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Digital inclusion through mobile phones?: A comparison between mobile-only and computer users in internet access, skills and use

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ABSTRACT

Given the rapid rise of mobile-only users, we investigated the digital inclusion process through smartphones. By using Chile as a case study, a country that has strongly promoted mobile connections to address internet access gaps, we compared mobile-only and computer users in different dimensions of the digital inclusion process, including digital skills and differentiated uses of the web. By relying on a face-to-face national representative survey, the results showed that smartphones represent an opportunity to access the internet for those who traditionally lag behind. However mobile-only use does not necessarily lead to a more complete digital inclusion process because it was related to lower levels of skills and less diverse types of uses of the web compared to those people who also use the computer. Also, skills partially mediated the association between access device and types of uses of the web, which suggests that the differences by access device partly occur because people have greater chances to develop skills when accessing the web through computers.

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Digital inclusion; digital inequality; mobile phones; digital skills; internet access; internet use

Introduction

The internet is going mobile and, for many people, the smartphones are becoming the port of entry to the digital world. The sharp rise in mobile internet use and smartphone-only users is happening in developed countries such as the US, particularly among Hispanics and African Americans (Pew Research Center, 2016a) but even more so in developing countries from Africa and Latin America (Stork, Calandro, & Gillwald, 2013; Subtel, 2016).

From a policy-making perspective, to get access to the internet through mobiles represents a cost-effective opportunity to reduce digital access gaps. Compared to computers, smartphones are more affordable and break down access barriers such as costs of infrastructure, equipment and required skills. Thus, policy agendas have promoted mobile connection as a speedy and relatively inexpensive solution to provide physical internet access and, as a result, diminish access inequalities (Donner, 2015). However, there is

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consensus that digital inequality is not resolved after access is provided (Witte & Mannon, 2010) because a more complete digital inclusion process also include other dimensions such as type and quality of access, digital skills and differentiated uses of the internet (Correa, 2016; Hargittai & Hinnant, 2008).

Given the increasing policy-making promotion of mobile connections (Subtel, 2018) and the sharp rise of mobile-only use (Mossberger, Tolbert, & Hamilton, 2012), it is relevant to study the process of digital inclusion through smartphones and compare it with computers. In other words, to what extent are mobile-only users digitally included (or excluded) compared with people who also access the internet through computers?

In terms of digital inclusion, smartphones allow a fast rise in internet access (Stork et al., 2013), strengthen social ties (Maler, 2018) and may satisfy communication and recreational needs through the use of social networking sites and videogames (Pew Research Center, 2016a). However, research has found that this type of connection presents obstacles for the digital inclusion process because internet use through computers allows more diverse uses, including work activities, information-seeking and content creation (Pearce & Rice, 2013). Thus, some have criticized that there is a growing mobile internet 'underclass' (Napoli & Obar, 2014) or 'under connection' (Katz, 2017), even suggesting that these differences 'can reinforce, and perhaps even exacerbate, inequities in digital skill sets, online participation, and content creation. Consequently, mobile-only internet users become, in many ways, second-class citizens online' (Napoli & Obar, 2014, p. 330).

The majority of research that has explored mobile-only use has focused on how it is related to types of internet uses (e.g., Katz, 2017; Pearce & Rice, 2013) but not on other dimensions of the inclusion process such as digital skills, except from one study that compared home broadband and mobile access in skills in Chicago (Mossberger et al., 2012).

Using Chile as a case study, this investigation advances the extant literature by comparing two types of access devices, mobile-only and computer users, in different dimensions of the digital inclusion process, including physical access, digital skills and types of internet use using a national sample. Specifically, we explore to what extent mobile-only use reaches populations that tend to be digitally excluded and how people's digital skills and uses might differ depending on the type of access device. Finally, how these potential gaps in skills might explain the differences in internet uses by access device.

Chile offers a useful case because it is among the three most connected countries in Latin America (ECLAC, 2016) and has a high smartphone penetration (Pew Research Center, 2016b) due to a longstanding digital policy agenda that promotes mobile connections throughout the country (Subtel, 2018).

We focus on smartphones as a mobile device because the vast majority of people access the internet through smartphones and computers and not through tablets. [1] In addition, most tablets rely on home or public WiFi plans and a very small proportion of tablet users are 'mobile-only' users (Napoli & Obar, 2014).

