THE INTERNATIONAL PENETRATION OF IBUSINESS FIRMS: NETWORK EFFECTS, LIABILITIES OF OUTSIDERSHIP AND COUNTRY CLOUT

ABSTRACT

The burgeoning of ibusiness firms in the modern digital economy challenges the received internationalization theory. Given that ibusinesses such as social networking sites create value by providing a digital platform for users to interact with one another, we employ a user-network perspective and externalization logic, suggesting that ibusinesses' internationalization process depends critically on users' collective interactions, instead of being solely driven by firms' market commitments as noted by the Uppsala model. However, ibusinesses may suffer from liabilities of outsidership due to the boundedness of international network effects. Drawing on social network theory, we demonstrate that such liabilities can be mitigated by first diffusing the ibusiness platform in countries with higher clout. Our analysis using a unique dataset of mobile ibusiness platforms finds empirical support for the hypotheses. We discuss theoretical implications for the network approach of the Uppsala model in the digital era.

Keywords: digital; network effect; platform; outsidership; internationalization; foreign market entry

INTRODUCTION

Traditional international business (IB) theory suggests that the very existence of multinational enterprises (MNEs) follows an internalization logic where transactions and value-adding activities are performed within the firm (Buckley & Casson, 1976). Internationalization is thus viewed as driven by strategic planning internal to the firm and conditioned by firm routines and experiences (Dunning & Lundan, 2008). However, the modern business environment is increasingly transformed and revolutionized by information and digital technologies (Alcácer, Cantwell, & Piscitello, 2016). With the burgeoning digital economy, new forms of internationalization are emerging, which are unaccounted for by received wisdom (Coviello, Kano, & Liesch, 2017). A notable one is the international expansion of ibusiness firms. As defined by Brouthers, Geisser, and Rothlauf (2016), ibusiness firms provide an Internet-based platform to enable interactions among users, including product/service transactions and information exchange. Since the value proposition of ibusinesses is based on user participation and exchange, their internationalization may be externalized; it is no longer a unilateral, manager-led process, but involves a community of geographically dispersed users whose interactions draw new adopters from global markets (Chandra & Coviello, 2010; Coviello et al., 2017). This important shift in the mechanism underlying internationalization poses critical questions for the applicability of traditional theories.

One distinguishing feature of ibusinesses is the presence of network effects (Zhu & Iansiti, 2012). The value accruing to network users arises from the size of the installed base, i.e., the number of other users with whom they can interact in the same network (Katz & Shapiro, 1985). The more users an ibusiness platform has, the more value it can provide for potential adopters, and hence the more capable it is to attract new users. While network effects are well documented as a key determinant of platform growth, to what extent they drive internationalization remains contested (McIntyre & Srinivasan, 2017). As digitized offerings know no borders (McKinsey, 2016), some argue that ibusinesses with a larger global installed base can exploit international network effects to penetrate new markets (Fuentelsaz, Garrido, & Maicas, 2015). On the contrary, macro-level data implies that user interactions on digital platforms may be largely domestic, and national borders still matter in cyberspace (Ghemawat, 2016). Drawing on the network approach of the Uppsala model

(Johanson & Vahlne, 2009), Brouthers et al. (2016) reason that ibusiness firms could suffer from liabilities of outsidership if they need to establish a new local user network in each foreign market. This leads to an intriguing question as to whether and when network effects can help to overcome liabilities of outsidership in ibusinesses' internationalization. Our study provides an answer by tracking the penetration of a unique sample of mobile ibusinesses across 50 target countries.[1] We find that international network effects can be strengthened if the ibusiness platform had recently penetrated high clout countries.

Our study makes three contributions. First, we shed light on foreign entry strategies with digital characteristics. Extant literature views network effects as an exogenous, structural factor of the industry (Fuentelsaz et al., 2015; McIntyre & Subramaniam, 2009). Little is known as to what levers ibusiness firms have to enhance global market penetration (McIntyre & Srinivasan, 2017). Based on social network theory (Suarez, 2005), we show that ibusiness platforms may utilize country clout to manipulate network effects in their favor and mitigate liabilities of outsidership. It is our contention that, rather than assuming the "internationalization premium" of digitization (Cavusgil & Knight, 2015), ibusiness firms should proactively build competitive advantages by conquering countries of strategic importance.

Second, we enhance the understanding of liabilities of outsidership in an effort to extend the application of the Uppsala model in the digital economy. Outsidership has been considered a critical impediment to network development and internationalization (Johanson & Vahlne, 2009). However, previous research on outsidership and network-specificity does not explicitly account for network effects (Brouthers et al., 2016). Our analysis illuminates the nature of outsidership in ibusinesses' foreign expansion; the incremental value of an additional user to potential adopters may be discounted by national boundaries so that user network diffusions could be stalled at *borders*. Exploring the boundedness of network effects enriches the key concept of liabilities of outsidership in the internationalization theory (Johanson & Vahlne, 2009).

Third, we demonstrate how contemporary business models offer opportunities to challenge firm-centric theories. The growing platform literature contends that a rising number of users can invert the platform firm so that the locus of value-adding activities moves outside the organizational

boundary (Parker, Van Alstyne, & Jiang, 2017). Similarly, the internationalization of such generative technologies may be steered by user participation, rather than by market commitment decisions of firms and managers. Building on network economics (Katz & Shapiro, 1986), we elucidate how users' value co-creation collectively affects ibusinesses' international expansion, yielding new insights into the network-based process model (Vahlne & Johanson, 2017).

THEORY AND HYPOTHESES

A User-network-centric Perspective on Internationalization

Internet-enabled information and communication technologies have been dramatically transforming global businesses. The growth of a rising number of modern firms is conditioned by digital infrastructures and zero marginal costs (Boudreau, 2012). Digitized products and services are distributed through virtual channels and instantly accessible to users around the world (Coviello et al., 2017). The digital affordance of disintermediation allows firms to satisfy customer demands irrespective of their physical locations (Autio, 2017).

A salient distinction of this new generation of firms lies in *users as resources*. The locus of once internal processes and activities is inverted to outside the firm's formal boundary (Parker et al., 2017). External users including end-consumers may be collectively engaged in product innovation and co-production (Baldwin, Hienerth, & von Hippel, 2006; Chandra & Coviello, 2010; Vargo & Lusch, 2004). For instance, Coviello and Joseph (2012) find that users not only contribute financial, technical and informational inputs to influence the product development process, but also play a promotional role in wider diffusions of the innovation, including in international markets. Shah and Tripsas (2007) argue that communities of individual users are the breeding ground for entrepreneurial activities; the collective creation, sharing and adoption of new ideas among users lead to the formation of commercial ventures. This lens of externalization has rejuvenated traditional conceptualization, in that for digital firms the intangible assets that are valuable and hard to imitate must include user networks, as well as the community, information and resources users contribute (Shankar & Bayus, 2003; Sun & Tse, 2009). Nonetheless, extant research views the way customers participate in innovation as largely defined by the firm (Coviello & Joseph, 2012).

Although the importance of external resources in internationalization is well recognized from the inter-organizational network perspective (Coviello, 2006), the role of user networks remains underexplored. While leveraging external resources is a firm-led behavior, users may set in motion an evolutionary pathway unforeseen by the firm. They do so by co-creating, co-distributing and co-consuming a technology with others across national borders (Chandra & Coviello, 2010). Accounting for user networks has the potential to extend the conventional, firm-centric theory. This paper focuses on ibusiness firms, a prominent type of digital-native organizations particularly driven by externalization. We examine below how user networks may affect ibusinesses' internationalization as regards country penetrations and explore the way in which they may build competitive advantages over the course of internationalization.

iBusiness Firms and Network Effects

iBusiness firms refer to organizations that provide an Internet-based platform to enable interactive, multilateral communication among online users (Brouthers et al., 2016).[2] A fundamental characteristic is that ibusinesses do not fully control what users or third-parties do or build on their platforms, but instead generate value through maintaining and channeling the exchanges between various participants. From the network economics perspective, the success of an ibusiness firm lies in its ability to encourage mass-market adoption and build a large user network (Zhu & Furr, 2016) –a system of interconnected nodes of individual or organizational users (Kane, Alavi, Labianca, & Borgatti, 2014).[3] iBusiness platforms serve as an intermediary to reduce frictions and barriers that prevent these nodes from interacting with one another. The vibrancy of ibusinesses hinges on the value contributed by the network of users.[4]

In the modern digital economy, advanced information technologies have substantially enhanced efficiency in demand aggregation (Van Alstyne, Parker, & Choudary, 2016). As opposed to supply-side economies of scale in traditional industries, ibusinesses enjoy increasing returns to scale, also known as network effects, on the demand side (Eisenmann et al., 2011; Katz & Shapiro, 1986). Network effects manifest as potential adopters attach a higher value to an ibusiness platform when the installed base, i.e., the number of users who have adopted the platform, increases. This is for two

primary reasons. First, the core value proposition of ibusiness platforms emanates from the enabling of user interactions and the resulting exchange opportunities and content that the platform providers would not be able to create on their own. The larger the network, the better the matches between exchange parties, and the greater and more diverse the pool of information generated. iBusiness platforms, such as online auctions, will have little value in the absence of a community of users.

