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A Demand-Side View of Mobile Internet Adoption in the Global South

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Abstract

Mobile technologies show great potential to accelerate internet access and usage, especially in developing countries. A better understanding of key drivers and main constraints for mobile internet access is the first prerequisite for governments to design targeted policy solutions. This study exploits a household survey that collects information on information and communications technology access and usage at the household and individual levels in 22 countries in the Global South. The study finds that in addition to infrastructure investment, which has been the main focus of many developing countries, other demand-side factors are of critical importance. Across the developing world, females, the elderly, those who live in rural areas, and those who have a relatively low level of income or education are less likely to adopt mobile internet. Social network effects are found to have a significant positive impact on the usage of mobile internet. Those who have more close friends using an online social network are more likely to adopt mobile internet. Individuals whose five closest friends are using an online social network (such as Facebook or Twitter) are 63.1 percent more likely to adopt it than those without any close friends using such online social network sites/apps. Across regions, although the factors affecting the adoption of mobile internet remain largely the same, the magnitudes of their impacts vary. In Asia, gender differences are negatively associated with mobile internet. In Africa, the impact of education level is more salient than in the other two regions, implying an urgent need to improve digital literacy.

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A Demand-Side View of Mobile Internet Adoption in the Global South[1]

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Keywords: Internet adoption, mobile broadband, developing economy, digital gap.

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1. Introduction

Since its inception in the 1990s, the internet has transformed the ways people interact, businesses conduct commercial transactions, and governments deliver public services. Internet penetration—on both the supply side (infrastructure deployment) and demand side (user adoption)—continues to improve. International internet bandwidth nearly tripled between 2015 and 2019, to 466 terabytes per second.[2] The share of the global population using the internet increased from 8.0 percent in 2001 to 51.4 percent in 2018.[3] However, the penetration of fixed broadband internet is far from satisfactory in low-income countries, where, in 2018, fixed broadband subscriptions averaged 0.74 per 100 people.[4]

In this context, mobile technologies show great potential to accelerate internet access and usage. Global mobile cellular subscriptions increased more than 10 times—from 0.74 billion in 2000 to 7.9 billion in 2018.[5] In low- and middle-income countries, mobile cellular subscriptions also reached a relatively high level of 102 per 100 people in 2018.[6] (However, it is worth noting that the unique mobile subscriber penetration rate, as a share of population, was still as low as 45 percent in the Sub-Saharan Africa region in 2018.[7]) It is estimated that by 2020, 9 in 10 people will be covered by 3G networks that enable internet access from the palms of their hands (World Bank 2018). The increasing rate of mobile phone ownership in combination with expanding 3G network coverage promises to promote access to and usage of mobile internet.

Research findings have provided evidence on the development impacts of mobile internet access and usage. Katz and Callorda (2018) estimate that a 10 percent increase in mobile broadband penetration is associated with a 1.8 percent increase in gross domestic product (GDP) in middle-income countries, and a 2 percent increase in GDP in low-income countries. Mobile broadband coverage is also shown to have large and positive impacts on household consumption levels (Bahia et al. 2020). Mobile internet access and usage are also found to have a positive impact on people's happiness and well-being (GSMA and Gallup 2018) and women's empowerment (Bailur and Masiero 2017). It is argued that access to and usage of information and communication technology (ICT) reduce poverty, by fostering access to and exchange of information, and improving the transparency and accessibility of public services—all benefits that would also apply to mobile internet (Cecchini and Scott 2003; Roller and Waverman 2001; Waverman, Meschi, and Fuss 2005).

Despite the potential of mobile internet to help achieve development goals, there is a significant digital divide among and within countries. According to the Organisation for Economic Co-operation and Development, the digital divide refers to the "gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard to both their opportunities to access ICTs and to their use of the Internet for a wide variety of activities". According to the Global System for Mobile Communications (GSMA 2019a), those who are not connected through mobile internet are disproportionately rural, women, or illiterate. For instance, in developing countries, women still remain 10 percent less likely than men to own a mobile phone, and 23 percent less likely than men to use mobile internet services. Similarly, rural populations are 40 percent less likely to use mobile internet than urban populations (GSMA 2019b).

[2] TeleGeography.
[3] ITU statistics.
[4] World Development Indicators.
[5] World Development Indicators.
[6] World Development Indicators.
[7] Statista.com.

Some studies consider the factors affecting fixed-internet access and usage and other aspects of the digital divide. For instance, income, installation fees, and age are shown to be significant factors predicting fixed-internet usage (Birba and Diagne 2012; Cerno and Amaral 2006; Katz and Rice 2003). Other socioeconomic variables such as education, gender, locality and household size are also found to be drivers for internet adoption and usage in general. For instance, Goldfarb and Prince (2008) find that low income, less-educated people spend more time online. Similarly, Penard et al. (2012) and Penard et al (2015) find that education and computer literacy increase internet usage. Gilwald et al. (2018) provide evidence on lower internet adoption rate among women and those who live in rural areas. Other infrastructure factors such as increasing the distribution of electricity and improving competition in digital infrastructure are found to help promote the adoption of internet services (Armey and Hosman 2016; Rodriguez-Castelan et al. 2019).

However, with regards to mobile internet, existing studies have a few limitations. First, previous research has mainly focused on understanding the determinants of mobile phone ownership in developing countries. Education, employment status, and type of electricity are found to be important factors (Aker and Mbiti 2010; Björkegren 2019; Forenbacher et al. 2019; van Biljon and Kotzé 2007). Second, studies on mobile internet adoption tend to focus on the supply side, emphasizing technological aspects such as the efficient compression of images or data delivery (Kim and Kim 2002). Funk (2005) presents how certain technological products such as the push mail service and micropayment systems promote mobile internet adoption. Third, only specific country or regional data are used in the few studies analyzing the demand-side factors affecting mobile internet adoption. For instance, Srinuan, Srinuan, and Bohlin (2012) use data from Thailand to find that price, the availability of fixed telephony, and individuals' age and location are strong determinants of mobile internet adoption. Consumers' perspectives on service applications are also found to affect mobile internet adoption in Taiwan, China (Hsu, Lu, and Hsu 2007). Hasbi and Dubus (2020) provide evidence of the positive impact of being part of an online social community on mobile broadband use in Sub-Saharan Africa. Meanwhile, a cross-country/region analysis that presents commonalities and differences in how specific demand-side factors affect mobile internet adoption across developing countries is missing.

This study aims to (1) examine how socioeconomic variables and perception factors affect mobile internet adoption; and (2) compare differences in mobile internet adoption across different countries, regions, and demographic profiles from the demand side. The study adds to the literature in the following ways: (1) it is one of the first studies to explore determinants of mobile internet adoption in developing countries, (2) it uses nationally representative household-level data that follow a consistent methodology across countries allowing for cross-country comparisons, which is a rarity in the literature, and (3) it establishes a significant relationship between a few demand side variables and mobile internet adoption, which present significant policy implications. The study finds that demand-side factors are of critical importance for mobile internet adoption. Across the developing world, females, the elderly, those who live in rural areas, and those who have a relatively low level of income or education are less likely to adopt mobile internet. Social network effects are found to have a significant positive impact on the usage of mobile internet. In addition, across regions, although the factors affecting the adoption of mobile internet remain largely the same, the magnitude of their impacts vary.

The paper is organized as follows: section 2 outlines the study's conceptual framework. Section 3 describes the data used. Section 4 lays out the study's empirical strategy. Section 5 presents the results of several modeling exercises and explores alternate scenarios. The last section concludes and discusses policy implications.

2. Conceptual Framework

Information is critical to social and economic activities that constitute the development process. Efficiency, effectiveness, and equity all matter in leveraging information to promote development. Access and usage are among the first prerequisites to exploiting the potential of ICTs. Unequal levels of access and usage create a digital divide between individuals, households, businesses, and geographic areas at different socioeconomic levels.

The world's significant gap in ICT access and usage, despite broad awareness of their associated benefits, has driven researchers to examine determinants of the digital divide. As shown by Srinuan and Bohlin (2011) and Helbig, Gil-Garcia, and Ferro (2005), the determinants can be grouped into three categories: (1) physical infrastructure on the supply side; (2) socioeconomic factors on the demand side, such as income and education level; and (3) perspective factors on the demand side shaped by the institutional environment, culture, language, and network effects. This is also consistent with the framework proposed by van Dijk (2006), who argues that there is a cumulative and recursive model of digital technology adoption, starting with motivation, followed by physical/material access, subsequently requiring digital skills and complementary services (such as electricity) to achieve usage, leading to strengthened motivation and increased usage over time. A higher level of skills and more customized products could strengthen the initial motivation.