Mobile connectivity, computer-nevers and digital inclusion

In the past decade, many developed and developing countries have promoted mobile broadband access to increase levels of connectivity. The mobile broadband penetration goes along the rapid increase in smartphone access and use, which does not differ greatly by sociodemographic factors (Reuver, Nikou, & Bouwman, 2016). Given the lower costs of

infrastructure and equipment, internet access through smartphones represents a pragmatic solution to the digital divide (Donner, 2015), which implies that disadvantaged populations who have never accessed the internet through a computer are adopting smartphones to get access to the web for the first time (James, 2009). However, digital inclusion goes beyond access and involves a multidimensional process (Robinson et al., 2015) that includes the access device as well as digital skills and differentiated types of use (e.g., van Dijk 2004). In this study, we will focus on skills and types of uses because these aspects are the most likely to be affected by the access device.

Digital skills have been broadly defined as 'the capacity to respond pragmatically and intuitively to challenges and opportunities in a manner that exploits the Internet's potential' (DiMaggio, Hargittai, Celeste, & Shafer, 2004, p. 378). van Deursen and van Dijk (2010) categorize different types that may be applied to both computer and mobile devices, including operational (the ability to operate hardware and software), information (the capacity to search, select, evaluate and process information on the internet), formal (the ability to navigate in a hypermedia context) and strategic (the ability to use the Internet to attain particular goals).

The majority of the research has focused on self-reported of operational and information skills (Litt, 2013). To overcome the problem of measuring self-reported skills, Hargittai developed a measure which correlates people's knowledge of Internet terms with abilities to find information online in controlled settings (Hargittai, 2005; Hargittai & Hsieh, 2012) and involve mainly operational and information skills. In addition, van Deursen and van Dijk (2014) developed items to measure the different skills' dimensions, including operational, information, formal and strategic. Despite how these are measured, the evidence strongly suggests that while access gaps are closing, new skills or usage gaps are opening (van Deursen & van Dijk, 2014). For instance, among connected people, those who have a lower socioeconomic status have lower levels of skills than those from higher socioeconomic status (Correa, 2016) and young people tend to outperform older people in technical or operational skills (e.g., van Deursen & van Dijk, 2010).

In sum, there is no such thing as closing 'the gap' after connection is achieved as the literature shows that skills have an impact on the number, complexity and types of activities performed in the web (Borg & Smith, 2018).

Differentiated uses of the internet

In theory, the web has the potential to further a wide range of activities oriented to enhance communication, access to information and services, education and economic opportunities as well as political and civic engagement (Castells, 2000). Therefore, it is argued that some activities could be tagged as more meaningful because they can enhance their political, cultural and knowledge capital such as seeking health information, using government sites and performing financial transactions (Hargittai & Hinnant, 2008).

Research has found a 'usage gap' (van Dijk, 2004) in which people from middle-upper socioeconomic status tend to rely on a wider repertoire of activities that have educational, information or service-oriented purposes while people from lower SES rely on a narrower set of applications that target communication and entertainment purposes (e.g., Bonfadelli, 2002; Howard, Rainie, & Jones, 2001). Researchers have also demonstrated that young people who are better off are more likely to engage in creative (Hargittai & Walejko,

2008) and mobilizing activities (Navia & Ulriksen, 2017; Valenzuela, Somma, Scherman, & Arriagada, 2016).

The evidence also suggests that digital skills play a relevant role on the number and complexity of activities (Livingstone & Helsper, 2007). These previous findings, however, do not distinguish by access device.

Opportunities and challenges of mobile inclusion

There is a nuanced scenario regarding the usage of smartphone as a digital inclusion tool. For example, smartphones provide access opportunities for people who traditional lag behind in digital inclusion such as minority groups, lower income and lower educated people (Tsetsi & Rains, 2017). However, the literature has also warned that public policies that solely focus on smartphone access and do not include computers present some problems. First, mobile and computers differ in their technological capacities (memory, storage capacity and speed), which makes the smartphone a useful tool for 'social' activities but not for 'work' activities (Hyde-Clarke & Van Tonder, 2011). The amount, quality and display of the content on the screen are dissimilar through these two devices (Kaasinen et al., 2009). Thus, while computers allow more depth, the phone affords more ubiquity and rapid diffusion although information-seeking is more superficial and content creation more difficult (Hargittai & Kim, 2010).