Second, the current installed base and market share are used by potential adopters to estimate the future market share (Liebowitz & Margolis, 1996). iBusiness users face uncertainty about the prospects of a platform, and they do not want to be stranded in a failing network (Tiwana, Konsynski, & Bush, 2010). User expectations of a network's growth potential prove a key determinant of platform adoption decisions (Besen & Farrell, 1994). The presence of a large installed base serves as a cue for the long-term viability of a platform product (Brynjolfsson & Kemerer, 1996). An early preponderance of adoption alleviates the concern over potentially joining a marginal, less valuable network and causes potential adopters to disregard their private search for a better platform (Bikhchandani, Hirshleifer, & Welch, 1992). Greater network size generates more value and attracts more users. An increase in users in turn produces more valuable contributions, leading to a positive feedback loop (Schilling, 2002). Therefore, in theory, ibusiness platforms should demonstrate significant network effects.

What this implies for IB theory is that internationalization may not be a singular, discrete act. In much the same way as consumers co-create opportunities for product innovation (Coviello & Joseph, 2012), the collective interaction of users may co-create the internationalization process in a continuous, ongoing fashion. Establishing critical mass of pioneering adopters should engender an ever-growing installed base by force of network effects and eventually allow the digital platform to dominate the global marketplace alongside only a handful of rivals due to the distinct winner-takes-all dynamics (Cennamo & Santalo, 2013; McIntyre & Subramaniam, 2009).

iBusiness Quality and International Penetration

The previous argument about ibusiness diffusion presupposes that the value of an ibusiness is strictly dependent on the existence of other users affiliated with the same platform, presumably because users

must be integrated into a network to derive any benefits from using the platform. However, empirical research shows that network effects alone are not sufficient for retaining leadership in platform-based markets (Zhu & Iansiti, 2012), as innovative new entrants can claim a greater market share than incumbents in high-tech industries (McIntyre, 2011; Tellis, Yin, & Niraj, 2009). This implies that a part of the value of a network product may stem from product quality attributes (McIntyre & Subramaniam, 2009), which exist independently of the number of other users (Bental & Spiegel, 1995). Sheremata (2004) contends that consumers in network industries derive utility from two separate sources: product benefit and network benefit. Only the latter is a function of network size.[5]

Nevertheless, to what extent any given quality attribute affords product benefit and affects adoption decisions depends on user preferences (Mitra & Golder, 2006). We thus approach an ibusiness's quality via the eyes of the beholder (Claussen, Kretschmer, & Mayrhofer, 2013). User-defined quality refers to the perceived performance of aggregate product attributes, such as reliability and convenience, that are of significance to users (Tellis et al., 2009)[6]. For digital products, examples include graphic design and technical capability (Anderson, Parker, & Tan, 2014; Brynjolfsson & Kemerer, 1996). Particularly for new entrants in platform based markets, offering functional improvements such as enhanced design and social media features is considered a viable strategy, since users' expectations of quality are conditioned by incumbent platforms' comparable features (Evans, 2003; Zhu & Iansiti, 2012). Perceived product performance in excess of competitors' offerings renders an ibusiness more attractive to potential adopters (Casadesus-Masanell & Zhu, 2013; McIntyre, 2011). Nascent ibusinesses often improve quality to compensate users for smaller network benefits and increase the overall value of switching from an incumbent platform (Claussen et al., 2013; Sheremata, 2004).

While attributes of a new ibusiness are critical to determine user adoption, prior research suggests that user assessment of product performance may vary (Boudreau, 2012; Kim & Jensen, 2014), depending partly on the match between user preferences in a country and the product attributes of an ibusiness. Different user groups may derive more or less product benefit from a given technical feature or graphic design. Therefore, we develop our baseline hypothesis to examine the effect of user-defined quality on international penetration.

Hypothesis 1 (H1): iBusiness platforms exhibiting higher user-defined quality are more likely to penetrate target countries.

Network Effects and Liabilities of Outsidership

While traditional MNEs push products to the foreign marketplace through export channels and overseas subsidiaries, ibusinesses expand by initiating a *gravitational field* that pulls new users into orbit around their own platforms (Brouthers et al., 2016). Extant research on network products views internationalization as a means to arouse social gravity, in that international success may increase network value to users in new markets (Beise & Cleff, 2004; Fuentelsaz et al., 2015). The underlying premise, from the network economics perspective, is that the incremental value of one additional user is equal, regardless of who s/he is and where s/he lives (Shy, 2001). Hence, a wider international scope of the network can be associated with a more sizable installed base. This grants advantages over less internationalized platforms in the eyes of the potential adopter, to the extent that ibusinesses can transfer the competitive position from one national market to another. The apparent trend of digital globalization further facilitates the emergence of a new concept: *international* network effects (Fuentelsaz et al., 2015). Harnessing the power of international network effects seems the key to success in ibusinesses' globalization.

An implicit assumption behind this contention is that the digital marketplace in which ibusiness platforms operate and in which users interact with one another renders the physical borders irrelevant (UNCTAD, 2017). Revolutionary information technologies usher in the age where institutions and consumer preferences converge, and organizations and individuals are more interconnected than ever (McKinsey, 2016). iBusiness platforms open up wider access to products and services and confer on customers valuable opportunities to interact with fellow users around the world. Users are less bound by the virtual border in information exchange and transactions and may not perceive national boundaries in their adoptions (Lim, Leung, Sia, & Matthew, 2004). As traditional MNEs diversify into more foreign markets, they are bound to face rising liabilities of foreignness due to cross-country differences in economic development, institutional infrastructures and cultural values (Zaheer, 1995). Conversely, ibusiness platforms may leverage international network effects that

traverse different territories, so that a larger global installed base will attract more potential adopters in a target market, regardless of where the existing users physically reside.

Hypothesis 2a (H2a): *The size of the global installed base will have a positive effect on an ibusiness platform's penetration in target countries.*

The assertion is not without contest that installed base size is the primary driver of adoption decisions, and hence ibusinesses' internationalization. Research reveals that the strength of network effects varies with a range of factors, and total network size may not be the exclusive determinant as assumed (Afuah, 2013; Frels, Shervani, & Srivastava, 2003; Shankar & Bayus, 2003). One notable factor is the compatibility between different clusters of networks (Katz & Shapiro, 1985). Social network theory postulates that the installed base should not be viewed as consisting of identical users (Suarez, 2005). Instead, users derive more benefits from interacting with only a subset of the entire network, with whom they maintain strong ties (Lee, Song, & Yang, 2016). Thus, the marginal value of one additional user to a given potential adopter varies depending on the characteristics of the new user. This local bias causes users to be more influenced by the choices of acquaintances than the total size of the network in their adoption decisions (Lee, Lee, & Lee, 2006; Maicas, Polo, & Sese, 2009). Beise and Cleff (2004) contend that language barriers hamper global user interactions and hence the cross-border diffusion of an innovation. It implies that, in reality, international network effects are limited.