Much attention was devoted to the importance of physical infrastructure access following the technological determinism of the early 2000s (Jerome Lim 2002; Lentz and Oden 2001; Moss 2002). However, as the digital divide widened, despite expanding service coverage, many researchers explored other underlying socioeconomic factors affecting demand, such as literacy, education, income, and geography (Bagchi 2005; Gauld, Goldfinch, and Horsburgh 2010; Salajan, Schönwetter, and Cleghorn 2010). At a later stage, other social science disciplines came into play as the research on the digital divide evolved. One strand of the literature argues that psychological attitudes toward ICTs affect their adoption (Srinuan and Bohlin 2011; van Dijk 2006), while a second strand emphasizes the role of social networks in shaping perceptions and driving adoption, such as membership in occupational, religious, or cultural communities (Al-Jaghoub and Westrup 2009; Andrés et al. 2010).

The abovementioned studies focus on assessing the determinants of fixed-internet access and usage, many in developed countries. Nevertheless, the fixed internet and mobile internet are different in a variety of aspects such as the price of access devices, convenience of access, coverage and reliability of signal, connection speed, and so on. This paper will explore whether the three main determining factors behind the adoption of general ICTs apply to mobile internet as well. First, the physical infrastructure needed to access mobile internet at the level of 3G or above differs from the telephone or fixed-line broadband connections needed for fixed internet. Household access to electricity is essential for laptop usage with fixed connections, but people can charge mobile phones at other places outside the home, such as offices, community hotspots, or with neighbors. Second, socioeconomic factors such as income and education level might affect access to and usage of mobile internet differently than they do other types of ICTs. For instance, the cost of a mobile phone device is often less than that of a desktop computer. Many mobile network operators and technology firms (e.g., social media platforms) offer a variety of data promotion packages to attract potential customers, and mobile systems can be more intuitive and easier to learn. Third, in terms of perspective factors, with the recent booming of social media, it is argued that social network effects such as the desire to follow friends or family on social media mobile apps are of particular relevance to the access and usage of mobile internet.

Within a framework commonly used in the literature to assess the determinants of general ICT access and usage, this paper examines three sets of determining factors behind mobile internet adoption: (1) physical infrastructure (coverage by a 3G or above mobile network, and electricity access); (2) socioeconomic

factors such as gender, income level, location (urban/rural), education level, price of mobile data packages, price of internet-enabled phones, and so on; and (3) perspective factors shaped by the institutional environment, culture, and network effects.

3. Data

In 2017–18, ICT policy think tanks in the Global South, including RIA (Research ICT Africa), LIRNEasia (Learning Initiative for Network Economies in Asia), and DIRSI (el Diálogo Regional sobre la Sociedad de la Información / Regional Dialogue on the Information Society), coordinated a global initiative, conducting household surveys to collect information about ICT access and usage at household and individual levels. Ten African countries (Ghana, Kenya, Lesotho, Mozambique, Nigeria, Rwanda, Senegal, South Africa, Tanzania, and Uganda), six Asian[8] countries (India, Sri Lanka, Pakistan, Bangladesh, Nepal, and Cambodia), and six Latin American countries (Argentina, Colombia, Ecuador, Guatemala, Paraguay, and Peru) were covered (see Annex 1 for more survey methodology details).

Going beyond other microlevel data sets such as the Living Standards Measurement Study and the Global Findex database, this data set collects rich, in-depth information on ICT access and usage from the demand side. It provides valuable information on mobile phone ownership and usage, internet access and usage, social media activities, digital finance, participation in the gig/sharing economy, as well as the reasons for engaging in those ICT-enabled activities. The surveys are nationally representative, and the data can be disaggregated on the basis of gender, age, location (urban or rural), and income level.

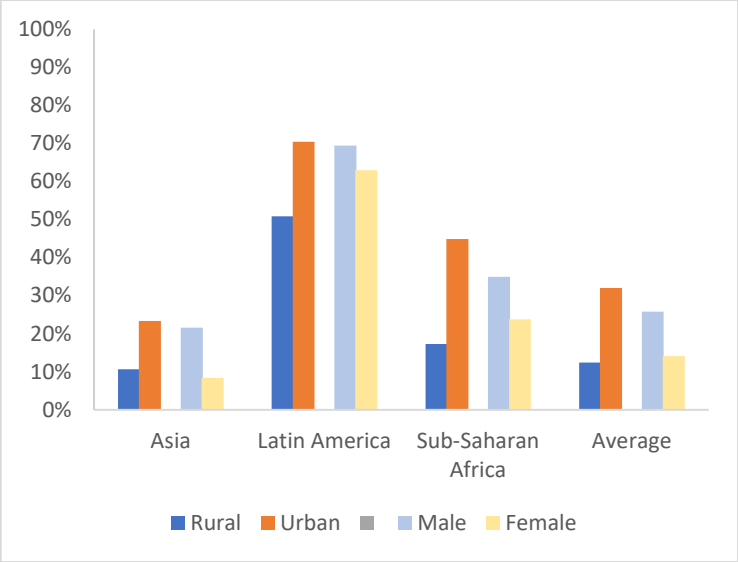
Unfortunately, there is no direct question on mobile internet adoption in the surveys. However, such usage can be captured through combining information gained through multiple survey questions regarding whether respondents: (1) have used the internet or not, (2) own a mobile phone, and (3) whether the type of mobile phone they own allows internet access. An individual is counted as using mobile internet if he or she has used the internet and also owns an internet-enabled phone.[9] Results show that Latin American countries have the highest rate of mobile internet adoption: 65.6 percent of the total population. The rural and urban divide is significant across all regions (figure 1), especially in Africa, where the adoption rate among urban residents is more than twice that among rural residents. Asian countries in the sample have the widest gender gap: only 8.4 percent of females used mobile internet in 2017. Those who are at the bottom 40 percent of the national income distribution have a lower adoption rate across regions, while the gap is minimal in Latin America.

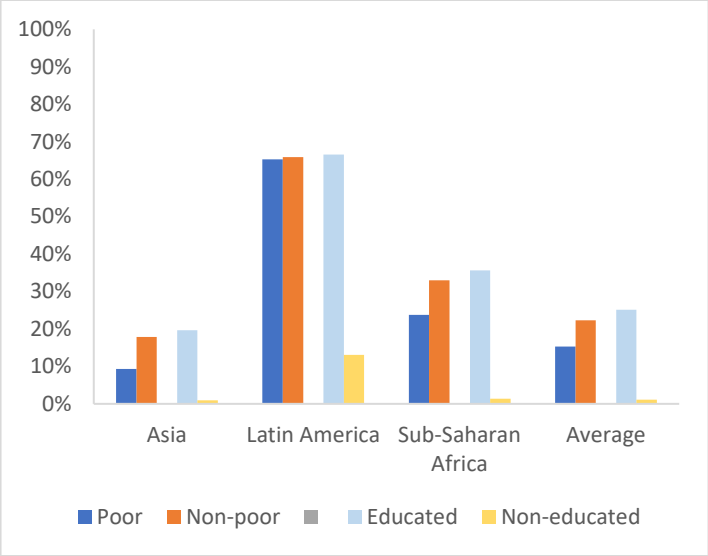
Figure 1. Mobile internet adoption, by subgroup, across regions (% of population)

a. Rural vs. urban and male vs. female **b. Poor vs. not and educated vs. not**

[8] The majority of the Asian countries covered in the sample are in South Asia.

[9] Internet-enabled phones include smartphones and feature phones. Admittedly, this constructed variable cannot completely rule out cases of individuals owning an internet-enabled phone who in fact accessed the internet through Wi-Fi–enabled fixed broadband. However, data from Telegeography show that household fixed-broadband penetration is low (at 13.5 percent) across countries in the sample; thus, such cases should be minimal. The estimated rate is as low as 3.6 percent among African countries, and 7.7 percent among the Asian countries covered.