As a result, computer-nevers have fewer opportunities to use the internet more effectively (Napoli & Obar, 2014). Pearce and Rice (2013), who compared mobile-only and computer internet users, found that computers increased the likelihood of engaging in more 'capital-enhancing' activities, including work-related activities, use of search engines and reading online news. Mobile-only access increased the use of social networking sites and they did not find device differences for recreational uses. In the same vein, Katz (2017) found that mobile-only use was a form of 'under-connectedness' because people 'who only have access via a smartphone or tablet use the internet less frequently, and for a narrower set of activities, than families who go online via a computer at home' (p. 242).

Most research that has explored mobile-only use has focused on the types of internet activities performed by the users (e.g., Mossberger et al., 2012; Napoli & Obar, 2014). Very scant research has explored the differences in digital skills by access device. van Deursen and van Dijk (2018) investigated the gaps in digital skills according to the number of access devices, although they collapsed mobile-only and PC-only users into one group. They found that they had fewer skills than people who used more than one access device. Mossberger et al. (2012) used bivariate analyses to compare mobile access with home-broadband access in digital skills in Chicago, US. They also found that mobile access was associated with fewer skills than home broadband access.

This study contributes to the literature by comparing access device (i.e., mobile-only users with people who also use the computer to access the internet) not only in types of activities but also in digital skills controlling for gender, age, income, education and years of experience. It also investigates to what extent digital skills mediate – or explain – the gaps in types of internet activities by access device using a face-to-face nationally representative sample in Chile, a country with high levels of internet and smartphone penetration but strong structural inequalities.

The Latin American and Chilean context

Latin America is widely recognized by its inequalities in social, economic and geographical aspects. For instance, Chile and Mexico have the highest levels of inequality among OECD countries (OECD, 2015). This is no different in the digital arena (Gray, Gainous, & Wagner, 2017). For instance, although internet access has increased significantly, in terms of traffic and speed on fixed networks, the region ranks among the lowest in the world (ITU, 2017). Furthermore, there are large gaps among countries, with three showing an internet penetration of less than 15% and three –among them Chile– where it reaches more than 60% of its population (ECLAC, 2016). There are also differences in smartphone ownership: while 65% of Chileans report smartphone ownership, one out of four Peruvians does so (ITU, 2017).

Despite that since the 2000s almost all Latin American countries have developed digital agendas (Helsper, 2018), costs, lack of infrastructure, skills and content availability are still barriers to address digital inclusion (Galperin, 2017). In Chile, since 1992 this 17-million people country became one of the first in the region to develop a national ICT policy. Currently, the main focus is the delivery of infrastructure access as well as the internet territorial coverage, and a public–private initiative that subsidizes 3G and 4G mobile broadband connections to rural isolated areas (Subtel, 2016).

According to national figures, home internet access increased from 62% to 72% in two years (Subtel, 2016), particularly due to an increase in mobile connections and smartphones. A comparative survey (Pew Research Center, 2016b) revealed that Chile has similar levels of smartphone penetration with Canada and United Kingdom and surpasses Germany, France and all the Latin American countries included in the study. The quality of mobile connections, in terms of speed, is among the highest in Latin America but lower than developed countries (e.g., Japan, the Netherlands, Australia, Norway, France) (Open Signal, 2017).[2]

This rapid growth of mobile connections and smartphone use is also related to an increase in mobile-only use. An analysis of the internet access surveys of the Office of Telecommunications shows that between 2013 and 2015, the percentage of users who access exclusively through smartphones increased from 9% to 21%. Also, 27% use it mostly, though not exclusively, through mobiles. At the same time, there has been a decrease from 58% to 52% in people who access the internet from both the computer and smartphones between those years. The most benefited with mobile-only use are people from rural areas and lower socioeconomic status.

However, in Chile the urban–rural gap continues to be one relevant digital challenge (Pavez, Correa, & Contreras, 2017). While 74% of urban households have access, 55% of their rural counterparts do so (Subtel, 2016). Most of the rural population relies on mobiles. For instance, 80% of internet users in isolated rural communities in Chile access the internet through mobile phones only (Correa, Pavez, & Contreras, 2017). In terms of socioeconomic gaps, while internet penetration in the poorest quintile is 63%, in the richest quintile is 79% (Subtel, 2016). Despite the gap, these levels among the poorest people are similar to the averages of other Latin American countries (60% approx) and among the richest sectors are similar to the average in developed countries (80% approx). Evidence also shows that the cost of services with better connections, particularly broadband access, is still high which may lead to the danger of replacing broadband by weaker connections such as 3G wireless access (Subtel, 2016). Therefore, as Chile endures similar patterns of digital

inequality compared to other countries but the penetration of smartphones is high, and there is a rise of mobile-only use, it is a relevant case study to explore the role of mobile-only use in the digital inclusion process.