This notion has important implications for our understanding of ibusinesses' liabilities of outsidership in internationalization. Liabilities of outsidership, in general, refer to the fact that the internationalization process of a firm is conditioned by its acceptance into segmented business networks (Johanson & Vahlne, 2009). One of the primary concerns of internationalizing firms is how to move from a network outsider to an insider. We extend the concept from firms to network products and from supply-side networks to user networks. Due to the lack of embeddedness in the local user network, ibusiness platforms may face significant difficulty in developing a new installed base and in reaching critical mass in the target country for the platform to be valuable (Brouthers et al., 2016). Recent research shows that the benefits that online users accrue from the content contributed by other users may decline sharply as the content contributor and the content consumer become markedly

different (Zhang & Sarvary, 2015). In a similar vein, we postulate that, even if potential adopters are made aware of the existence and prevalence of a new, global ibusiness platform, they may not attach sufficient importance to the overall size of the established installed base. This is because the current user network could be of substantial heterogeneity and comprises a variety of market segments or culture groups (Peterson, Søndergaard, & Kara, 2017). Network benefits depend on compatibility. Potential adopters could hold differentiated points of interest and opinions from users in other countries and thus devalue the opportunities to interact or exchange with them. The lack of embeddedness of a new platform in the target market further raises concerns over its future growth, making potential adopters hesitant to join. Thus, liabilities of outsidership may relegate the global installed base to a minor factor in users' adoption decisions.

Hypothesis 2b (H2b): The size of the global installed base will not have a significant effect on an ibusiness platform's penetration in target countries.

The Role of Country Clout

Regardless of how easily the diffusion of an innovation crosses national borders, international network effects may not be purely a structural condition, but manipulated by the firm in a strategic way. Social network research posits that firms can exploit the promotional influence of existing users on potential adopters (Rogers, 2003). Susarla, Oh, and Tan (2012) show that the diffusion rate of user-generated content depends on the users' positions in the social network. Central nodes enjoy greater influence owing to their higher prestige and other users' conformed sense of social identity. Those occupying boundary-spanning positions or higher up in a hierarchical structure are also more powerful in affecting others' adoption decisions (Katona, Zubcsek, & Sarvary, 2011; Tucker, 2008). Most studies tend to focus on influencers' persuasive capacity within a cohesive local network. Some influencers, however, can extend their power beyond the immediate environment to users with whom they share no direct social interactions and to those who are far removed (Gatignon & Robertson, 1985). The role of opinion leadership in product diffusion has been long recognized (Iyengar, Van den Bulte, & Valente, 2011). In online social networks, individuals with a larger number of social ties have greater impact on the overall speed and number of adoptions (Goldenberg, Han, Lehmann, &

Hong, 2009). However, extant research predominantly nests at the individual level (Katona et al., 2011).

Drawing upon the notion of country clout, we extend this literature to the user-network level and focus on diffusion across countries. A country's clout refers to its general capacity to influence other countries through economic and social connections (van Everdingen, Fok, & Stremersch, 2009). Generally, the more central a country is relative to other countries regarding economic power and social connectivity, the higher the country's clout. Empirical research shows that prior market penetrations of new consumer durables in relatively high clout countries reduce subsequent time-to-penetration in other countries (van Everdingen et al., 2009). While extant diffusion studies mainly ascribe one's external influence to awareness raising (Susarla et al., 2012; Tucker, 2008), we theorize that widespread adoptions in high clout countries enhance the substantive network benefits that potential adopters in other countries can derive from joining a new network for two main reasons. First, as the wisdom of preceding users is uncertain, potential adopters face difficulties in evaluating the quality of user contributions and the experience of information exchange on a new ibusiness platform. Users from high clout countries are regarded as highly informed, respected or connected owing to their central positions. A large network of users from high clout countries provides access to more precise information and content and increases the economic value accrued from network affiliation.

Second, users enjoy interacting with those who serve as a type of role model. It is well documented that consumers may purchase a product to satisfy social needs, e.g., "to get into the 'swim of things'", "to conform with the people they wish to be associated with" and "to be fashionable or stylish" (Leibenstein, 1950: 189). The desire to achieve the same level of prestige as the opinion leaders, or to gain their social approval and maintain social relationships with them, boosts the intention to engage (Burns & Wholey, 1993). In this regard, the opportunity of interacting with a large network of users from high clout countries increases the social benefit derived from joining an ibusiness platform. Both economic and social benefits amplify the network value arising from a large global installed base. Therefore, we posit that, when a part of the growing user network is

recently established in high clout countries, network effects of the global installed base will be strengthened in subsequent international expansions.

Hypothesis 3 (H3): The clout of the recently penetrated countries positively moderates the relationship between an ibusiness platform's global installed base and its penetration in target countries.

DATA AND MEASURES

Research Setting

We test our hypotheses in the unique context of mobile application (app) ibusinesses at Apple's App Store. Since the launch of the Apple's App Store and Google Play (formerly Android Market) in 2008, the mobile apps industry has been experiencing exponential growth. In 2015 alone, mobile apps were downloaded 156 billion times, generating $34.2 billion in annual revenues (IDC, 2016). Not every app enables direct user interactions. But many once PC-based ibusinesses, such as Facebook and Linkedin, now provide mobile access to their online platforms. Most strikingly, mobile user bases grow much faster than their PC counterparts, making mobile apps the dominant portal to various ibusinesses.[7] Apps outside social networking services are also transforming into ibusinesses to harness network effects for more rapid growth and sustained advantages.

The explosion of the apps industry implies that all apps, including ibusiness ones, must compete for consumers' limited attention before reaching the right audience. It is reasonable to assume that mobile users take into account two key indicators when they consider downloading an app – they look at the top rankings and/or the app's ratings. Both pieces of information are prominently displayed on the App Store. As with other ibusinesses, once an app is released in the store, it becomes instantly accessible to users around the world. The opportunity to capitalize on massive exchanges and maximize rents on a global scale is the key driver behind an app's internationalization. Meanwhile, it is ever more difficult for an app to be noticed by users out of a large pool of similar alternatives available. International market penetration thus represents an important sign of an app's success.

Sample and Data

For this study, we acquire a longitudinal, cross-country dataset on the international penetration of 4,583 top-ranked mobile apps in the Health and Fitness category of Apple's App Store. The Health and Fitness category is one of the fastest growing categories; the number of apps has doubled in just 2.5 years and revenues are expected to grow tenfold, from $2.4 billion in 2013 to $26 billion by the end of 2017.[8] Restricting our sample to only one category mitigates the influence of various systematic differences across app categories and stores (e.g., Ghose & Han, 2014). Health and Fitness includes apps from 24 subcategories, which provides the opportunity to generalize our results to broader contexts. Most importantly, we desire a category that contains both ibusiness and non-ibusiness apps so that we can rule out alternative explanations of international penetration. Unlike the Social Networking category, Health and Fitness category features both. For example, several apps focus on reviewing and recommending different types of oil products to their users. Non-ibusiness apps, such as Oil Bible, Oil Reviews or YL Oil Guide, rely on the knowledge and expertise of their developers who share opinions on essential oils and oil blends. In contrast, ibusiness apps, such as Droplii or Pocket Oils, create virtual communities of users who introduce, review and recommend oil recipes to one another. In the robustness section, we compare and contrast ibusiness with non-ibusiness apps. Our database provides detailed information on various daily metrics (e.g., country-wise rankings, downloads and revenues) of Health and Fitness apps across 50 countries for the period between October 2014 and December 2015. It accounts for more than 80% of downloads and revenues apps in this category earned in all these countries during our study period.

To test the hypotheses, we first search our database for apps that meet the definition of an ibusiness. Our selection is theoretically guided by Brouthers et al. (2016), who define ibusiness firms as providing online platforms offering virtual communities or marketplace/transaction brokerages. We limit our focus to newly launched apps so that we could document country-wise penetrations of mobile apps from their first penetration to the end of the study period. We do so because H3 examines the impact of previous penetrations on subsequent market penetrations. In addition, our data indicates that around 75% of app penetrations occur within 180 days after app launch. We thus include in our sample ibusiness apps that were released in the last quarter of 2014, so that we could trace the

internationalization trajectories of these apps for at least 12 months. Based on these criteria, our sample comprises 24 apps from 8 subcategories, which are tracked on a daily basis. Table 1 shows the geographic distribution of downloads of the sampled apps.