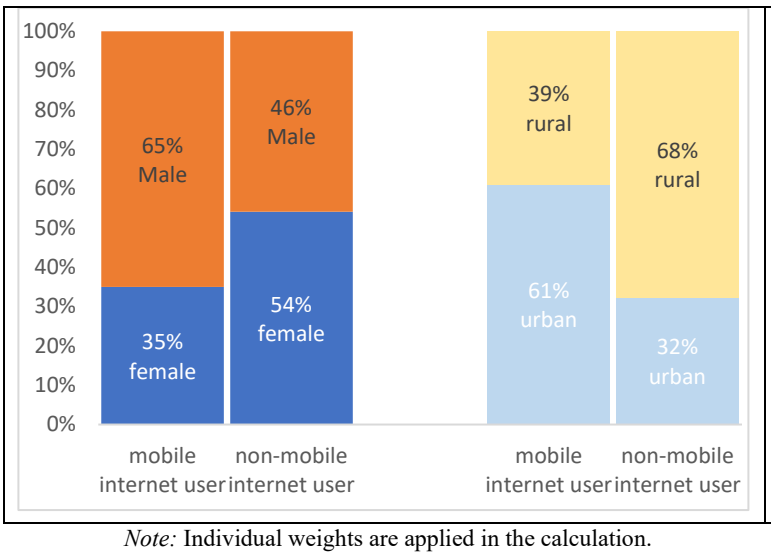


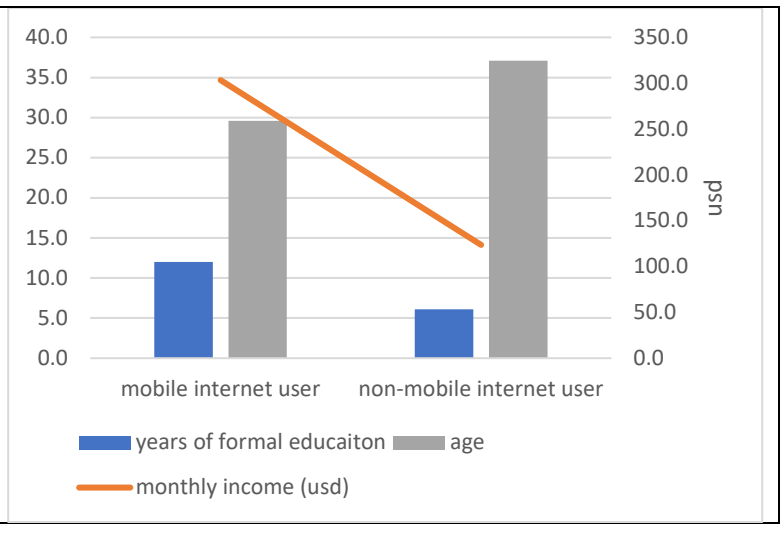


Note: Individuals who have completed at least primary education are grouped as "educated"; individuals who are in the bottom 40 percent of the national income distribution are classified as "poor." Individual weights are applied in the calculation.

The demographic profiles of mobile internet users and nonusers are notably different (figure 2). Across the countries covered in the sample, 54 percent of the nonusers are female, and 68 percent of them are living in rural areas, while the majority of mobile internet users are male and urban residents. The average age of mobile internet users is 29.6 while that of the nonusers is 37.1, indicating that the elderly lag behind in adopting new technologies. Mobile internet users tend to be more educated and wealthier than nonusers. The average number of years of formal education (12.0 years) of mobile internet users is almost twice that of the nonusers (6.1 years). Furthermore, 92 percent of mobile internet users have at least completed primary school, while more than half of the nonusers have either no formal education or have not completed their primary education. The monthly income of mobile internet users is $303.4, more than double that of nonusers at $123.6.

Figure 2. Demographic profiles of mobile internet users and nonusers

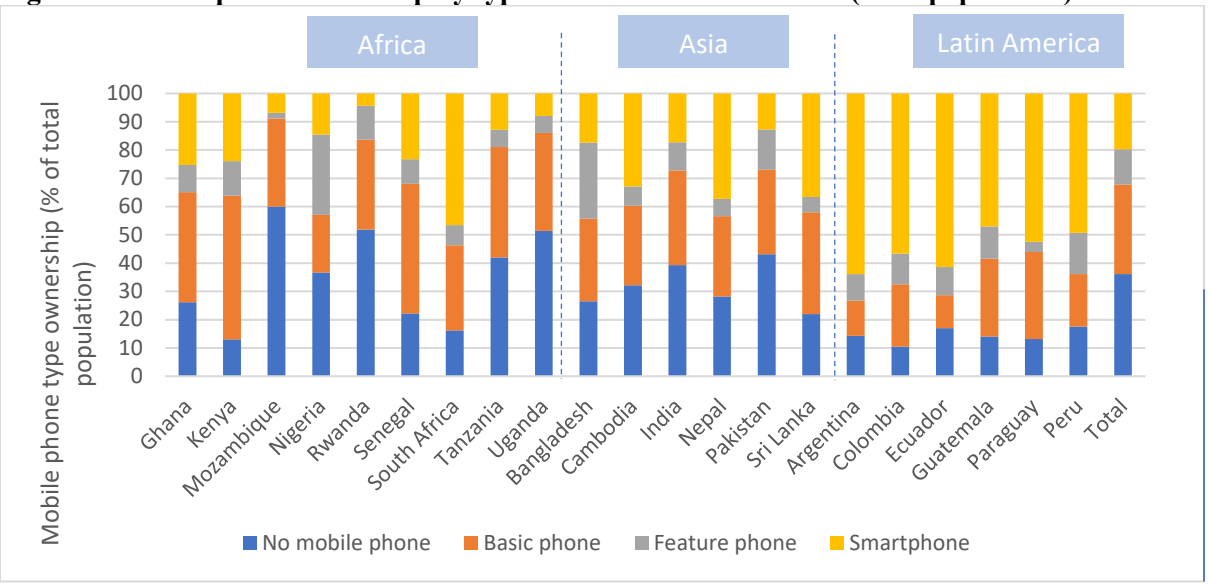




Note: Individual weights are applied in the calculation.

The analysis examines decision factors from two perspectives: owning an internet-enabled phone and using internet through the internet-enabled phone. Having an access device, or internet-enabled phone, is the first prerequisite to using mobile internet. More than half of the total population own a mobile phone in almost all the countries covered except for Mozambique, Rwanda, and Uganda (figure 3). There remains a significant divide between men (77.8 percent) versus women (50.4 percent), and urban (73.6 percent) versus rural residents (58.1 percent).

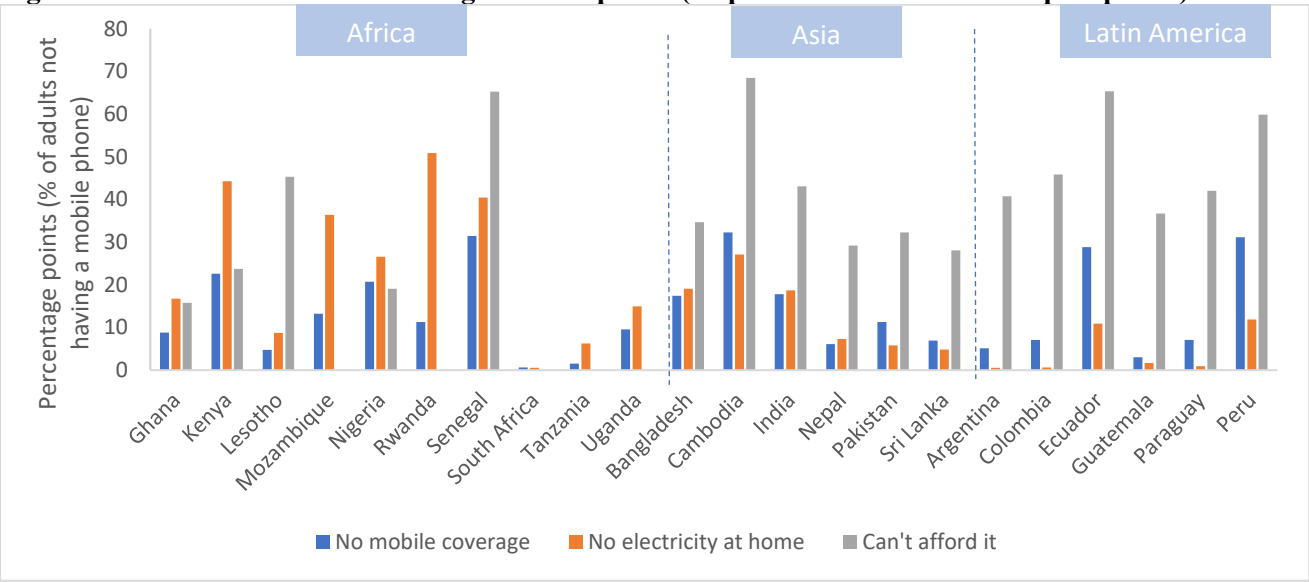
Figure 3. Mobile phone ownership by type across selected countries (% of population)



Note: Individual weights are applied in the calculation.

With regard to obstacles to owning a mobile phone, different reasons are cited such as affordability (39.3 percent), no mobile coverage (16.3 percent), and no electricity at home (17.7 percent). For those who do not have a mobile phone, affordability is a bottleneck across countries: 68.5 percent of those without a mobile phone in Cambodia cite affordability as such. The obstacle of electricity access is particularly severe in Africa (figure 4), especially in Rwanda (50.9 percent) and Senegal (40.4 percent). A lack of mobile coverage is challenging in Cambodia (32.3 percent), Peru (31.2 percent), and Senegal (31.5 percent).