Hypotheses

Because mobile access is a pragmatic policy-making initiative to provide internet to disadvantaged populations (James, 2009; Napoli & Obar, 2014), we hypothesize that:

H1: Mobile-only use will be more frequent among women, older people as well as people with lower income, education and less experience with the internet.

The literature suggests that the process of digital inclusion goes beyond access and includes other dimensions such as the development of digital skills and diverse uses. Because the evidence indicates that mobile-only use provides fewer opportunities to develop digital skills (e.g., operational, strategic and formal abilities), we pose the following hypothesis:

H2: Controlling for sociodemographic variables (i.e., gender, age, income and education) and years of experience with the internet, those who access the internet through mobiles only will have fewer digital skills than those who also access the internet through computers as well.

In addition, the literature also suggests that mobile phones have different affordances from computers in terms of memory, storage capacity, speed and size of the screen, which lead to differences in types of uses. Thus, we propose that:

H3: Controlling for sociodemographic variables (i.e., gender, age, income and education) and years of experience with the internet, mobile-only users will perform fewer types of internet activities compared with who also use the computer.

Finally, because digital skills may conduct to digital literacy that enable users to expand their digital repertoires to actually get more gains out of internet use (Donner, 2015), we pose the following hypothesis:

H4: The relationships between access devices and differentiated types of internet use will be mediated by digital skills.

Method

To answer the research question and test the hypotheses, we relied on a face-to-face probabilistic survey of individuals aged 16 and older administered by the Department of Telecommunications (Subtel) throughout Chile, both in urban and rural settings. The data collection was between 4 November and 22 December 2015. The design was a multistage probability sampling stratified by the 15th administrative regions and urban/rural. The sampling units were districts, blocks, households and interviewee. The final sample was 3,600. Of those, we concentrated on internet users ($n = 2{,}681$).

Variables' description

Sociodemographics: To examine the sociodemographic factors, standard questions were employed. Gender was recoded as a dummy variable (Men = 0; Women = 1). Age and household income were measured as a continuous variables. Lastly, education was

measured by the highest level of formal education completed by the respondent. Response categories varied from 1 (no formal education) to 11 (college degree).

Years of experience using the internet: Respondents were asked: When was the first time you had access to the internet? This variable was measured in a 5-point-scale where 1 = one year or less; 2 = 1–3 years; 3 = 3–5 years; 4 = 5–7 years and 5 = more than 7 years (For the descriptive statistics of demographic variables see Table 1).

Digital skills: Given that this study relied on secondary-data analysis, we did not have items that strictly measured digital skills. Therefore, we used the following items as a proxy of digital skills because they require digital abilities. Respondents were asked to respond 'yes' (1) or 'no' (0) to seven items that tackled three types of digital skills. The operational skills included the items 'Use some sort of protection tool or software (antivirus, antispam, firewall),' 'Use a parenting control software or content filter.' The strategic skills were measured with the following items: 'Delete or edit something I posted online,' 'Delete my search history (in Google, for example).' Finally, formal skills included 'Change privacy settings in a social networking site (Facebook, Twitter, Instagram, LinkedIn, etc)' and 'Change passwords.' Although this study is missing the information dimension of digital skills (the capacity of to search, select and evaluate information) because it uses secondary-data analysis, it still includes three out of four dimensions of digital skills because it is necessary to acknowledge that skills encompass several different abilities. Responses were added to create a single scale of digital skills (see Table 1).

Types of internet use: They were measured with seven different indexes. Response categories were 'yes' (1) or 'no' (0). Communication was measured with two items: 'use social networking sites' and 'WhatsApp chatting.' Information was measured with nine items, including seek information about 'goods and services,' 'work opportunities,' 'health or health services,' among others. Recreation was measured with three items such as 'play videogames online,' and 'download and/or listen music.' Transactions were measured with four items such as 'banking transactions,' 'pay online,' 'complete forms online.' Work/Business was measured with six items including 'contact new clients,' 'apply for jobs,' 'maintain a website for the company,' 'buy goods or services for the company,' 'sell goods or services for the company.' E-government was measured with five items

Table 1. Descriptive statistics of variables used in the study.