Table 1

We supplement our data with information gathered from publicly available sources. By writing various Application Programming Interface (API) programs, we set up data crawlers and web robots on websites that store mobile app related information. Through web crawling, we collect important control variables such as languages offered by apps in each country, availability of apps on multiple platforms and updates released in apps after their launch. Finally, we match our data with various country level variables. We acquire foreign country clout scores from van Everdingen et al. (2009) and country-level economic and demographic variables from the World Bank. Setting data on the app-country-day level, we obtain a final sample of 273,566 observations. In our data, we lag all time-varying independent and control variables by one day (i.e., t-1). For all time-invariant variables (e.g., country level variables), we take the values at the beginning of our study. In unreported regressions, we also estimate our models after lagging all time-varying variables by 3, 5, 7 and 10 days (i.e., t-3, t-5, t-7 and t-10) and obtain largely consistent results.

Dependent Variable

Our dependent variable is the event of app penetration, which takes the value of 1 if an app penetrated a target country for the first time on a given day t, and 0 otherwise. This variable is particularly relevant in the digital context where products are instantly available worldwide at their launch, and the presence of an app in any particular country alone does not effectively indicate successful market entry (Santangelo & Meyer, 2017). One established metric of international success concerns the actual market penetration (Rugman & Verbeke, 2004). We follow prior research to define app penetration as the possession of an app by a substantial number of users in a target country (Chandrasekaran & Tellis, 2008).

We take advantage of a distinctive feature of our context, app rankings, to define app penetration. The precise algorithm behind the App Store top rankings remains proprietary, but

industry wisdom suggests that it is primarily a function of download frequency over a short period of time as a sign of ongoing popularity within a country (Yin, Mitra, & Zhang, 2016). Previous studies use app rankings to indicate an app's entry success or performance (Garg & Telang, 2014; Kapoor & Agarwal, 2017; Lee & Raghu, 2014). Differing from marketing literature which refers to market penetration as takeoff or a dramatic jump in sales (e.g., van Everdingen et al., 2009), the successful foreign entry of a mobile app is denoted by its breaking into the highly visible top rankings in different countries. During our sampling period, Apple's App Store displayed top 150 ranked apps in every country (Ghose & Han, 2014). Our observations start after the first penetration of an app and continue until an app penetrated a country or right censored at our cutoff point, (i.e., December 31, 2015). We code the day an app was ranked among the top 150 for the first time in a target country as app penetration in that particular market. In total, we obtain the event of penetration for 345 app-country observations. In the robustness tests discussed later, we employ several alternative criteria for the dependent variable and do not notice any substantive change in our results.

Independent and Moderating Variables

To measure the first independent variable, app quality, we use weighted average ratings an app received from its launch till day t-1 within a target country. While the quality of digital platforms involves a myriad of aspects (Zhu & Iansiti, 2012), we focus specifically on the utility users derive from them (Yin et al., 2016). App ratings serve as a key signal of quality, as they are provided by existing users and represent their posterior beliefs about the product's performance and the value they derive from it based on actual experience (Chen, Wang, & Xie, 2011). Flawed designs and functionalities are often the reasons for bad reviews and ratings, whereas superior technical capabilities may deliver greater user utility and earn higher ratings. As with other online distribution channels, ratings in the App Store are scaled from one to five. Summary statistics, such as the average of ratings, are prominently displayed and shared with prospective users within a target country. Therefore, ratings also capture word-of-mouth and reputation in online markets, which exert persuasive influences on prospective users' adoption decisions (Reuber & Fischer, 2009; Rosario,

Sotgiu, De Valck, & Bijmolt, 2016). Research on online products, especially apps, relies on user ratings as a valid proxy to measure quality (Kapoor & Agarwal, 2017).

Our second independent variable, global installed base, is a time-varying variable, computed as the cumulative number of downloads (measured in thousands) each app received across 50 countries since its launch up to day t-1. This variable reflects the historical adoption of an app by users around the world and, more importantly, captures the network effects. Size of the installed base is not directly related with our dependent variable, because app rankings are country specific and mainly influenced by downloads within a recent short spell in the target country. In an unreported regression, we also use foreign installed base to capture the cumulative downloads each app earned outside the target country. This further allows us to distinguish existing users from potential adopters inside that country who might display different backgrounds, interests or values from the former. The results remain consistent.

Our moderator, clout, reflects the external influence of a country over other countries. To measure clout, we use the country clout scores provided by van Everdingen et al. (2009). These scores take into account a variety of country characteristics regarding economic power and social connectivity, such as economic wealth, foreign trade and population size. van Everdingen et al. (2009) find that these country level characteristics are important in determining the external influence of one country over others, in the sense that consumer durables that had taken off in a high clout country are more likely to achieve a significant jump in sales in other countries due to information spillover and awareness raising. Our variable indicates the clout of a recently penetrated country, which is defined as the country in which an app penetrated within ten days before day t. In cases where an app had penetrated multiple countries in the last ten days, we calculate the average clout score. To ensure the robustness of our results, we use clout scores of countries in which an app penetrated for the last 1, 3, 7 and 15 days. Also, we employ the maximum and minimum clout scores in the case of multiple penetrations in the last 1, 3, 5, 7, 10 and 15 days. We obtain robust results in terms of signs and significance under all specifications.

Control Variables

We control for a comprehensive set of variables at the individual app, category-country, and country levels. Among app level variables, we first account for app price. This is a time-varying variable indicating the prices of all paid apps in US dollars at time t while assigning a value of zero to all free apps. The price of an app may have an important impact on app penetration (Eckhardt, 2016; Ghose & Han, 2014), since free or lower priced apps may generate more downloads and quickly rise into top rankings.

We also control for app size, measured in megabytes. App size is used as a proxy to reflect the sophistication and quality of an app (Ghose & Han, 2014). Apps with a larger size are likely to have more features and graphics, which could reflect app functionality and also influence user adoption decisions.

Apps in Apple's App Store can offer multiple languages to reach out to a wider range of countries. We therefore follow previous research to compute a binary variable, language, which reflects whether an app offers at least one of the official languages of the target country (Kim & Jensen, 2014).

In addition, app developers can modify their apps by releasing updates that introduce new features or fix bugs (McIlroy, Ali, & Hassan, 2016). Updating an app may enhance the popularity as well as the quality of an app, thereby affecting its penetration rate (Lee & Raghu, 2014). Therefore, we control for updates, computed by counting the number of updates an app released since its launch up until t-1.

We also control for multihoming, defined as the act of hosting an app on multiple app platforms (Hossain & Morgan, 2013). To create this variable, we track whether each app in our sample is also present on Google Play (the other most prominent digital distribution channel for mobile apps). We garner app launch dates from Google Play for all apps that multihomed on Google Play. Based on this information, we create a time-varying dummy variable, indicating whether an app was available on Google Play at day t-1 or not.

We recognize that prior experience of app developers can have important consequences for app penetrations. As the apps industry is relatively new, most app developers are still in the learning

phase, whereas experienced developers may have accumulated better understanding of programming techniques as well as the needs and preferences of app users (Li, Goh, & Cavusoglu, 2013). Therefore, we control for developer experience, measured by the number of months since a developer first launched an app in Apple's App Store.

We also control for two important category-country level variables, market size and industry concentration. Using the complete dataset of 4,583 apps, we calculate these two variables for the Health and Fitness category in each country for every single day during our study period. In our regressions, we lag both variables by one day (i.e., t-1). The first category-country level variable, market size, indicates the total downloads (in millions) achieved by all apps in the Health and Fitness category in each target country on each day. Our second category-country level variable, industry concentration, describes the share of total downloads earned by the ten leading apps in the Health and Fitness category in each country every day. To calculate industry concentration, we follow Eisenhardt and Schoonhoven (1990). First, we select the top 10 apps that received the highest downloads in a target country on a given day. Next, we divide the downloads of the top 10 apps by the total downloads earned by all apps in a target country for the same day. Industry concentration reflects the degree of competition in a category, as highly concentrated categories are characterized by relatively few large players together holding a significant share of the total market (Basdeo, Smith, Grimm, Rindova, & Derfus, 2006). High industry concentration increases entry barriers that may limit new entrants' ability to penetrate a target country (e.g., Mudambi & Zahra, 2007).