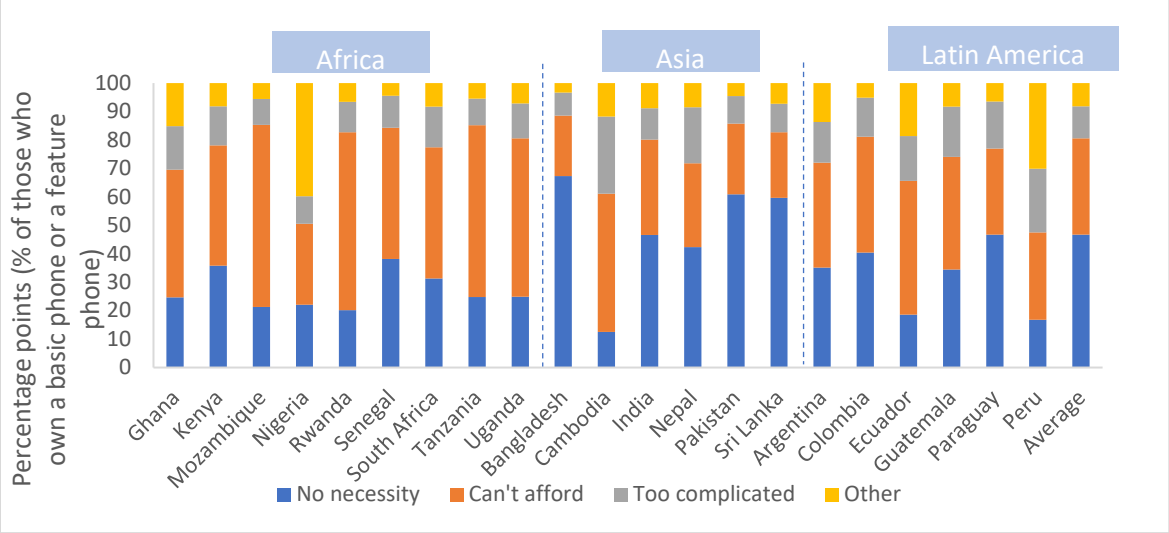
Figure 4. Reasons cited for not having a mobile phone (respondents can select multiple options)



Note: Individual weights are applied in the calculation.

Around 70 percent of those who own a mobile phone only have a basic or feature phone.[10] Overall, smartphone penetration is higher in Latin American and Asian countries than in African countries. For instance, among those who own a mobile phone, the percentage with a smartphone is above half in all Latin American countries in the sample, and close to half in Asian countries (48.5 percent in Cambodia, 51.8 percent in Nepal, and 47 percent in Sri Lanka). That a smartphone is not necessary and not affordable are the two most cited reasons for not having one (figure 5). The affordability obstacle is especially severe in Mozambique, Rwanda, and Tanzania.

Figure 5. Main reason cited for not choosing a smartphone among owners of a basic mobile phone (respondents can choose only one main reason)

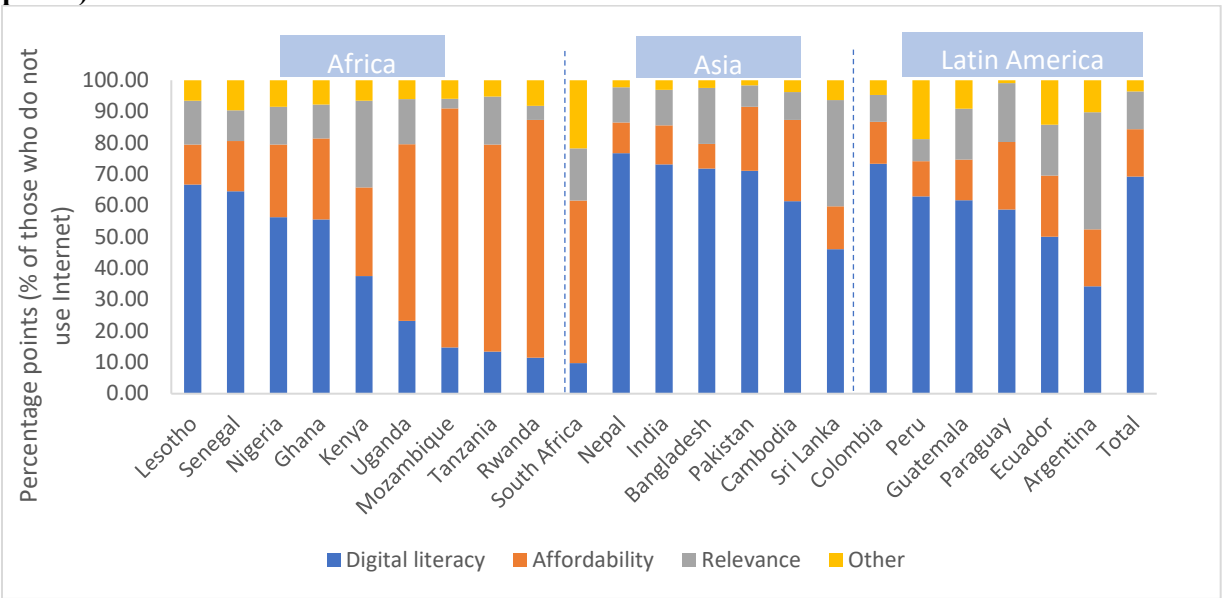


Note: Individual weights are applied in the calculation.

[10] Annex 2 contains detailed country-level information on smartphone ownership and smartphone uptake rates.

Besides owning an internet-enabled phone, individuals face challenges in accessing and using the internet. For those who do not use the internet at all, the most cited reasons relate to digital literacy, including "do not know what internet is" (58.9 percent) and "do not know how to use the internet" (10.1 percent) (figure 6). No access to a device (computer or mobile phone) is another internet usage constraint (11.5 percent). Other factors such as lack of content in the local language or data privacy concerns do not appear to be key obstacles. Among those who do actually use the internet, the extent of their usage is constrained primarily by lack of time, high data costs, and internet speed.

Figure 6. Main reason for not using the internet across the population as a whole (in percentage points)



Note: The digital literacy category includes "do not know what internet is" and "do not know how to use internet"; affordability includes "no access device" and "too expensive"; the relevance category includes "no interest/not useful" and "no relevant content in local language." Individual weights are applied in the calculation.

People also engage in various mobile internet activities. Survey results show that social networking apps are the most often used app type among people who have an internet-enabled phone. More than a quarter of internet-enabled phone owners use social networking apps daily. Average monthly expenditure on mobile phone data, as a percentage of total income, is 0.9 percent in all the countries covered. In a few countries, such as Sri Lanka, South Africa, and Ghana, monthly mobile data expenditure is more than 2 percent of monthly income—an affordability threshold set by the United Nations.[11] Meanwhile, male, urban residents and young people tend to spend more, which may be associated with their income and level of digital awareness.

Those who use the internet adopt different methods to save data charges, such as accessing the internet in a free Wi-Fi area (37.2 percent) or at home or at work (41.9 percent), and taking advantage of special data promotions (49.6 percent). Using special data promotions is the most popular method to save on data charges across countries. This may be related to not only the various promotion packages offered by mobile network operators, but also zero-rating plans offered by content providers such as Facebook.

[11] The United Nation's "1 for 2" threshold of internet affordability is defined as 1 gigabyte (GB) for no more than 2 percent of average monthly income. https://a4ai.org/affordable-internet-is-1-for-2.

4. Empirical Strategy

To further unravel the factors affecting mobile internet adoption, following the approach of Forenbacher et al. (2019) and Hasbi and Dubus (2020), this analysis tries to estimate the probability of using mobile internet through the following model:

$$\text{Mobile Internet}_i = \alpha + \beta_k x_{ik} + \ldots + \beta_k x_{ik} \quad (1)$$
$$k = 0,1,\ldots,m;\ i = 0,1,\ldots,n$$

where *Mobile Internet*$_i$ is a binary variable that equals 1 if individual *i* uses mobile internet, and 0 if not. Given that the dependent variable is a binary variable, a logit model is adopted for the estimation to predict the probability of an individual adopting mobile internet. By logarithmically transforming the outcome variable, it allows the examination of a nonlinear association in a linear way. The coefficient β_k measures, ceteris paribus, the effect of a one-unit change in x_{ik} on the dependent variable.