	% or Mean	Standard deviation	Cronbach's alpha
Gender (women)	50%	–	
Age (continuous)	41.51	16.27	
Income (continuous)	CL$724,590 US$1013	CL$778,368 US$1088	
Education (1–11)	6.53	2.83	
Years of experience (1–5)	3.99	1.29	
Digital skills (0–7)	2.13	1.76	$\alpha = .68$
Types of internet use			
Communication (0–2)	1.31	.82	$r = .52$
Information (0–9)	2.65	2.32	$\alpha = .75$
Recreation (0–3)	.88	1.02	$\alpha = .64$
Transactions (0–4)	.72	.12	$\alpha = .73$
Work/Business (0–5)	.47	1.03	$\alpha = .71$
E-government (0–5)	.76	1.31	$\alpha = .70$
Content creation (0–5)	1.76	1.77	$\alpha = .74$
Access device			
Mobile-only	20.8%	–	
PC & Mobile user	79.2%	–	

such as 'make queries and claims to governmental organizations,' 'pay online to governmental organizations,' 'download and fill out government forms.' Finally, content creation was measured with five items that included 'create and upload content to social networking sites,' 'create and upload content to the web,' 'update statuses in social networking sites' (for descriptive statistics, see Table 1).

Internet access device: In order to identify different types of users based on their internet access device, we identified the type of device they possessed and we categorized them into 'mobile-only' (coded as 1) and 'mobile-computer' (coded as 0).[3] Mobile-only use is defined by those people who only access the internet through mobile phones either via a wireless data plan or Wi-Fi and do not have computers. PC and mobile use are defined by people who use both computers and smartphones similarly.

Analytical strategy

To test H1 – which explores the sociodemographic factors related to the type of device that people use to access the internet - we conducted a bivariate analysis (crosstabs and t-tests) where we compared sociodemographic variables by type of access device. To test H2 - which examined the association between internet access device and skills - we conducted a hierarchical linear regression. Finally, to test H3 and H4 we conducted several hierarchical linear regressions, where the baseline models analyzed the association between the control variables (i.e., sociodemographics and years of experience using the internet) and types of internet use. Models 1 tested the association between devices and different types of internet use (H3) and models 2 included skills to test whether this variable mediates the relationship between devices and types of internet uses using a causal-step approach suggested by Baron & Kenny.[4] However, to more formally test H4, which proposes the mediation of digital skills (or indirect effect), in a more stringent way and also estimate the direct and total effects, we used the conditional process analysis method which calculates the percentage bootstrap confidence interval of the indirect effects (Hayes, 2013).[5]

Results

Of the 2681 respondents who use the internet in Chile, 20.8% are mobile-only users. This figure increases among the rural population to 41.5%. Among newer users of the web (i.e., those who have access less than seven years ago), 57% have internet access through smartphones exclusively.

Sociodemographic differences by access device

H1 proposed that mobile-only use represents an opportunity to close internet access gaps. Table 2 shows that a greater percentage of women than men access the web exclusively

Table 2. Internet access device gap by gender.

Device	Men (%)	Women (%)
Mobile-only users	17.3	24.5
PC & mobile users	82.7	75.5
$X^2 = 17.603$, $p \leq .001$		

Table 3. Mean differences income, age, education and years of experience using internet by access device.

	Mean score of mobile-only users (sd)	Mean score of Mobile & PC users (sd)	*t*-value	*p*-value
Household income	598,251.29 (553,650.14)	896,757.21 (932,458.87)	−9.24	≤.001
Age	36.75 (14.14)	39.09 (15.58)	−3.26	≤.001
Education	6.08 (2.43)	7.49 (2.64)	−11.39	≤.001
Years of experience	3.16 (1.38)	4.14 (1.21)	−6.19	≤.001

through smartphones. Table 3 also suggests that people from lower education, income and less years of experience using the internet (i.e., newer users) are more likely to be mobile-only users. Younger people, rather than older, tend to be mobile-only users. H1 was partially supported.

Digital skills by access device

H2 proposed that those who access the internet through mobiles only will have lower levels of digital skills than those who also access the internet through computers. Table 4 shows that the control variables – sociodemographics and years of experience using the internet – are all significant and behave in expected directions (see baseline model and model 1). For instance, while age is negatively related to digital skills, education, income and years of experience are all positively associated with skills. Controlling for these factors, internet access device has a small, although significant, difference in skills. Those who access the internet through smartphone-only have lower levels of digital skills while those who also use a computer have higher levels of digital skills. Thus, hypothesis 2 was supported.