Furthermore, we recognize that systematic differences across countries may affect our results. Therefore, we control for a number of country level variables. First, previous research suggests that larger countries may have a more diverse population (Alesina & Spolaore, 1997), which facilitates the penetration of products and services. Hence, we control for the population of each target country, measured in ten millions. Second, prior research posits that product takeoffs are faster in wealthier countries that enjoy higher GDP per capita (Helsen, Jedidi, & DeSarbo, 1993). Accordingly, we control for the log of GDP per capita of each target country. Third, in conventional diffusion research, scholars argue that citizens of countries with higher imports and exports may have higher connectivity with foreign countries (Beise, 2004), which increases their awareness about the availability of new

products and leads to higher adoption rates (Talukdar, Sudhir, & Ainslie, 2002). We control for the foreign trade of each target country, measured by taking the log of the sum of imports and exports of each target country. In unreported regressions, we also control for imports and exports separately, and the results stay unchanged. We also take into account the time zone of the target country, as differences in time zones may affect the ability of a country to influence a target market. This variable indicates the time difference (in hours) of each target country from coordinated universal time (UTC). Finally, we recognize that psychic distance between the home country of ibusiness developers and each target country may also impact app penetration. To control for psychic distance, we use the index developed by Dow and Karunaratna (2006), which measures psychic distance between each country pair with regard to language, education, industrial development, religion and political system. We combine five dimensions of psychic distance into one comprehensive measure (Boellis, Mariotti, Minichilli, & Piscitello, 2016).

Statistical Approach

We use the Cox proportional hazard model to analyze penetrations of mobile apps across target countries. Since we do not have any priori assumptions about the baseline hazard rate of our dependent variable, app penetration, we employ the Cox model with the form: $h(t) = q(t)\exp[bX(t)]$ (Blossfeld, Golsch, & Rohwer, 2007), where $h(t)$ represents the hazard rate of an app to penetrate a target country on day t given that it has not penetrated before; $q(t)$ is the baseline hazard of app penetration; $X(t)$ is a vector of independent variables, including time-invariant variables, time-variant variables and interaction terms. Finally, b is a vector of the coefficients to be estimated.

An important merit of the Cox model is its ability to incorporate differences in penetration timings. It also accounts for the right censoring of apps that did not penetrate a target country during our observation period. Left censoring, however, does not pose a problem in our study because we track all apps from their respective launch dates.

In our estimation, we cluster observations based on individual apps to address the potential problems of autocorrelation and heteroscedasticity (Wooldridge, 2002). We also use a robust estimation procedure to obtain consistent standard errors (Lin & Wei, 1989). It allows us to relax the

assumption that observations within the same cluster (e.g., observations from the same app) are uncorrelated.

RESULTS

Table 2 reports the descriptive statistics and correlation table. We observe little correlation among variables, alleviating any concerns about multicollinearity. In addition, we use linear regression collinearity diagnostics to check the value of the variance inflation factor (VIF) for all independent variables and interaction terms. We find the highest VIF value to be 1.99, well below the rule-of-thumb cutoff of 10 (Neter, Wasserman, & Kutner, 1985). We also find that apps in our sample, on average, penetrated 16 countries. First country penetration took an average time of 46 days since the launch of an app; fifth penetration took 73 days; and 10th penetration took 103 days.

Table 2

Table 3 presents the results of the Cox model. Positive coefficients imply an increase in the probability of app penetration into a target country. Hence, positive coefficients indicate that the penetration rate of a particular app increases with positive changes in the covariates. Similarly, negative coefficients indicate that the probability of app penetration decreases with positive changes in the covariates (Box-Steffensmeier & Jones, 2004). Our model fit improves in every subsequent model.

Table 3

We present the results for the control variables in Model 1. Among app level variables, we find a positive and statistically significant impact of language ($p=0.021$). For country level variables, we find that GDP per capita of a target country has a positive and significant effect ($p=0.005$) whereas foreign trade has a negative and significant effect ($p=0.001$).

As regards our hypotheses, Model 2 in Table 3 shows that H1 is supported. We find that the coefficient for app quality is positive and statistically significant ($p=0.000$). Regarding H2, the coefficient of global installed base is positive but only marginally significant ($p=0.060$). It fails to provide sufficient evidence for us to reject H2a and to conclude that global installed base does not impact international penetrations of ibusinesses. However, statistical significance alone might be

misleading. We follow Meyer, van Witteloostuijn, and Beugelsdijk (2017) to discuss our results in respect to effect sizes and economic significance. For app quality, a one-unit increase in app quality increases the hazard of app penetration by 45%. The economic significance of this estimate is substantial, and our H1 remains corroborated. In contrast, a one-unit increase in global installed base (i.e., 1000 downloads) increases the hazard of app penetration by 0.39%, which does not provide sufficient ground for us to reject H2b. The marginal statistical significance combined with small economic impact of global installed base indicates that it exerts a trivial effect on the likelihood of penetration in new target countries, contrary to what network economics would suggest. Finally, we find a positive and statistically significant impact of clout. A one-unit of increase in clout is associated with an increase of 20% ($p=0.006$) in the hazard rate of app penetration. This finding indicates that being established in high clout countries improves an app's subsequent chance to penetrate other countries.

We then add the interaction term between global installed base and clout in Model 3. We find a positive and statistically significant coefficient ($p=0.031$) supporting H3. Henceforth, we find evidence that when an ibusiness app has recently penetrated a high clout country, the effect of global installed base on the rate of penetration into other countries becomes more pronounced. We plot a Kaplan-Meier survival curve in Figure 1 as a visual depiction of the interaction. Each descent indicates an instance of penetration into new target markets. Therefore, a lower survival curve denotes lower probabilities of surviving the event in the event analysis and hence higher probabilities of penetrating into new countries. The key conclusion derived from Figure 1 is that the apps with a larger global installed base and having recently penetrated higher clout countries are the most likely to penetrate new target markets by a clear margin, in line with H3.

Figure 1

Robustness Test

We conduct a series of sensitivity tests to examine the robustness of our results. First, we fit several additional models using alternative measures of penetration. Our main criterion for penetration utilizes app rankings at the Apple's App Store. Breaking into top ranking not only denotes recent

success in the target market, but also paves the way for persistent within-country penetration owing to the visibility effect and informational cascades (Duan, Gu, & Whinston, 2009). In the robustness test, we use top 50, top 100, top 200, top 250 and top 500 rankings as cutoff points to define app penetration. Moreover, we measure international penetration based on the market share in each country. According to our data, an app tends to capture a download share of at least 0.5% in a market within its respective subcategory in the month it ranks among the top 150 for the first time. Using this alternative criterion, we consider an app to penetrate a target market in the first month when it achieved at least 0.5% download share. Under all these alternative measures of our dependent variable, the results remain qualitatively consistent.

Second, we address a potential alternative explanation of ibusinesses' international penetration. Our theorization rests on the premise that users desire interactions with other members of a platform, so that ibusinesses' global diffusion is driven by network effects. The impact of a large installed base is thus indicative of network effects. An alternative explanation would be that diffusion can be achieved through word-of-mouth in social interactions, where initial adopters spread information about the platform to potential adopters in a way that creates peer influence (Aral & Walker, 2011). Nevertheless, our focus on cross-country diffusion alleviates this concern, because inter-country word-of-mouth diffusion requires direct personal contacts across the border, which are not ubiquitous (Putsis, Balasubramanian, Kaplan, & Sen, 1997). Our quality measure also minimizes the impact of online word-of-mouth to some extent (Ghose & Han, 2014; Yin et al., 2016). To further distinguish network benefits from the broader set of social influences, we conduct additional analyses, taking advantage of the unique feature of the Health and Fitness category. If the alternative explanation holds true, one would expect that the global installed base also affects the international penetration of mobile apps that are not subject to network effects (i.e., non-ibusiness apps). Thus, we draw a sample of 24 newly launched non-ibusiness apps from our sampling frame, matched one-to-one with the 24 ibusiness apps in the main sample on the basis of subcategory and app size. These non-ibusiness apps do not have a platform feature by which users can interact with one another. Hence, cross-border diffusion of these apps, if at all, should largely depend on word-of-mouth. We run the model on this matched sample and find that the effect of app quality remains highly significant

(p=0.000) and registers a similar effect size as that of our main specification. However, we find an insignificant effect for both global installed base (p=0.232) and the interaction between clout and global installed base (p=0.163). The results lend support to our theorization that network effects drive ibusinesses' internationalization. Our findings also corroborate previous research, in that even over online social networks, word-of-mouth transmission could be locally concentrated (Susarla et al., 2012).

