4. The significance and magnitude of the interaction term between the feature updates and digitalization distance are shown in Table 6 and graphed in Figures 5 and 6. After running the inteff command, I found that the mean interaction effect between the existing user base and host country market dominance is positive (0.269) and varies from -3.5 to 3.276. According to Figure 3 and Figure 4, for the host countries where the market dominance level ranges from 0.4 to 0.7, the interaction effects are all negative. In terms of the significance of the interaction effects, for the host countries where the market dominance level ranges from 0.4 to 0.6, the interaction effects are mostly significant. In terms of the moderation effect of the digitalization distance, I learned that the mean interaction effect between the feature updates and the digitalization distance is positive and varies from -0.004 to 0.065. According to Figure 5 and Figure 6, for the groups where the digitalization distance between the platform's host and home country is higher than 0.1, the interaction effects are all positive. In terms of the significance of the interaction effects, for the groups where the digitalization distance between the platform's host and home country ranges from 0.4 to 0.6, the interaction effects are mostly significant. Therefore, the hypotheses associated with the moderation effects are more likely to remain supported when the focal platform enter into the host countries with the market dominance level ranging from 0.4 to 0.7 and the

digitalization distance between the platform's host and home country ranges from 0.4 to 0.6 with the alternative measurement of the platform's penetration in the host country.

Insert Table 5 about here

Insert Figure 3 about here

Insert Figure 4 about here

Insert Table 6 about here

Insert Figure 5 about here

Insert Figure 6 about here

Second, since the impact of the existing user base may be driven only by the home country user base of the focal platform, I replaced the existing user base with the foreign user base to exclude the possibility that my results are solely driven by the home country user base of the platform (Chen et al, 2019). The foreign user base of the focal platform was measured as the log-transformed total number of comments given by the users in the foreign countries and the results are present in Table 7. I found that the effect of the foreign user base is positive and statistically significant ($b=0.281$, $p=0.017$) and the significance hold in all partial models and the full model. Regarding the economic impact, 1% increase in the foreign installed base raises the ranking of the platform's app penetration in the host country by 0.28%, about half of that of the total existing user base, which suggests that both the foreign user base and the local user base play important role in the platform's penetration in the host country.

Insert Table 7 about here

5. CONCLUSIONS AND DISCUSSIONS

5.1 Conclusions

Existing literature suggests that the rise of digital platforms brought changes to international market entry and growth processes. However, previous work sheds little light on how digital platforms penetrate different countries or what factors influence their international

penetration. In this study, I combine IO economics and technology management perspectives to investigate how digital platforms successfully build new user bases and penetrate new foreign markets by influencing potential users' perceptions of the network and product value of the platform. I argue that both the size of the platform's installed user base and the number of the platform's feature updates may influence the international penetration of digital platforms by influencing the potential users' perception of the platform's network value and product value separately. I also identify the contextual factors that condition the potential users' perception of the network and the product value of the platform. I hypothesize that the impact of the size of the installed user base on the platform's penetration in the host country is influenced by the level of incumbents' market dominance in the host country, and the influence of the platform's feature updates on the platform's penetration in the host country is conditioned by the digitalization distance between the host and the home country of the platform. Using a sample of Chinese social media platforms, the empirical results confirm my theoretical arguments that the size of the installed user base is significantly and positively associated with the platform's ranking in the host country, and such influence will be weakened when the level of incumbents' market dominance is high in the host country. The number of the platform's feature updates also significantly and positively contributes to the platform's ranking in the host country, and this positive relationship will be strengthened when there is a longer digitalization distance between the host and the home country of the platform. This work contributes to extant research on platforms and firms' internationalization.

5.2 Contributions

This study contributes to the existing research on platforms. First, this study combines different theoretical perspectives to provide a more comprehensive view of digital platforms. Studies based on the IO economics perspective focus on the impact of network effects and the network value of platforms and pay little attention to the product value of the

platform. Meanwhile, technology management research focuses on the role of platform innovation and product value of platforms and provides little insight into how a platform's network influences its performance. To fill the above gaps, this study combines both the IO economics and technology management perspectives to investigate whether and how the network and product innovation of a platform influence the success of the platform's international penetration. More importantly, I have identified the conditions under which the platform network and the product innovation may contribute to the platform's performance differently in different situations. For example, when the host country does not have a dominant platform and is less advanced than the platform's home country in the area of digitalization, the network of the platform will play a more important role than the product innovation of the platform in contributing to the platform's penetration in the host country. In contrast, when the host country's market is already dominated by one or a few platforms and the host country is more advanced than the platform's home country in the area of digitalization, the product innovation of the platform will contribute more to the platform's penetration in the host country compared with the platform's network.