Differentiated uses of the web by access device

H3 explored the association between internet access device and different types of internet use and predicted that mobile-only users will perform fewer activities than those who also access it through computers. The previous literature suggested that mobile-only users will

Table 4. Hierarchical regression – Factors predicting digital skills.

	Baseline model *β*	Model 1 *β*	Model 2 *β*
Sociodemographics			
Gender (women = 1)	−.057**	−.047*	−.03
Age (continuous)	−.318***	−.301***	−.29***
Income (continuous)	.091***	.082***	.09***
Education (1–11)	.198***	.147***	.14***
R^2	16.5%***		
Years of experience using the internet			
Years of experience	–	.153***	.15***
R^2 change	–	2%	
R^2 total	–	18.5%***	
Device			
Mobile-only (PC & Mobile as reference)	–	–	−.09***
R^2 change	–	–	0.7%
N	2201	2201	2201
R^2 total			19.9%***

perform the same level of communicational and recreational uses of the internet but fewer of the latter activities than those who use the computer.

As models 1 of Table 5 show, controlling for gender, age, income, education and years of experience, those who access the internet through mobiles only are less likely to use the web for recreation than those who also access it through computers but there is no device gap for communication (e.g., social networking sites and WhatsApp chatting). Thus, there is a device gap for recreational uses of the internet but not for communicational uses. In addition, Models 1 of Tables 6, 7 and 8 also show a device gap for uses related to information-seeking, transactions, e-government and content creation but not for business/work. As predicted, those who access the web through smartphones only are less likely to perform most of these activities.

H4 proposed the mediation of digital skills between access device and types of internet use suggesting that skills may serve as a mechanism that explains the device gap in types of internet use. First, skills are the strongest predictor of all types of internet use. To test H4 we first compared models 1, which includes access device plus the control variables, and models 2, which also incorporate digital skills (see Tables 5–8). The results showed that after including skills in the models the strength of the relationships between access device and types of internet use decreased considerably and became very weak, although they remained as statistically significant associations. The exception is content creation, where it became non-significant and suggests a full mediation. A more stringent test of mediation can be seen in Table 9, which estimated the mediating (or indirect) relationships as well as the direct and total effects. The results suggest that for all the types of internet uses, the confidence interval of the mediating (or indirect) role of digital skills was below zero,

Table 5. Hierarchical linear regression: Predictors of communication and recreational uses of the internet.

	Communication			Recreation		
	Baseline model β	Model 1 β	Model 2 β	Baseline model β	Model 1 β	Model 2 β
	Sociodemographics			Sociodemographics		
Gender (Women = 1)	.06**	.06**	.07***	−.04*	−.03	−.01
Age (continuous)	−.33***	−.33***	−.25***	−.22***	−.23***	−.12***
Income (continuous)	.08***	.07***	.06**	.08***	.07***	.05*
Education (1–11)	.00	.00	−.02	.07**	.04*	.00
Years of experience using the web (1–5)	.11***	.11***	.08***	.10***	.09***	.04*
R^2	14.2%***			9.4%***		
	Access device			Access device		
Mobile-only (PC & mobile as reference)	–	−.00	.02		−.15***	−.10***
R^2 change	–	0%			2.3%	
R^2 total	–	14.2%***			11.6%***	
	Digital skills			Digital skills		
Skills (0–7)	–	–	.23***			.36***
R^2 change	–	–	4,3%			10,4%
N	2201	2201	2201	2201	2201	2201
R^2 total			18.3%***			22%***

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 6. Hierarchical linear regression: Predictors of informational uses of the internet.

	Information		
	Baseline model β	Model 1 β	Model 2 β
Sociodemographics			
Gender (Women = 1)	−.02	−.01	−.00
Age (continuous)	−.15***	−.17***	−.03*
Income (continuous)	.08***	.07***	.04*
Education (1–11)	.23***	.21***	.16***
Years of experience (1–5)	.16***	.15***	.09***
R^2	16.3%***		
Access device			
Mobile only (PC & mobile as reference)	–	−.12***	−.07***
R^2 change	–	1.5%	
R^2 total	–	17.8%***	
Skills			
Skills (0–7)	–	–	.42***
R^2 change	–	–	14.1%
N	2,201	2,201	2,201
R^2 total			31.8%***

*$p < .05$, **$p < .01$, ***$p < .001$.

which suggests a significant mediating effect of this variable. For all the outcome variables, digital skills are relevant mediators. For example, in the case of information, transactions and e-government, between 44% and 48% of the total relationship (or effect) between access device and these types of internet uses is channeled via digital skills. In the case of content creation, 67% of the total effect goes through skills. In sum, the fact that mobile-only users perform fewer of these internet activities is because they have developed fewer digital skills.