Third, we further test the robustness of our results by developing a clout measure specific to the digital context.[9] While a country's clout is defined by its economic and social connections with other countries, the original index constructed by van Everdingen et al. (2009) does not capture network characteristics. Following prior literature on network analysis (Aral & Walker, 2011; Hidalgo, Klinger, Barabási, & Hausmann, 2007), we argue that countries who use similar ibusiness apps can be conceptualized as having ties with each other. The greater the number of ties, the more central a country is, and therefore, the higher the clout that country enjoys in the virtual network of nations. Based on this logic, we develop a measure of the virtual clout of each country in the sample. We initiate an extensive data collection exercise by querying publicly available web data through API codes and web crawlers. We gather the top 150 Social Networking apps ranked in each of 155 countries featured in the Apple's App Store in the quarter preceding our study period (i.e., the second last quarter of 2014). Constrained by computing power, we use daily apps rankings on the 15th day of each of the three months to represent the monthly rankings. We restrict our sample to the Social Networking category because it is exclusively comprised of ibusiness apps. Using this data, we generate a network of intercountry ties and calculate a normalized degree centrality score to quantify the virtual clout for each country in our sample (Freeman, 1978). We substitute the new variable, virtual clout, for clout in the robustness check. We find the coefficient of virtual clout to be statistically significant (p=0.008), showing that having penetrated a high virtual clout country increases the likelihood of an ibusiness' penetration into new countries. We also find virtual clout to positively moderate the global installed base (p=0.008). Hence, the results remain consistent with our main specification.

Next, we replace the variable, global installed base, with foreign installed base to ascertain that our results are not driven by the local installed base. We find the main effect of foreign installed base ($p=0.051$) to be marginally significant. In terms of economic value as well, a one-unit increase in foreign installed base raises the hazard of app penetration by only 0.35%, close to the economic impact of global installed base. We also find that the interaction effect between foreign installed base and clout is positive and statistically significant ($p=0.023$). Our results remain robust.

In addition, we estimate our models after excluding the home country of mobile app developers. In so doing, we focus strictly on the international penetrations of ibusiness apps. The results are consistent. We also take into account unobservable differences among countries or app subcategories, which may influence the penetrations of mobile apps across countries. We estimate all models with fixed effects of target country, app subcategory and developer home country. The results of hypothesis testing remain unchanged.

Finally, we estimate our models using parametric survival analysis techniques, e.g., accelerated failure time (AFT) models. Parametric models relax the proportional hazards assumption of a Cox model and assume hazard functions to have specific distributions. We run our regressions under Weibull, log-logistic, exponential and log-normal distributions, and our results are consistent in signs and significance.

DISCUSSION AND CONCLUSION

Business leaders of today view globalization as increasingly encapsulated in data and communication flows (McKinsey, 2016). We study the internationalization of ibusiness platforms whose offerings are primarily based on users' interactions and contributions. This is a theoretically important phenomenon, because network platforms are one of the three elemental models for configuring value-adding activities (Stabell & Fjeldstad, 1998). One might assume that the simultaneous launch of digital goods in global markets implies a sprinkler approach to new product introduction (Kalish, Mahajan, & Muller, 1995). On the contrary, we show that digital internationalization resembles more a waterfall strategy, in that adoption in one country increases the likelihood of penetrations in others (Putsis et al., 1997; Tellis, Stremersch, & Yin, 2003). Unlike the conventional waterfall approach, cross-country

diffusions of ibusinesses are not led by the firm, but by the network of users around the world. We find that global availability by virtue of the online business model alone does not predispose the firm to a true global scale in market reach. Our study further specifies where foreign expansion should take place for the firm to reap more benefits from waterfall diffusions.

It is noteworthy that the analysis reveals a marginally significant effect of global installed base with weak economic influence. We interpret it as resulting from two counterbalancing forces. On the one hand, network effects prove a substantial influence in winner-takes-all markets. Prospective users tend to prefer ibusinesses with a greater number of existing users with whom they can interact and exchange. It is well documented that the force of network effects grants significant advantages to early movers, leading to the rise and persistence of dominant platforms across various industry settings (Katz & Shapiro, 1986; Schilling, 2002). The self-reinforcing power of a large installed base drives an ibusiness's global success (Cennamo & Santalo, 2013). On the other hand, the transition from an early mover to a winner cannot be taken for granted. While network effects may represent a key determinant of market outcomes at later stages of a platform's life cycle, nascent ibusinesses could face serious challenges. Given the incompatibility of user interactions across countries, prospective users may assign lower value to the size of the total installed base during early penetrations of a platform (Afuah, 2013; Suarez, 2005). Current platform research centers on the benefits of network effects, yet leaves its downsides and boundaries underexplored (McIntyre & Srinivasan, 2017). We note that online platforms relying on user-generated content often see heterogeneous preferences of users from different segment groups (Zhang & Sarvary, 2015). This is consistent with the observation that social networks are characterized by strong ties among individuals within a cluster and sparse weak ties linking one cluster to another (Rogers, 2003).

Our study makes several contributions. First, we explore novel foreign entry strategies in the digital economy. Extant research often attributes networks' entry success to a random historical event resulting in an early lead in installed base (Arthur, 1996; David, 1985). Conversely, we argue that managing internationalization can be interpreted as drawing influential users into the existing user network, and we view high clout countries as possessing influential power that transcends cross-national distances. Our findings suggest that local users seem to desire the chance of engaging with

prestigious actors more than the preference for homophily. For instance, Facebook was initially launched to connect Harvard students to one another. The single type of interaction resulted in high network benefits, making it well-received later in other elite colleges and universities (Suarez & Kirtley, 2012). The early popularity with influential higher education institutions acted as a catalyst for diffusions among high school students and finally the general population. In a similar vein, Apple allows app developers to use location-based information to inform users what apps are popular around them.[10] Business intelligence companies, such as App Annie, offer analytical solutions to help app developers conquer a specific geographic segment and hence accelerate user adoptions on a broader scale. The effective management of network effects in expanding market scope can be categorized as a dynamic capability for ibusiness firms (Eisenmann et al., 2011). We note that some ibusiness platforms happen to draw foreign users merely because of their global availability, while others have a true intent to excel in global markets (Coviello, 2015). Diffusing early in high clout countries could be a winning strategy for the latter.

Second, we enhance the conceptualization of liabilities of outsidership in an effort to extend the Uppsala model to digital globalization. While digitally empowered entrepreneurial firms are poised to enjoy the new source of "internationalization premium" (Cavusgil & Knight, 2015), the barriers to cross-border venturing should not be assumed away. Recent research proposes that the internationalization of ibusiness firms is conditioned by liabilities of user-network outsidership (Brouthers et al., 2016), yet the source of such liabilities has not been fully explored. From the Uppsala perspective, a firm's outsidership is characterized by its own position in networks of business relationships with other firms (Vahlne & Johanson, 2017). This is because the received theory conceptualizes internationalization as a prolonged process of knowledge development embedded in economic exchanges with network partners (Johanson & Vahlne, 2009). In the context of ibusinesses, we argue that internationalization is driven by social exchanges enacted and maintained by end-users. Outsidership arises from the lessened *gravitational field* between users, instead of constrained access to network-specific information and knowledge (Muzychenko & Liesch, 2015). Accordingly, ibusiness firms can strategically manipulate the social interaction in external user networks to

influence the trajectory of global diffusion. Extending liabilities of outsidership to ibusiness expansion, our study seeks to refine the Uppsala model for digital internationalization (Coviello et al., 2017).

Third, we elaborate on the evolutionary perspective on internationalization (Santangelo & Meyer, 2017). Our assumption is that the unit to which the evolutionary lens applies needs not be confined by the formal organizational boundary. Recent literature on digital competition stresses that the locus of value-adding activities is inverted to outside the firm (Parker et al., 2017). Following the externalization logic (Chandra & Coviello, 2010), we argue that ibusinesses' inter-country diffusion is shaped by user participation. The dynamism lies in that user participation from one time period affects the trajectory of network diffusion in the next via value co-creation and co-distribution. Nevertheless, the user-led evolution may result in a trajectory unanticipated by the firm and its managers. A prominent example is Google's Orkut, one of the pioneering social networking sites. Initially targeting the US market, the website—much to managers' surprise—took off in Brazil, India and Estonia (Zhang & Sarvary, 2015). The geographically and culturally diversified diffusion route will continue to evolve, as more network actors collectively engage in the ongoing interaction (Coviello et al., 2017). As noted earlier, the evolutionary course can be distorted by managers' revolutionary initiatives to attract influential users from high clout countries. Thus, we expand the scope of *relationships* in the Uppsala model and reimagine the firm as moderating users' relationship building. Aligning external value creation with the organizational goal may be the new challenge facing a range of internationalizing digital firms.