Following the conceptual framework, which categorizes factors affecting the digital divide into three groups, variables in the model include: (1) infrastructure factors (3G network coverage and household access to electricity); (2) socioeconomic factors such as gender, income level, education level, and rural/urban location; and (3) social network effects (table 1). Those factors also reflect what the descriptive statistics show to be the main obstacles to owning an internet-enabled phone or using internet, as outlined in the data section above.

Infrastructure factors include whether an individual's location is covered by a 3G mobile network signal, and whether the individual's household has access to electricity. Whether an address is covered by a 3G mobile signal is identified by mapping the household survey data (which feature GPS location data at the individual level) with the global mobile network coverage data from the Collins Bartholomew data set.[12] Socioeconomic factors include gender, age, education level, income level, marital status, and urban/rural location. Demographic information at the individual level is taken directly from the household survey. Lastly, the number of close friends using an online social network like Facebook or Twitter is used as a proxy for social network effects.

Though three waves of data were collected in years 2008, 2012, and 2017, the survey samples were different in each wave, so no panel is available. Given the rapid pace of change in the ICT sector, analysis is confined to the most recently available data for the year 2017, based on cross-sectional estimation.

Table 1. Data description

Variable	Definition, Year	Source
Dependent variable		
Mobile internet	Accessing the internet through a smartphone or feature phone	After Access data, 2017
Infrastructure variable		
3G network coverage	The individual's household is covered by a 3G mobile network signal	After Access data, 2017; Collins Bartholomew data, 2017

[12] Not all countries have geolocation data at the individual/household level in the ICT household survey. For countries that do not have geolocation data at the individual/household level, a household is considered as not having a 3G mobile network coverage if anyone from the same survey enumerator area identified a lack of mobile coverage as an obstacle to accessing the internet.

Electricity access	The individual's household has access to electricity	After Access data, 2017
Socioeconomic variables		
Female	Respondent is female, 2017	After Access data, 2017
Age group (1-3)	Respondent's age group, 2017 (1 stands for young people, 15-30 years old; 2 stands for middle-age people, 30-60 years old; 3 stands for elderly people, >60 years old)	
Education (1–5)	Respondent's education level, 2017 (1 stands for no formal education; 2 stands for less than 6 years of formal education; 3 stands for more than 6 but less than 12 years of formal education; 4 stands for more than 12 but less than 16 years of formal education; 5 stands for more than 16 years of formal education)	
Log value of monthly income	Log value of the individual's monthly income in USD	
Married	Individual is married	
Urban	Individual resides in an urban area	
Social network effect		
Close friend (0–5)	The number (up to 5) of the respondents' closest friends who use an online social network like Facebook or Twitter (0 refers to no close friend and 5 refers to all five closest friends)	After Access Data, 2017

Table 2. Data summary

	Mean	SD	Min	Max
Mobile internet	0.338	0.473	0	1
Household 3G network coverage	0.909	0.288	0	1
Household having access to electricity	0.843	0.364	0	1
Female	0.563	0.496	0	1
Age group (1-3)	1.695	0.632	1	3
Log value of monthly income	4.709	1.411	-6.274	11.353
Married	0.558	0.497	0	1
Urban residence	0.541	0.510	0	2
Education level (1-5)	2.740	1.035	1	5
Number of closest friends using online social networks (e.g. Facebook/Twitter (0–5)	2.072	2.211	0	5

5. Results

The results section first presents the results from the basic model (1) specification applied to the entire sample and conducts the checks for robustness. The impact of several alternative modeling strategies is then explored, including disaggregation of the sample by geographic region, and the impact of alternative ways of modeling the influence of income on uptake decisions.

5.1 Factors affecting mobile internet adoption in the Global South

Estimations show that factors affecting the adoption of mobile internet are largely consistent with those that affect other types of digital divides (table 3). Among infrastructure factors, having access to electricity at

the household level is found to significantly improve the likelihood of mobile internet adoption. Socioeconomic factors such as gender, age, income, and education level all have a significant impact on the usage of mobile internet. Females, the elderly, those who live in rural areas, and those who have lower levels of income or education are less likely to adopt mobile internet. Social network effects have a significant positive impact on the usage of mobile internet.[13] Individuals whose five closest friends are using an online social network (e.g., Facebook, Twitter) are 63.1 percent more likely to use the mobile internet than those who do not have any close friends using such online social network sites/apps.

Table 3. Logit regression results on mobile internet adoption

Model	Logit	
	Mobile internet adoption	
	Coefficient	Marginal effects
Infrastructure factors		
Household 3G network coverage	0.188**	0.039**
	(0.085)	(0.017)
Household having access to electricity	0.759***	0.143***
	(0.110)	(0.017)
Social-economic factors		
Female	-0.142***	-0.031***
	(0.044)	(0.010)
Age group (middle age, 30-60)	-0.695***	-0.150***
	(0.048)	(0.010)
Age group (old people, >60)	-1.985***	-0.282***
	(0.109)	(0.009)
Log value of monthly income	0.195***	0.042***
	(0.018)	(0.004)
Married	-0.138***	-0.030***
	(0.049)	(0.011)
Urban	0.378***	0.081***
	(0.046)	(0.010)
Years of formal education (less than 6)	0.676***	0.155***
	(0.124)	(0.029)
Years of formal education (6-12)	1.603***	0.347***
	(0.118)	(0.024)
Years of formal education (12-16)	2.388***	0.535***
	(0.125)	(0.022)
Years of formal education (>16)	2.551***	0.552***
	(0.139)	(0.020)
Network effects		
1 close friend uses an online social network	1.461***	0.349***

[13] It is also worth noting that the adjusted R2 decreases from 0.448 to 0.346 if the variable "how many close friends are using an online social network" is removed from the model.

	(0.087)	(0.020)
2 close friends use an online social network	1.335***	0.319***
	(0.076)	(0.018)
3 close friends use an online social network	1.791***	0.420***
	(0.076)	(0.016)
4 close friends use an online social network	2.115***	0.480***
	(0.096)	(0.017)
5 close friends use an online social network	3.049***	0.631***
	(0.064)	(0.010)
_cons	-4.287***	
	(0.225)	
Country fixed effects	Yes	Yes
Number of observations	19,979	19,979
R2		
Adjusted R2	0.448	0.448

Note: *** p<0.01, ** p<0.05, * p<0.1. Marginal effects at mean are presented.

To evaluate the validity of model (1), a Hosmer–Lemeshow goodness-of-fit test is conducted after the estimation. Given the large number of observations, the test is conducted with 100 groups. A p-value of 0.7387 of the Pearson chi-square from the Hosmer and Lemeshow's goodness-of-fit test indicates that the model fits the data well. Furthermore, to detect if any potential observations have a significant impact on the model, model (1) is retested by excluding observations with Pearson residual value more than 2, deviance residual value more than 2, and leverage value more than 3 times the average leverage. The sign and significance of the coefficient of different factors affecting mobile internet adoption are still retained after excluding those observations.

5.2 Differences in factors affecting mobile internet adoption across regions

Results are slightly different if model (1) is estimated for each region separately (table 4). Among the infrastructure factors, 3G network coverage's impact is significant in Asia, and the impact of household access to electricity is particularly high in Africa and Latin America. In terms of socioeconomic factors, gender significantly affects the adoption of mobile internet in Asian countries, showing potential gender inequality in digital access and usage in the region. In Asia, married people tend not to use mobile internet as much as others. Residence in a rural or urban location has a significant impact in African and Latin American countries. Income level's impact is significant in Africa and Asia. The effects of education level are particularly salient in Africa, implying the region's needs to improve digital literacy.