Second, extant studies on platform strategies focus mainly on a single country setting and report little about the external environment's impact. Thus, I investigate the relationship between a platform's strategies and the platform's performance across different countries and examine the contextual factors that may influence the efficiency of platform strategies.

Third, while emerging market platforms play an increasingly important role in shaping global digitalization (Evans & Gawer, 2016), existing literature focuses mainly on platforms from developed countries to investigate platform strategies and the emergence of network effects and pay little attention to the rise of emerging market platforms. I investigate how emerging market platforms based in China successfully penetrate new foreign markets and thus contribute to a more complete understanding of digital platforms' international

expansion.

This study also points out how emerging market platforms can succeed in their globalization. I find that both the existing user base and the feature updates will contribute to a platform's international penetration, but the influence of the existing user base and the feature updates are conditioned on the characteristics of the host country targeted by the focal platform. The internationalization strategies of emerging market platforms should fit the characteristics of the host country they penetrate. For instance, it will be more advantageous for emerging market platforms with an extensive user base to penetrate the host country with a lower level of market dominance. However, it does not mean that small emerging market platforms with little user base cannot successfully expand abroad. Small emerging market platforms may also successfully penetrate internationally when they focus on platform innovation and penetrate the host countries that are more advanced in digitalization.

5.3 Limitations

This study is not without limitations and these offer opportunities for future studies related to digital platforms. First, this study focuses on the user-side to study how platforms can build a user base in the new foreign markets, but there are also complementor-side issues that may influence the success of the platform's entry into the new foreign markets. For instance, the platform's existing user base may also influence the local complementors' choice of joining the platform, and the platform's cooperation with local complementors may help the platform overcome the liability of outsidership, which in turn influences the penetration of the platform into the new foreign markets. Future studies may complement this study by exploring how local complementors respond to foreign platforms' entry and how platforms can establish and leverage the connections with local complementors to penetrate the markets.

Second, Afuah (2013) suggests that important network structure-related factors other than

network size may also influence network value, such as transaction feasibility among members and centrality and structural holes in the network. Therefore, future studies may complement this study by investigating the impact of network-structure-related factors on the international penetration of digital platforms.

Third, focusing on existing users' roles as the providers of information, I use the number of user evaluations to indicate the focal platform's existing user base. Future studies may use a more direct measurement of the user base, such as the daily active users, to explore its impact on platforms' international penetration.

Lastly, I study a sample of Chinese leading social network platforms to understand the international penetration of platforms based in emerging markets. Future studies could further investigate differences between emerging market platforms and developed market platforms in the process of internationalization. This would require including both emerging market platforms and developed country platforms in the sample.

APPENDIX

Table 1 Total sample vs final sample

Sample Variables	Total sample			Final sample		
	N	Mean	S.D.	N	Mean	S.D.
(1) Platform penetration performance	8350	-2.317	.632	5845	-2.296	.654
(2) Total App	9495	.277	.434	5845	.275	.449
(3) Total update	9495	2.622	1.617	5845	2.61	1.656
(4) Cultural distance	9495	2.876	1.578	5845	2.676	.954
(5) Geographic distance	9495	3.887	.24	5845	3.844	.258
(6) Institutional similarity	9495	.779	.513	5845	.825	.512
(7) Market competition_host	9495	5.226	.4	5845	5.33	.368
(8) Market size_host	9495	.37	.591	5845	.524	.676
(9) Existing user base	9495	4.85	.683	5845	4.934	.628
(10) Feature updates	6315	.79	.138	5845	.804	.891
(11) Market dominance	9495	.83	.893	5845	.798	.131
(12) Digitalization distance	9435	.399	1.146	5845	.62	1.046

Table 2 Descriptive statistics

Variables	Obs	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Platform penetration performance	5845	-2.296	.654											
(2) Total App	5845	.275	.449	-0.134*										
(3) Total update	5845	2.61	1.656	-0.359*	0.044*									
(4) Cultural distance	5845	2.676	.954	-0.187*	-0.007	0.009								
(5) Geographic distance	5845	3.844	.258	-0.164*	0.002	0.000	0.587*							
(6) Institutional similarity	5845	.825	.512	0.067*	0.001	0.010	0.211*	0.128*						
(7) Market competition_host	5845	5.33	.368	0.055*	0.024	-0.021	-0.119*	-0.273*	0.369*					
(8) Market size_host	5845	.524	.676	-0.045*	-0.003	-0.001	-0.336*	-0.120*	-0.339*	-0.074*				
(9) Existing user base	5845	4.934	.628	0.659*	0.291*	-0.338*	0.023	0.023	-0.050*	-0.086*	0.017			
(10) Feature updates	5845	.804	.891	-0.133*	0.164*	0.358*	-0.009	-0.009	0.005	0.026	-0.002	-0.037*		
(11) Market dominance	5845	.798	.131	0.043*	-0.081*	0.100*	0.203*	0.083*	-0.069*	-0.159*	-0.100*	0.079*	-0.046*	
(12) Digitalization distance	5845	.62	1.046	-0.001	0.023	-0.020	0.083*	-0.066*	0.627*	0.605*	-0.318*	-0.104*	0.032	-0.176*