Limitations, Future Research and Managerial Implications

We acknowledge that this study only considers one specific type of fully digitized businesses and one form of digital internationalization. While the definition of ibusiness is general and includes both online communities and marketplaces, our study does not explicitly differentiate the various roles assumed by users. The data constrains our ability to distinguish between individual users and organizational users. Nor can we discern users who may have abandoned the app at some point after installation. Our quality measure captures users' perception about overall platform quality, which could include the quality of network content, although this may be less the case for nascent platform

apps (Evans, 2003). Nevertheless, it is hard to ascertain whether higher quality is attributed to superior technical capability as assumed by platform literature (Zhu & Iansiti, 2012). For platforms exhibiting a strict geographic boundedness where user interactions require physical contact, the diffusion of the platform could more resemble that of a physical product and be less affected by country clout. We encourage future research to explore the implications of cross-sided network effects and particularly the local availability of complementary goods for the internationalization of ibusiness platforms. To further understand liabilities of outsidership, it might also be fruitful to account for heterogeneity in user types and investigate alternative segmentation approaches (Van Alstyne & Brynjolfsson, 2005). Lastly, a single firm may sponsor multiple platforms. Our analysis more precisely examines the internationalization of ibusiness platforms instead of firms.

All in all, we are far from alone in observing the historic challenges of digitization for IB theory (Coviello et al., 2017). While some scholars conclude that information technology stands to facilitate cross-border operations and opportunity exploitation (Chen & Kamal, 2016; Mithas, Whitaker, & Tafti, 2017), others advocate a more fundamental rethink of IB theory in light of diminishing location specificity in digital marketplaces (Autio & Zander, 2016). Our findings imply that like traditional MNEs, digital firms internationalize to exploit their unique firm-specific advantages (FSAs) across borders. Nevertheless, generative technologies increasingly enable firms to build platform-based businesses on the contributions of external entities which are less location-bound. The externalization logic involves new approaches to organizing that are beyond the scope of received IB theories but have important implications for internationalization. Previous research shows that product modularity–a key characteristic of platform organization–may help to overcome cultural distance in interorganizational value co-creation (Lew, Sinkovics, Yamin, & Khan, 2016). Our study draws attention to distinct strategies for the firm to embrace and manage external entities in international competition. The growing external focus of firms pursuing digital strategies will make it imperative to contemplate alternative theoretical accounts of internationalization focusing on interaction, complementarity and interdependence.[11] We call for more empirical evidence on the internationalization of platform firms and indeed on the applicability of existing theories to all types of digital firms.

This research rests on the premise that the distinction between consumption, production and distribution is blurred (Chandra & Coviello, 2010). One promising avenue for future research emanates from the go viral strategy that ibusiness firms may pursue to enhance users' influence on other users. It echoes the literature on viral marketing where consumers bear the responsibility of shaping mass preferences (Aral & Walker, 2011; Katona et al., 2011). However, extant research tends to focus on the contagious dissemination of innovations while assuming innovations to remain unchanged. Instead, we extrapolate that the ibusiness platform itself may continue to evolve as it spreads, resulting from the contributions and sometimes unprompted changes brought by an expanding community of users (Nambisan, 2017). An example is the transition of Facebook from a college-oriented social network to one serving the general public. This modifies the received view of internationalization based on predefined products and FSAs. We encourage future research to theorize about the evolutionary nature of digital artifacts during the process of their diffusion and particularly internationalization.

For practitioners, our study draws attention to new realities of global expansion. A widespread transition in this era is from selling standalone products to establishing ibusiness platforms (Zhu & Furr, 2016), where long-standing foreign entry strategies become less relevant. We suggest that the firm is not the sole agency in the internationalization process. Nor is internationalization fully determined by external users. In much the same way as traditional firms hire and retain the best talent, ibusinesses need to recruit the right users. Our findings can translate into actionable strategies for them to mobilize this unique resource in their favor—one which largely determines the competitive outcome in winner-takes-all markets. Specifically, we recommend managers to employ a staged approach, not based on distance but based on clout. Promoting ibusinesses first in high clout countries is analogous to seeding viral content with influencers, which may encourage user participation on a wider stage and lead the ibusiness platform to global success.

Conclusion

Given the fundamental importance of network platforms in value creation, it is our view that the rapid growth of ibusiness firms and the profound transformation they bring to the modern economy merit

careful theorization. In this paper, we characterize an alternative mechanism of internationalization complementary to the received process model and make an early attempt to delineate empirically this prominent form of digital foreign expansion. More importantly, we identify a winning strategy in global markets that does not rely on Schumpeterian innovation but on the management of network effects. The study also sheds new light on the received concept of liabilities of outsidership. While IB as a topical field of study should respond to contemporary business practices resulting from digital transformation in a timely manner, we show that these new phenomena confer valuable opportunities for the IB literature to remain relevant.

NOTE

[1] Hereafter, we refer to any new national market in which an ibusiness platform can potentially penetrate and diffuse as a *target* country.

[2] Expanding from the early focus on e-commerce corporations (de la Torre & Moxon, 2001), we theorize about and empirically analyze the more general set of ibusiness platforms. iBusinesses are similar to, but broader than, platform-mediated networks (Eisenmann, Parker, & Van Alstyne, 2011; McIntyre & Srinivasan, 2017) and multi-sided platforms (Hagiu, 2014), which specifically require direct contact between two or more distinct groups of network participants (e.g., end users and third-party developers), and which could operate in online as well as offline industries. Since users may concurrently assume multiple roles and participate on both sides of the market (Coviello et al., 2017), we do not explicitly differentiate between different groups of users but focus on the overall installed base in our theory and analysis. The theorization applies to both online communities and marketplaces as introduced by Brouthers et al. (2016).

[3] Our empirical testing traces user installed base, which presumably consists of individual end-users.

[4] In this paper, we set the level of analysis at the ibusiness platform, rather than the firm.

[5] A similar distinction has been notably made in the economics literature between autarky value (product benefit) and synchronization value (network effect) (Liebowitz & Margolis, 1996).

[6] For a platform product, users may also take into account the quality of network content (Zhu & Iansiti, 2012).

[7] For instance, Facebook saw daily mobile users exceed daily PC users in the fourth-quarter of 2012. CEO Mark Zuckerberg said that "in 2012, we connected over a billion people and became a mobile company". In 2014, over 400 million Facebook users only logged in with their mobile phones, and total monthly active mobile users reached more than 1 billion.

[8] Projections by Research2guidance in the report "mHealth App Developer Economics, 2014".

[9] We are grateful to an anonymous reviewer for this suggestion.

[10] See: http://www.businessinsider.com/the-story-of-apples-confusing-inconsistent-rules-for-app-developers-2013-4?IR=T, accessed June 2017.

[11] We thank editor and a reviewer for encouraging us to reflect on IB theories in view of our findings.