Table 4. Logit regression results for mobile internet adoption by region

Model	Logit			
	Marginal effects			
	All region	Africa	Latin America	Asia
Infrastructure factors				
Household 3G network coverage	0.039**	0.012	0.053	0.037**
	(0.017)	(0.021)	(0.046)	(0.018)
Household having access to electricity	0.143***	0.106***	0.229	0.070**
	(0.017)	(0.016)	(0.149)	(0.028)
Social-economic factors				
Female	-0.031***	-0.020*	-0.002	-0.042***
	(0.010)	(0.012)	(0.016)	(0.012)
Age group (middle age, 30-60)	-0.150***	-0.112***	-0.174***	-0.099***
	(0.010)	(0.014)	(0.018)	(0.014)
Age group (old people, >60)	-0.282***	-0.153***	-0.538***	-0.148***
	(0.009)	(0.016)	(0.025)	(0.013)
Log value of monthly income	0.042***	0.037***	0.015***	0.048***
	(0.004)	(0.005)	(0.006)	(0.006)
Married	-0.030***	0.000	-0.034*	-0.062***
	(0.011)	(0.013)	(0.018)	(0.017)
Urban	0.081***	0.069***	0.084***	0.049***
	(0.010)	(0.013)	(0.019)	(0.011)
Years of formal education (less than 6)	0.155***	0.093**	0.119**	0.142***
	(0.029)	(0.037)	(0.057)	(0.039)
Years of formal education (6-12)	0.347***	0.269***	0.321***	0.267***
	(0.024)	(0.029)	(0.060)	(0.034)
Years of formal education (12-16)	0.535***	0.491***	0.344***	0.511***
	(0.022)	(0.035)	(0.034)	(0.047)
Years of formal education (>16)	0.552***	0.583***	0.296***	0.466***
	(0.020)	(0.035)	(0.019)	(0.052)
Network effects				
1 close friend uses an online social network	0.349***	0.391***	0.156***	0.257***
	(0.020)	(0.030)	(0.028)	(0.034)
2 close friends use an online social network	0.319***	0.298***	0.167***	0.272***
	(0.018)	(0.027)	(0.024)	(0.029)
3 close friends use an online social network	0.420***	0.427***	0.202***	0.384***
	(0.016)	(0.026)	(0.020)	(0.030)
4 close friends use an online social network	0.480***	0.492***	0.227***	0.480***
	(0.017)	(0.032)	(0.018)	(0.036)
5 close friends use an online social network	0.631***	0.666***	0.555***	0.553***

	(0.010)	(0.015)	(0.027)	(0.020)
Number of observations	19,979	8,068	5,469	6,442
R2				
Adjusted R2	0.448	0.454	0.366	0.394

Note: *** p<0.01, ** p<0.05, * p<0.1. Marginal effects at mean are presented.

5.3 Alternative way of modeling the influence of income

Model (1) includes the income variable, which is an important explanatory factor for ICT adoption in general according to the literature. Individuals' income level could affect their decisions to purchase an Internet-enabled phone, and afford mobile data packages to access internet, which jointly have an impact on the decision of mobile internet adoption. To further unpack the impact of income on affordability, the analysis tries an alternative specification with inclusion of a few affordability dummies while other co-variates remain the same. To understand how the prices of mobile data packages affect the adoption of mobile internet, the analysis considers a country's average cost per 1 gigabyte (GB) of mobile data, and constructs a dummy variable that equals 1 if the country's average cost per 1 GB of mobile data is more than 2 percent of the individual's monthly income. Moreover, since the affordability of an access device is often cited as an obstacle to internet usage, the analysis uses data about a country's average cost of an internet-enabled phone from International Data Corporation (IDC) and constructs a dummy variable that equals 1 if the average phone cost is more than the individual's monthly income. Due to collinearity concerns, the inclusion of these affordability measures precludes the incorporation of the income variable directly.

Results confirm the important role of affordability issues in driving mobile internet adoption. The high cost of mobile data packages and expensive mobile phones negatively affect the adoption of mobile internet. If the country's average cost per 1 GB of mobile data is more than 2 percent of an individual's monthly income, that individual is 5 percent less likely to adopt mobile internet. If the country's average cost of an internet-enabled phone is more than an individual's monthly income, that individual is 4 percent less likely to adopt mobile internet. Meanwhile, the sign and level of significance of other variables in model (1) remain largely similar (see tables 5 and 3). For instance, under both the original and new model specifications, if the individual's residence has access to electricity, he or she is 14 percent more likely to use mobile internet; and urban residents are 8 percent more likely to use mobile internet. With regard to education level, the impacts of completing primary and secondary education remain largely the same, while the impact of completing tertiary education is at a higher level in the new model specification. Individuals who have completed tertiary education are 61.2 percent more likely than those with no formal education to use mobile internet, while the impact level is 55.2 percent in model (1). Finally, the overall explanatory power of the regression is slightly lower when income is used (0.45) than when the two affordability dummies are used (0.47).

Table 5. Logit regression results with different treatment of the income variable

Model	Logit	
	Mobile internet usage	
	Coefficient	Marginal effects
Infrastructure factors		
Household 3G network coverage	0.180*	0.037*
	(0.108)	(0.022)
Household having access to electricity	0.770***	0.142***

	(0.121)	(0.018)
Social-economic factors		
Female	-0.235***	-0.050***
	(0.049)	(0.010)
Age group (middle age, 30-60)	-0.709***	-0.150***
	(0.054)	(0.011)
Age group (old people, >60)	-1.914***	-0.268***
	(0.118)	(0.010)
Married	-0.130**	-0.028**
	(0.055)	(0.012)
Urban	0.362***	0.076***
	(0.052)	(0.011)
Years of formal education (less than 6)	0.801***	0.185***
	(0.164)	(0.039)
Years of formal education (6-12)	1.743***	0.365***
	(0.154)	(0.029)
Years of formal education (12-16)	2.541***	0.561***
	(0.161)	(0.028)
Years of formal education (>16)	3.016***	0.612***
	(0.182)	(0.021)
High cost of internet-enabled phone	-0.189***	-0.040***
	(0.071)	(0.015)
High cost of mobile data package	-0.226***	-0.048***
	(0.074)	(0.016)
Network effects		
1 close friend uses an online social network	1.577***	0.374***
	(0.097)	(0.021)
2 close friends use an online social network	1.416***	0.337***
	(0.086)	(0.020)
3 close friends use an online social network	1.797***	0.421***
	(0.086)	(0.018)
4 close friends use an online social network	2.205***	0.497***
	(0.110)	(0.019)
5 close friends use an online social network	3.073***	0.631***
	(0.072)	(0.011)
_cons	-3.119***	
	(0.250)	
Number of observations	16,591	16,591
R2		
Adjusted R2	0.466	0.466

Note: *** p<0.01, ** p<0.05, * p<0.1. Marginal effects at mean are presented.

6. Conclusion

As digital technologies penetrate various aspects of social and economic life, having access to affordable and reliable internet becomes essential for individuals to stay connected with their social networks, efficiently engage in online economic activities, and better receive public services. The United Nations Sustainable Development Goals set the target (9.c) to "significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020." A better understanding of key drivers and main constraints for internet access is the first prerequisite for governments to design targeted policy solutions.

Results from the study show that besides infrastructure investment, which has been the main focus of many developing countries, other demand-side factors are of critical importance. Across the developing world, females, the elderly, those who live in rural areas, and those who have a relatively low level of income or education are less likely to adopt mobile internet. Therefore, policy measures targeted at reducing gender inequality and the urban/rural divide could support wider adoption of mobile internet. Enhancing education levels to increase people's awareness of the benefits of being digitally connected could also positively affect mobile internet adoption. Among infrastructure factors, having access to electricity at the household level is significantly associated with mobile internet adoption, particularly owning an internet-enabled phone. 3G network coverage remains to be a significant factor, especially in Asia.

Moreover, social network effects are found to have a significant positive impact on the usage of mobile internet. Those who have more close friends using an online social network are more likely to adopt mobile internet. Individuals whose five closest friends are using an online social network (e.g., Facebook, Twitter) are 63.1 percent more likely to adopt it than those without any close friends using such online social network sites/apps. Collaborating with different firms across social media platforms to leverage these positive social network effects is one route to reduce the digital divide in mobile internet connections.

Lastly, income is a strong driver of mobile internet adoption in its own right. Moreover, the high cost of smartphones and mobile data packages negatively affects the adoption of mobile internet. It is estimated that if a country's average cost for 1 GB of mobile data is more than 2 percent of an individual's monthly income, that individual is 5 percent less likely to adopt mobile internet. If the country's average cost of an internet-enabled phone is more than the individual's monthly income, that individual is 4 percent less likely to adopt mobile internet. This implies the necessity to create a competitive market with multiple players offering data packages at affordable prices, and to take measures to reduce the retail cost of smartphones.

Across regions, although the factors affecting the adoption of mobile internet remain largely the same, the magnitude of their impacts vary. In Asia, gender differences are negatively associated with mobile internet in the region. In Africa, the impact of education level is more salient than the other two regions, implying an urgent need to improve digital literacy.

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Annexes

Annex 1. Survey methodology

The three think tanks, including RIA (Research ICT Africa), LIRNEasia (Learning Initiative for Network Economies in Asia), and DIRSI (el Diálogo Regional sobre la Sociedad de la Información / Regional Dialogue on the Information Society), conducted the survey separately in 2017/2018. They adopted the same questionnaire and sampling methodology. The random sampling is based on a Census sample. A Census divides a country into Enumerator Areas (EAs) which roughly have a household density of 200. The desired level of accuracy for the survey was set to a confidence level of 95% and a margin of error of 5%, which yields a minimum sample size per tabulation group of 385. Weights at household level and individual level are calculated based on the inverse selection probabilities and I gross up the data to the national level when applied.