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 3 Regression results

DV: Platform penetration performance _{t+1}	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Platform-fixed effect	Include d	Include d	Include d	Include d	Include d	Include d	Include d	Include d
Month-fixed effect	Include d	Include d	Include d	Include d	Include d	Include d	Include d	Include d
Total app	.344 (.46)	.794* (.324)	.333 (.468)	.795* (.303)	.87** (.272)	.349 (.462)	.314 (.454)	.841** (.272)
Total update	.028* (.011)	.012 (.009)	.025* (.011)	.011 (.009)	.006 (.007)	.024* (.011)	.024* (.011)	.002 (.007)
Cultural distance	-.14*** (.023)	-.142*** (.022)	-.14*** (.023)	-.167*** (.026)	-.167*** (.026)	-.137*** (.021)	-.137*** (.021)	-.165*** (.025)
Geographic distance	-.214** (.054)	-.208** (.057)	-.214** (.054)	-.21** (.056)	-.208** (.056)	-.228** (.053)	-.231** (.055)	-.226** (.058)
Institutional environment similarity	.148** (.033)	.149** (.032)	.148** (.033)	.199*** (.039)	.197*** (.039)	.212*** (.032)	.214*** (.03)	.275*** (.041)
Market competition_host	-.007 (.028)	.002 (.026)	-.007 (.028)	-.044 (.022)	-.045 (.024)	.071 (.038)	.068 (.037)	.04 (.031)
Market size_host	-.089** (.03)	-.091** (.03)	-.089** (.03)	-.068 (.034)	-.068 (.034)	-.103** (.026)	-.103** (.026)	-.083* (.03)
Existing user base		.59** (.186)		.648** (.175)	1.003** (.251)			1.015** (.267)
Feature updates			.019** (.006)			.019** (.006)	-.001 (.015)	0.0004 (.014)
Market dominance				1.139** (.272)	3.892** (1.165)			4.06** (1.344)
Existing user base* Market dominance					-.554* (.202)			-.577* (.232)
Digitalization distance						-.072 (.041)	-.099* (.045)	-.11* (.051)
Feature updates* Digitalization distance							.033* (.015)	.033* (.015)
_cons	- 1.304** *	- 4.361** *	- 1.308** *	- 5.288** *	- 7.063** *	- 1.682** *	- 1.635** *	- 7.539** *
Observations	(.174) 5845	(.817) 5845	(.174) 5845	(.852) 5845	(1.157) 5845	(.21) 5845	(.21) 5845	(1.413) 5845
R-squared	.784	.793	.785	.811	.815	.79	.792	.825

Robust standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

Figure 1 Moderation effect of host country market dominance

Figure 2 Moderation effect of digitalization distance

Table 4 Regression results: survival in the Top 50 list as the DV

DV: Survival in Top 50 t+1	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Platform-fixed effect	Included	Included	Included	Included	Included	Included	Included	Included
Month-fixed effect	Included	Included	Included	Included	Included	Included	Included	Included
Total app	-.413 (2.008)	3.086 (2.260)	-.397 (2.010)	2.124 (3.274)	5.285 (1.963)	-.010 (2.120)	-.401 (2.341)	2.948 (2.396)
Total update	.114*** (.039)	.028 (.035)	.103** (.041)	.062 (.044)	.018 (.040)	.124** (.057)	.123** (.058)	.009 (.034)
Cultural distance	-.993*** (.103)	-1.012*** (.099)	-.994*** (.103)	-1.256*** (.148)	-1.257*** (.166)	- (.080)	- (.091)	-1.350*** (.132)
Geographic distance	-.616* (.320)	-.646** (.317)	-.618* (.320)	-.840*** (.319)	-.978** (.377)	- (.393)	- (.394)	-1.464*** (.450)
Institutional environment similarity	.264 (.275)	.243 (.287)	.267 (.275)	.666** (.338)	.802** (.321)	.930*** (.209)	.925*** (.212)	1.362*** (.276)
Market competition_host	-.064 (.134)	-.041 (.146)	-.066 (.133)	-.186 (.210)	-.171 (.245)	.433* (.260)	.373 (.251)	.088 (.318)
Market size_host	-.427 (.404)	-.444 (.418)	-.427 (.403)	-.365 (.470)	-.345 (.510)	-.608 (.400)	-.635 (.414)	-.551 (.486)
Existing user base		5.265*** (1.669)		7.792*** (2.386)	9.983*** (.963)			8.977*** (1.126)
Feature updates			.064 (.070)			.068 (.070)	-.117 (.086)	-.053 (.098)
Market dominance				8.755*** (2.396)	46.482*** (4.404)			35.771*** (5.612)
Existing user base* Market dominance					-6.953*** (.479)			-5.092*** (.753)
Digitalization distance						-.659*** (.212)	-.829*** (.157)	-.744*** (.173)
Feature updates* Digitalization distance							.304***	.224***
_cons	1.060 (1.977)	- (7.584)	1.017 (1.979)	- (11.575)	- (5.286)	.011 (2.135)	.586 (2.084)	- (4.601)
Observations	5,845	5,845	5,845	5,845	5,845	5,845	5,845	5,845
Pseudo R2	0.789	0.796	0.790	0.825	0.836	0.808	0.813	0.850