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Table 1: Geographic distribution of downloads of ibusiness apps

Country/Region	Downloads	Percentage	Country/Region	Downloads	Percentage	Country/Region	Downloads	Percentage
Argentina	44,245	0.46%	Hong Kong	592,966	6.10%	Portugal	19,610	0.20%
Australia	122,452	1.26%	Hungary	32,186	0.33%	Romania	17,399	0.18%
Austria	48,931	0.50%	India	189,663	1.95%	Russia	472,661	4.86%
Belgium	32,993	0.34%	Indonesia	47,418	0.49%	Saudi Arabia	20,163	0.21%
Brazil	80,853	0.83%	Ireland	22,182	0.23%	Singapore	378,123	3.89%
Canada	85,805	0.88%	Israel	11,771	0.12%	Spain	264,204	2.72%
Chile	96,981	1.00%	Italy	74,163	0.76%	Sweden	63,793	0.66%
China	2,994,420	30.82%	Japan	47,174	0.49%	Switzerland	23,162	0.24%
Colombia	36,168	0.37%	Korea	522,444	5.38%	Taiwan	210,717	2.17%
Croatia	6,921	0.07%	Kuwait	2,901	0.03%	Thailand	22,996	0.24%
Czechia	43,969	0.45%	Malaysia	112,195	1.15%	Turkey	37,999	0.39%
Denmark	32,555	0.34%	Mexico	127,663	1.31%	UAE	20,720	0.21%
Egypt	17,024	0.18%	Netherlands	13,174	0.14%	UK	566,293	5.83%
Finland	16,934	0.17%	New Zealand	51,788	0.53%	USA	1,704,583	17.54%
France	72,049	0.74%	Norway	22,627	0.23%	Venezuela	12,150	0.13%
Germany	201,579	2.07%	Philippines	13,777	0.14%	Vietnam	13,004	0.13%
Greece	16,190	0.17%	Poland	35,654	0.37%	**Total**	**9,717,392**	**100.00%**

Table 2: Descriptive statistics and correlation table

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. App penetration	0	0.04	1															
2. App price	0.51	13.4	0	1														
3. App size	42.11	38.46	0	0.01	1													
4. Language	0.27	0.44	0.01	0	-0.09	1												
5. Updates	5.11	3.79	-0.01	-0.03	0	-0.11	1											
6. Multihoming	0.5	0.5	0.01	-0.02	-0.05	-0.06	0.16	1										
7. Developer experience	3.78	11.7	0.01	-0.01	-0.09	0.1	-0.08	0.11	1									
8. Market size	0.05	0.11	0	0.01	-0.01	0.22	-0.06	0	0.01	1								
9. Industry concentration	0.01	0.04	0	0	0.01	-0.01	-0.09	0.02	-0.03	0	1							
10. Time zone	2.32	4.33	0	0	0	0.05	0	0.06	-0.01	-0.21	0.08	1						
11. Population	10.98	26.95	0	0	-0.01	0.1	0	0.01	-0.01	0.13	0.06	0.19	1					
12. GDP per capita	9.94	0.98	0.01	0	0.02	0.12	-0.02	-0.01	0.01	0.16	-0.01	-0.18	-0.43	1				
13. Foreign trade	26.99	0.98	-0.01	-0.01	-0.01	0.21	-0.01	0.03	0.02	0.38	0.08	0.12	0.41	0.27	1			
14. Psychic distance	1.51	1.93	0	0.01	-0.08	-0.19	0.08	-0.06	0.07	-0.06	0.03	0.16	0.36	-0.46	0.01	1		
15. App quality	0.54	1.28	0.02	-0.01	-0.12	0.07	0	0.08	-0.01	0.16	0	-0.07	0.01	0.09	0.13	-0.07	1	
16. Global installed base	94	101.92	-0.01	-0.03	-0.14	-0.12	0.54	-0.07	0.03	-0.03	-0.1	-0.02	0	0	0.03	0.16	0.07	1
17. Clout	0.44	1.03	0.01	0.06	0.01	0.02	-0.19	0.01	0.01	0.03	0.05	0	0	0	-0.01	-0.03	-0.01	-0.17

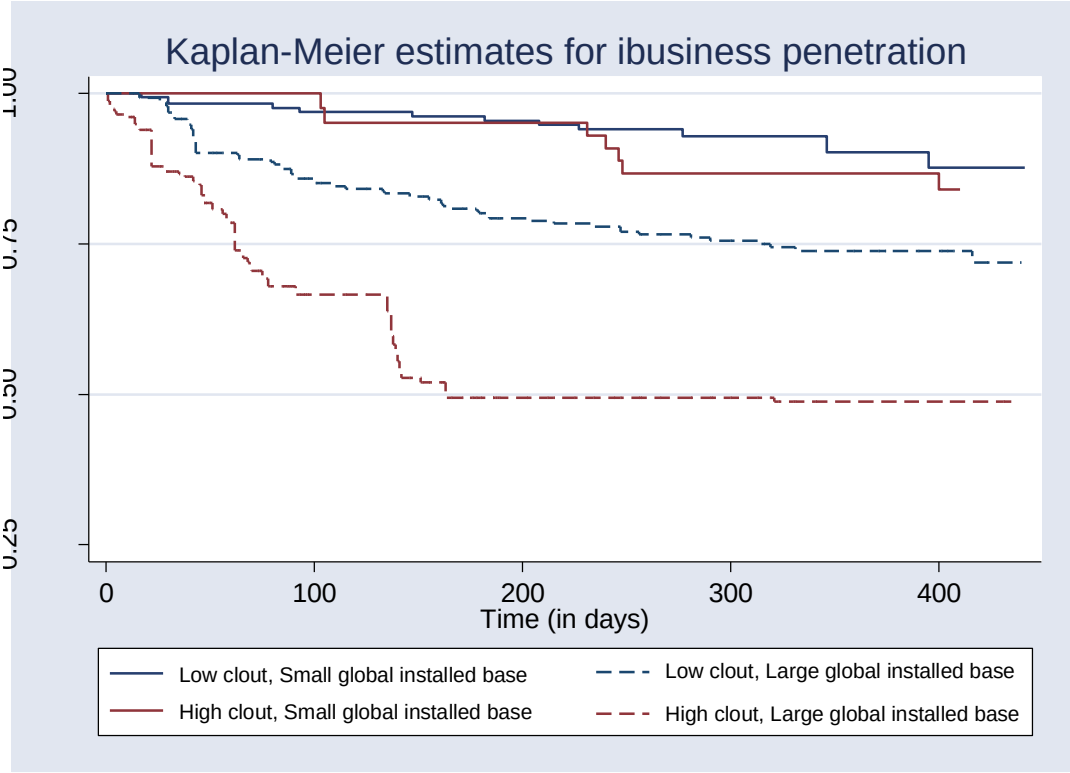
N=273,566

Table 3: Results for Cox proportional hazard model

Variables	Model 1 Controls	Model 2 Main Effects	Model 3 Interaction Effect
App price	-0.1300	-0.0134	-0.0094
	(0.1137)	(0.0949)	(0.0846)
App size	0.0028	0.0048	0.0045
	(0.0037)	(0.0031)	(0.0031)
Language	0.5025*	0.5190**	0.5081**
	(0.2183)	(0.1708)	(0.1713)
Updates	-0.0522	-0.0691	-0.0669
	(0.0550)	(0.0446)	(0.0436)
Multihoming	0.5536	0.4518	0.4215
	(0.3390)	(0.2865)	(0.2835)
Developer experience	0.0031	0.0033	0.0031
	(0.0093)	(0.0081)	(0.0081)
Market size	-0.1724	-0.8834	-0.8288
	(0.4026)	(0.5617)	(0.5343)
Industry concentration	0.5133	0.4007	0.4199
	(1.0472)	(1.3434)	(1.3366)
Time zone	-0.0172	-0.0139	-0.0129
	(0.0160)	(0.0143)	(0.0146)
Population	0.0008	0.0008	0.0008
	(0.0024)	(0.0023)	(0.0023)
GDP per capita	0.2092**	0.1416+	0.1422+
	(0.0740)	(0.0756)	(0.0753)
Foreign trade	-0.3013***	-0.3341***	-0.3341***
	(0.0890)	(0.0960)	(0.0951)
Psychic distance	0.0267	0.0028	0.0016
	(0.0769)	(0.0490)	(0.0492)
App quality		0.3673***	0.3658***
		(0.0557)	(0.0551)
Global installed base		0.0039+	0.0033
		(0.0021)	(0.0020)
Clout		0.1829**	0.1235
		(0.0666)	(0.0754)
Global installed base × Clout			0.0011*
			(0.0005)
Observations	273,566	273,566	273,566
Akaike information criterion (AIC)	4,552	4,392	4,389
Log pseudolikelihood	-2,263	-2,180	-2,178

Values are unstandardized regression coefficients with robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Figure 1


Kaplan-Meier estimates for ibusiness penetration
1.00
0.75
0.50
0.25
0
100
200
300
400
Time (in days)
Low clout, Small global installed base
High clout, Small global installed base
Low clout, Large global installed base
High clout, Large global installed base