Annex 2. Mobile Phone Ownership (%)

Country	Male	Female	Rural	Urban	Elderly	Young	Non-poor	Poor	No formal education	Years of formal education (less than 6)	Years of formal education (6–12)	Years of formal education (12–16)	Total
Argentina	84	87	94	86	81	92	85	86	51	59	85	93	86
Bangladesh	87	58	72	78	71	75	78	64	62	70	80	97	74
Cambodia	78	62	64	81	64	71	76	56	41	63	78	90	68
Colombia	89	90	84	92	90	89	92	87	61	84	90	95	90
Ecuador	84	83	78	86	84	82	82	85	44	73	83	84	83
Ghana	81	67	62	84	72	75	84	58	52	70	80	90	74
Guatemala	90	82	85	87	83	88	89	81	75	80	88	96	86
India	79	43	55	71	59	62	67	47	37	57	67	86	61
Kenya	92	83	85	93	88	86	93	79	58	76	84	98	87
Lesotho	80	78	72	87	74	83	82	74	49	64	82	92	79
Mozambique	50	32	33	55	43	39	57	16	22	33	60	93	40
Nepal	80	65	65	76	64	78	70	82	n.a.	75	85	96	72
Nigeria	70	57	54	78	67	61	74	48	25	56	77	93	63
Pakistan	68	43	56	59	64	53	74	33	39	59	74	87	57
Paraguay	89	85	81	90	84	91	92	80	66	78	91	98	87
Peru	86	80	80	83	81	83	88	76	n.a.	66	80	90	82
Rwanda	60	37	45	61	51	46	63	28	23	47	62	92	48
Senegal	81	74	72	84	76	79	82	71	67	86	82	96	78

South Africa	83	85	80	86	85	83	85	82	62	74	84	97	84
Sri Lanka	86	72	77	84	76	82	85	67	32	57	77	94	78
Tanzania	64	53	51	74	63	55	75	33	26	41	62	93	59
Uganda	58	40	44	64	54	46	66	24	23	41	50	89	49
Total	78	50	58	73	64	64	71	50	39	59	71	89	64

Annex 3. Smartphone (%)

Country	Male	Female	Rural	Urban	Elderly	Young	Non-poor	Poor	No formal education	Years of formal education (less than 6)	Years of formal education (6–12)	Years of formal education (12–16)	Total
Argentina_3g	100	100	100	100	100	100	100	100	100	100	100	100	100
Argentina_smartphone ownership	62	66	74	64	52	79	60	70	13	23	62	77	64
Argentina_smartphone uptake	62	66	74	64	52	79	60	70	13	23	62	77	64
Bangladesh_3g	97	96	97	96	97	96	96	98	94	98	97	100	97
Bangladesh_smartphone ownership	22	12	16	21	10	23	19	14	4	10	25	47	17
Bangladesh_smartphone uptake	23	12	16	21	10	23	19	14	5	10	25	47	18
Cambodia_3g	80	82	81	82	78	84	81	81	86	80	81	76	81
Cambodia_smartphone ownership	40	28	28	48	19	46	39	24	9	19	48	73	33
Cambodia_smartphone uptake	42	30	29	49	20	47	40	25	9	20	50	75	34
Colombia_3g	99	100	100	100	100	100	100	100	97	99	100	100	100
Colombia_smartphone ownership	56	57	50	60	42	69	64	48	3	25	60	81	57
Colombia_smartphone uptake	56	57	50	60	43	69	64	48	3	25	60	81	57
Ecuador_3g	94	95	87	99	94	96	95	96	100	93	94	96	95
Ecuador_smartphone ownership	65	59	57	64	47	71	61	62	0	31	62	75	61
Ecuador_smartphone uptake	65	59	55	64	47	71	61	62	0	30	61	74	61
Ghana_3g	73	83	54	98	79	78	85	69	70	81	77	91	78
Ghana_smartphone ownership	29	22	16	33	16	32	32	16	4	9	27	60	25
Ghana_smartphone uptake	33	26	19	34	20	36	35	17	5	7	32	60	29
Guatemala_3g	97	98	96	99	98	97	98	96	99	97	98	97	97

Guatemala_smartphone ownership	56	39	45	49	28	62	47	47	17	30	55	72	47	
Guatemala_smartphone uptake	56	39	45	49	28	61	47	47	17	29	55	72	47	
India_3g	93	95	95	91	94	94	94	94	95	96	92	94	94	
India_smartphone ownership	25	10	11	28	9	24	20	11	1	8	19	53	17	
India_smartphone uptake	25	10	11	28	9	24	20	11	1	8	19	54	17	
Kenya_3g	76	69	65	92	68	74	77	64	37	69	68	82	72	
Kenya_smartphone ownership	29	20	14	51	15	30	33	11	1	3	12	44	24	
Kenya_smartphone uptake	33	23	16	50	17	33	35	15	2	4	16	44	28	
Lesotho_3g	74	73	77	63	76	71	72	75	74	73	73	72	73	
Lesotho_smartphone ownership	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Lesotho_smartphone uptake	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Mozambique_3g	93	94	94	93	93	94	94	94	93	94	95	86	94	
Mozambique_smartphone ownership	9	5	2	17	4	8	10	2	0	1	16	49	7	
Mozambique_smartphone uptake	9	4	2	16	4	8	10	2	0	1	15	50	7	
Nepal_3g	98	95	96	97	96	97	96	98		95	97	97	97	
Nepal_smartphone ownership	44	31	30	41	21	50	37	40		23	53	79	37	
Nepal_smartphone uptake	45	31	30	42	22	50	37	41		24	54	80	38	
Nigeria_3g	72	73	58	94	72	72	73	71	46	72	83	84	72	
Nigeria_smartphone ownership	18	11	9	23	12	16	16	12	1	1	17	36	15	
Nigeria_smartphone uptake	22	14	12	23	14	20	20	14	1	1	19	35	18	
Pakistan_3g	93	92	92	94	93	92	94	91	93	97	88	91	93	
Pakistan_smartphone ownership	14	11	9	19	15	11	17	7	3	10	21	50	13	
Pakistan_smartphone uptake	14	10	8	20	15	11	17	7	3	11	21	53	13	
Paraguay_3g	88	88	75	96	87	89	90	85	77	84	90	94	88	
Paraguay_smartphone ownership	51	53	37	61	36	77	59	44	11	23	69	87	52	
Paraguay_smartphone uptake	54	54	37	62	38	78	60	46	15	24	69	88	54	
Peru_3g	99	99	97	100	99	100	99	99		98	99	99	99	
Peru_smartphone ownership	52	48	30	55	36	61	54	44		12	48	61	49	
Peru_smartphone uptake	52	48	29	55	36	61	54	44		11	48	61	49	

Rwanda_3g	100	100	100	100	100	100	100	100	100	100	100	100	100
Rwanda_smartphone ownership	5	3	1	16	3	5	7	1	1	1	4	53	4
Rwanda_smartphone uptake	5	3	1	16	3	5	7	1	1	1	4	53	4
Senegal_3g	80	83	77	87	81	82	85	77	81	81	80	83	82
Senegal_smartphone ownership	29	17	17	30	15	31	27	18	8	18	29	64	23
Senegal_smartphone uptake	31	20	20	32	17	33	29	21	9	21	31	69	26
South Africa_3g	89	89	86	90	89	89	90	87	88	81	89	94	89
South Africa_smartphone ownership	50	44	33	54	38	56	46	47	13	12	48	78	47
South Africa_smartphone uptake	51	46	33	56	39	57	49	47	14	10	50	78	48
Sri Lanka_3g	100	100	100	100	100	100	100	100	100	100	100	100	100
Sri Lanka_smartphone ownership	45	30	35	45	23	57	42	28	3	6	33	62	37
Sri Lanka_smartphone uptake	45	31	34	47	22	58	42	30	4	7	32	62	37
Tanzania_3g	98	97	96	100	97	97	98	96	87	96	99	100	97
Tanzania_smartphone ownership	15	11	5	29	8	16	19	4	0	1	10	71	13
Tanzania_smartphone uptake	16	11	5	29	8	17	19	4	0	2	10	71	13
Uganda_3g	90	94	92	95	94	91	92	92	94	92	92	91	92
Uganda_smartphone ownership	9	7	3	23	5	10	12	2	0	1	6	36	8
Uganda_smartphone uptake	9	7	3	24	4	11	12	2	0	1	6	36	8
Total_3g	91	92	91	93	92	91	92	91	89	94	92	93	92
Total_smartphone ownership	25	15	13	32	13	25	23	14	2	8	23	54	20
Total_smartphone uptake	25	15	13	32	13	25	23	15	2	9	23	55	20

Note: Smartphone ownership reflects the ownership rate of the entire population. The uptake rate refers to the ownership rate for the subpopulation covered by 3G.