Table 7. Hierarchical linear regression: Predictors of transactions and business/work uses of the internet.

	Transactions			Business/work		
	Baseline model β	Model 1 β	Model 2 β	Baseline model β	Model 1 β	Model 2
	Sociodemographics			Sociodemographics		
Gender (Women = 1)	−.04*	−.03	−.02	.−06**	−.05**	−.04*
Age (continuous)	−.07***	−.08***	.02	−.03	−.03	.06**
Income (continuous)	.14***	.13***	.11***	.09***	.09***	.06**
Education (1–11)	.21***	.19***	.15***	.11***	.11***	.06**
Years of experience (1–5)	.17***	.17***	.11***	.12***	.11***	.07**
R^2	16.4%***			6.3%***		
Access device					Access device	
Mobile only (PC & mobile as reference)	–	−.10***	−.05**		−.04	.00
R^2 change	–	1%			0.1%	
R^2 total	–	17.5%***			6.4%***	
Skills					Skills	
Skills (0–7)	–	–	.36***			.32***
R^2 change	–	–	10.4%			8.3%
N	2201	2201	2201	2201	2201	2201
R^2 total			27.8%***			15%***

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 8. Hierarchical linear regression: Predictors of e-government and content creation.

	E-government			Content creation		
	Baseline model β	Model 1 β	Model 2 β	Baseline model β	Model 1 β	Model 2 β
	Sociodemographics			Sociodemographics		
Gender (Women = 1)	−.00	−.00	.01	.00	.00	.02
Age (continuous)	−.05*	−.06**	.05**	−.19***	−.20***	−.07***
Income (continuous)	.09***	.08***	.06**	07**	.06***	.03
Education (1–11)	.18***	.16***	.11***	.03	.02	−.02
Years of experience (1–5)	.13***	.12***	.07***	.17***	.16***	.10***
R^2 total	9.4%***			9.1%***		
		Access device			Access device	
Mobile only (PC & mobile as reference)		−0.9***	−.05**		−.08***	−.02
R^2 change	–	0.9%			0.6%	
R^2 total	–	10.3%***			9.7%***	
		Skills			Skills	
Skills (0–7)	–	–	.36***			.40***
R^2 change	–	–	10.8%			13.2%
N	2201	2201	2201	2201	2201	2201
R^2 total			21.1%***			22.9%***

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 9. Testing the mediating role of digital skills between access device and types of internet uses.

	Direct effects (access device → outcome variable)		Indirect effects (access device → digital skills → outcome variable)		Total effects	
Outcome variables: Types of internet uses	Estimate	95% percentile bootstrap CI	Estimate	95% percentile bootstrap CI	Estimate	95% percentile bootstrap CI
Communication	.05	−.03, .13	−.06	−.08, −.04	−.009	−.09, .07
Recreation	−.28	−.38, −.18	−.12	−.16, −.09	−.40	−.51, −.29
Information	−.41	−.63, −.20	−.33	−.43, −.23	−.74	−.98, −.51
Transactions	−.17	−.26, −.08	−.14	−.18, −.09	−.31	−.43, −.18
Business/work	.005	−.11, .12	−.11	−.16, −.08	−.11	−.23, −.004
E-government	−.18	−.32, −.04	−.17	−.22, −.11	−.35	−.49, −.23
Content creation	−.09	−.24, .04	−.19	−.25, −.13	−.28	−.44, −.14

Note: The table reports unstandardized path coefficients and 95% percentile bootstrap confidence intervals (CI) based on 5,000 bootstrap samples for the indirect effects.
Access device (mobile only = 1, mobile & PC = 0).

Discussion and conclusion

Given the growing policy commitment to increase internet penetration through smartphones and the rapid rise of mobile-only users both in developed and developing countries, we investigated the nuances of the digital inclusion process through mobile phones in Chile. Particularly, this study compared access devices – i.e., mobile-only and computer use - in different dimensions of the digital inclusion process, which included access, digital skills and differentiated uses of the web. It also investigated to what extent the development of digital skills explains (or mediate) the differences in internet uses by access device.