Robust standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

Table 5 Moderation effect of market dominance: descriptive statistics of interaction effects(probit_ie), standard error of interaction effects(probit_se) and Z-statistics(probit_z) using the method and stata code provided by Norton et al. (2004)

Variable	Obs	Mean	Std. Dev.	Min	Max
_probit_ie	5,845	0.269	0.804	-3.500	3.276
_probit_se	5,845	0.483	0.706	1.98E- 18	4.788
_probit_z	5,845	0.655	1.455	-6.412	14.068

Table 6 Moderation effect of digitalization distance: descriptive statistics of interaction effects(probit_ie), standard error of interaction effects(probit_se) and Z-statistics(probit_z) using the method and stata code provided by Norton et al. (2004)

Variable	Obs	Mean	Std. Dev.	Min	Max
_probit_ie	5,845	0.030739	0.020408	-0.00402	0.065314
_probit_se	5,845	0.016269	0.00912	0.000024	0.050969
_probit_z	5,845	1.842018	1.193592	-0.71319	13.17225

Figure 3 Moderation effect of market dominance

Figure 4 Moderation effect of market dominance: Z-statistics

Figure 5 Moderation effect of digitalization distance

Figure 6 Moderation effect of digitalization distance: Z-statistics

Table 7 Regression results: foreign user base as IV

DV: Platform penetration performance _{t+1}	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Platform-fixed effect	Included	Included	Included	Included	Included	Included	Included	Included
Month-fixed effect	Included	Included	Included	Included	Included	Included	Included	Included
Total App	.344 (.46)	.557** (.181)	.333 (.468)	.533** (.15)	.614** (.203)	.349 (.462)	.314 (.454)	.587* (.212)
Total update	.028* (.011)	.01 (.006)	.025* (.011)	.01 (.006)	.007 (.006)	.024* (.011)	.024* (.011)	.001 (.006)
Cultural distance	-.14*** (.023)	-.142*** (.022)	-.14*** (.023)	-.167*** (.026)	-.167*** (.026)	-.137*** (.021)	-.137*** (.021)	-.165*** (.025)
Geographic distance	-.214** (.054)	-.206** (.058)	-.214** (.054)	-.209** (.056)	-.207** (.056)	-.228** (.053)	-.231** (.055)	-.225** (.058)
Institutional similarity	.148** (.033)	.148** (.032)	.148** (.033)	.198*** (.039)	.197*** (.039)	.212*** (.032)	.214*** (.03)	.275*** (.041)
Market competition_host	-.007 (.028)	.002 (.027)	-.007 (.028)	-.044 (.023)	-.045 (.025)	.071 (.038)	.068 (.037)	.04 (.03)
Market size_host	-.089** (.03)	-.091** (.03)	-.089** (.03)	-.068 (.034)	-.068 (.034)	-.103** (.026)	-.103** (.026)	-.083* (.03)
Foreign user base		.281** (.071)		.306*** (.061)	.487** (.12)			.495** (.138)
Feature updates			.019** (.006)			.019** (.006)	-.001 (.015)	.007 (.016)
Market dominance				1.145** (.269)	2.186** (.576)			2.29** (.741)
Foreign user base × Market dominance					-.29* (.118)			-.304 (.154)
Digitalization distance						-.072 (.041)	-.099* (.045)	-.108 (.051)
Feature updates × Digitalization distance							.033* (.015)	.031 (.015)
Cons	- 1.304*** (.174)	- 2.373*** (.118)	- 1.308*** (.174)	- 3.098*** (.249)	- 3.767*** (.328)	- 1.682*** (.21)	- 1.635*** (.21)	- 4.217*** (.579)
Observations	5845	5845	5845	5845	5845	5845	5845	5845
R-squared	.784	.795	.785	.813	.816	.79	.792	.825

Robust standard errors are in parentheses

*** p<.01, ** p<.05, * p<.1

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