Annex 4. Internet Usage Ratio

Internet Usage by Country and Subgroup

Country	Total	Male	Female	Rural	Urban	Elderly	Young	No formal education	Years of formal education (less than 6)	Years of formal education (6–12)	Years of formal education (12–16)
Argentina	79	80	78	79	79	66	96	9	29	79	93
Bangladesh	13	18	7	11	19	6	18	2	4	20	47
Cambodia	40	47	34	34	57	21	56	6	21	57	85
Colombia	77	77	78	72	80	58	94	8	38	88	98
Ecuador	80	85	77	76	82	61	93	19	40	84	94
Ghana	26	31	21	15	35	13	36	1	9	29	63
Guatemala	62	70	55	58	66	36	81	17	33	78	92
India	19	26	11	14	27	8	28	1	8	22	56
Kenya	26	31	21	16	53	13	34	1	3	15	46
Lesotho	32	36	31	18	54	13	52	2	3	31	83
Mozambique	23	26	20	9	44	16	26	3	5	33	60
Nepal	45	43	50	34	51	23	60	0	20	51	83
Nigeria	29	37	20	20	41	19	35	0	4	37	69
Pakistan	17	21	12	16	18	10	20	2	24	24	55
Paraguay	57	55	58	40	67	39	84	11	26	77	90
Peru	71	77	68	46	78	50	90	0	17	70	88
Rwanda	39	46	29	28	59	39	39	75	14	43	69
Senegal	30	33	26	21	39	15	43	7	25	41	83
South Africa	71	74	68	61	75	62	77	31	37	69	90
Sri Lanka	37	45	30	35	45	20	62	3	6	31	67
Tanzania	31	32	29	13	55	22	34	2	4	22	81
Uganda	45	44	46	39	54	30	50	0	17	40	64

Annex 5. Mobile Internet Adoption and Uptake Rates by Country and Subgroup

Country	Male	Female	Rural	Urban	Elderly	Young	Non-poor	Poor	No formal education	Years of formal	Years of formal	Years of formal	Total

										education (less than 6)	education (6–12)	education (12–16)	
Argentina_3g	100	100	100	100	100	100	100	100	100	100	100	100	100
Argentina_mobile internet	73	73	78	73	59	92	68	81	9	22	73	88	73
Argentina_mobile internet_uptake	73	73	78	73	59	92	68	81	9	22	73	88	73
Bangladesh_3g	97	96	97	96	97	96	96	98	94	98	97	100	97
Bangladesh_mobile internet	17	7	11	18	6	17	14	9	2	4	19	45	13
Bangladesh_mobile internet_uptake	18	7	11	18	6	18	14	9	2	4	19	45	13
Cambodia_3g	80	82	81	82	78	84	81	81	86	80	81	76	81
Cambodia_mobile internet	39	25	25	46	15	46	36	22	5	16	47	75	31
Cambodia_mobile internet_uptake	41	27	27	47	15	47	37	24	5	17	49	79	32
Colombia_3g	99	100	100	100	100	100	100	100	97	99	100	100	100
Colombia_mobile internet	66	68	61	71	49	86	74	60	8	28	75	92	68
Colombia_mobile internet_uptake	67	68	61	71	49	86	74	60	9	29	75	92	68
Ecuador_3g	94	95	87	99	94	96	95	96	100	93	94	96	95
Ecuador_mobile internet	78	71	69	76	54	89	73	75	0	33	77	91	74
Ecuador_mobile internet_uptake	79	71	69	76	54	89	73	75	0	34	76	91	74
Ghana_3g	73	83	54	98	79	78	85	69	70	81	77	91	78
Ghana_mobile internet	27	19	13	32	12	32	27	17	1	9	25	58	23
Ghana_mobile internet_uptake	32	22	14	32	14	36	30	19	1	8	28	60	27
Guatemala_3g	97	98	96	99	98	97	98	96	99	97	98	97	97
Guatemala_mobile internet	64	47	52	58	30	74	54	56	14	29	70	85	55
Guatemala_mobile internet_uptake	64	47	52	58	31	74	54	56	15	29	70	84	55
India_3g	93	95	95	91	94	94	94	94	95	96	92	94	94
India_mobile internet	22	8	10	24	7	22	18	9	1	5	17	51	15

India_mobile internet_uptake	23	8	10	25	7	22	18	9	1	6	16	53	15
Kenya_3g	76	69	65	92	68	74	77	64	37	69	68	82	72
Kenya_mobile internet	30	19	15	50	12	32	32	13	1	3	13	45	24
Kenya_mobile internet_uptake	35	23	18	50	15	37	36	17	2	5	16	48	29
Lesotho_3g	74	73	77	63	76	71	72	75	74	73	73	72	73
Lesotho_mobile internet	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Lesotho_mobile internet_uptake	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Mozambique_3g	93	94	94	93	93	94	94	94	93	94	95	86	94
Mozambique_mobile internet	20	16	6	36	12	19	22	8	2	3	26	55	18
Mozambique_mobile internet_uptake	20	15	6	35	12	19	22	7	2	3	25	57	17
Nepal_3g	98	95	96	97	96	97	96	98		95	97	97	97
Nepal_mobile internet	39	27	25	37	16	45	32	35		14	48	77	32
Nepal_mobile internet_uptake	40	27	25	38	17	46	33	35		15	49	79	33
Nigeria_3g	72	73	58	94	72	72	73	71	46	72	83	84	72
Nigeria_mobile internet	33	16	15	37	16	29	27	20	0	3	31	62	24
Nigeria_mobile internet_uptake	41	20	22	38	21	36	33	26	0	4	33	65	30
Pakistan_3g	93	92	92	94	93	92	94	91	93	97	88	91	93
Pakistan_mobile internet	15	7	10	14	10	13	16	5	1	13	17	52	12
Pakistan_mobile internet_uptake	17	8	11	15	10	14	17	6	1	14	19	57	12
Paraguay_3g	88	88	75	96	87	89	90	85	77	84	90	94	88
Paraguay_mobile internet	53	56	38	64	37	81	62	45	11	24	73	89	55
Paraguay_mobile internet_uptake	55	58	38	65	39	83	63	47	15	25	74	91	57
Peru_3g	99	99	97	100	99	100	99	99		98	99	99	99
Peru_mobile internet	65	60	35	70	42	81	68	53		11	61	77	62
Peru_mobile internet_uptake	66	60	36	70	42	81	69	54		12	61	78	62
Rwanda_3g	100	100	100	100	100	100	100	100	100	100	100	100	100
Rwanda_mobile internet	31	24	16	50	32	26	35	11	18	8	28	65	28

Rwanda_mobile internet_uptake	31	24	16	50	32	26	35	11	18	8	28	65	28
Senegal_3g	80	83	77	87	81	82	85	77	81	81	80	83	82
Senegal_mobile internet	30	24	19	37	14	40	29	25	7	22	35	82	27
Senegal_mobile internet_uptake	32	27	21	38	16	42	31	26	7	26	36	85	29
South Africa_3g	89	89	86	90	89	89	90	87	88	81	89	94	89
South Africa_mobile internet	68	60	51	69	56	69	65	62	20	33	60	84	64
South Africa_mobile internet_uptake	69	61	50	70	57	70	66	62	21	26	61	85	65
Sri Lanka_3g	100	100	100	100	100	100	100	100	100	100	100	100	100
Sri Lanka_mobile internet	41	24	29	39	17	55	36	23	2	4	26	59	31
Sri Lanka_mobile internet_uptake	41	24	29	39	15	56	35	24	4	6	24	60	31
Tanzania_3g	98	97	96	100	97	97	98	96	87	96	99	100	97
Tanzania_mobile internet	29	27	12	50	20	31	37	8	2	4	20	77	28
Tanzania_mobile internet_uptake	29	27	12	50	20	31	37	8	2	4	20	77	28
Uganda_3g	90	94	92	95	94	91	92	92	94	92	92	91	92
Uganda_mobile internet	30	38	22	47	24	37	40	15	0	4	25	56	33
Uganda_mobile internet_uptake	30	39	22	48	22	39	41	16	0	5	27	55	34
Total_3g	91	92	91	93	92	91	92	91	89	94	92	93	92
Total_mobile internet	26	14	12	32	11	26	22	15	1	7	23	57	20
Total_mobile internet_uptake	26	14	13	32	12	27	23	15	1	7	23	59	20

Note: Mobile internet reflects the adoption rate of the entire population. The uptake rate refers to the ownership rate for the subpopulation covered by 3G.