We used Chile as a case study because it has a strong and longstanding policies focused on providing infrastructure and mobile connections, which has led to a sharp rise in internet penetration – one of the highest in Latin America (Pew Research Center, 2016b; The Inclusive Internet Index, 2018) - and mobile-only use. At the same time, as any other Latin American country, it is structured by profound social inequalities, which pervades into the digital arena. Thus, there are relevant inequalities by geography (rural vs. urban) and socioeconomic status, among others.

The results showed that smartphones do represent an opportunity to access the internet for those who traditionally lag behind. In fact, we found that mobile-only users are comprised of a greater percentage of women as well as people from lower education and income. It is important to note that despite was has been found in other Latin American countries (Galperin, 2017) our data showed that young people are more likely to get exclusive access to the internet through smartphones than older people. This survey covers people from 18 years old and older, which suggests that young people who are no longer in the educational system may not be using computers anymore and rely on mobiles only. This phenomenon opens up questions on the type and quality of access of the so-called digital natives that are worth exploring. It is also interesting to note that the majority of people (57%) who have accessed the internet for the first time in the past seven years are mobile-only users confirming the idea that mobile phones are becoming a port of entry to the digital world. It would be interesting to see how this practice evolves and whether those who become internet users through smartphones continue their digital inclusion process by using computers and/or developing greater skills and diverse uses of the web. Thus, future research should develop panel studies with a focus on mobile-only users to investigate them over the years.

The results also showed that the type of access device made a difference in people's digital skills. To our knowledge, very scant research (i.e., Mossberger et al., 2012) briefly investigated the differences in digital skills by type of access (mobile vs. home broadband access) using bivariate analysis in Chicago, US. This study showed that when we controlled for factors that were strongly related to the use of smartphones as an exclusive way to get online and are also related to digital skills – e.g., education, income, gender and years of experience -, the type of device was related to the level of skills. Those who accessed the web through mobiles only had lower levels of skills. This means that getting access through computers, given their characteristics in terms of speed, information-seeking depth, memory and content creation, affords greater possibilities of developing skills than access through mobiles only. In fact, the quality and reliability of mobile connections in Chile are higher than other Latin American and developing countries but it is much lower than many countries in Europe and Asia and Oceania (Open Signal, 2017). This reveals that mobile connections, despite the high penetration, is still lagging behind compared to other more advanced economies. It is also relevant to note the pervasiveness of structural factors – income, education and age -, which speaks about a complex scenario where social inequalities mirror the digital arena.

Regarding the second dimension of the digital inclusion explored, as expected, we found that the device did not make a difference in communicational uses. Similarly, to what previous research has found (e.g., Hyde-Clarke & Van Tonder, 2011; Pearce & Rice, 2013), people who use smartphones only are as likely to use social networking sites and chat through WhatsApp as those who also use computers. But, contrary to previous literature,

we found that the device had a role in recreational uses of the web e.g., online videogames, downloading music. Mobile-only users were less likely to perform those activities. It is possible that the characteristics of computers, such as a larger screen and greater speed make computers more attractive than mobile for some recreational uses. In addition, we found device gaps in other uses, where mobile-only users tended to perform less information-seeking, transactions, e-government and content creation than those who relied on both devices. Interestingly, we found no gap for work/business activities. In this case, this variable was measured as contacting new clients, applying for jobs and buying and selling good/services, among others. Thus, it is possible that new mobile-friendly interfaces have come into play for these types of uses and may explain that people are likely to perform these activities regardless of the access device. Finally, our study also contributed to the literature by showing that skills mediated the association between access device and types of uses of the web, which suggests that the differences partly occur because people have greater chances to develop skills when accessing the web through computers.

These results confirm the concern that is problematic to focus on mobile access only. As previous research has suggested (Kaasinen et al., 2009; Napoli & Obar, 2014), these devices differ in their technology affordances, which may affect the depth and diversity of internet navigation, use and possibilities of active participation. But, at the same time, it is important to note that mobile-only use has allowed the possibility of getting online for groups who would be less likely to adopt internet.

Given that this study relied on secondary-data analysis, the measures to test the main dependent variables such as digital skills and types of uses were not optimal. For example, digital skills were measured with online behaviors that required a certain level of operational, formal and strategic skills but it was not a scale developed to measure skills per se. In any case, it reached adequate internal consistency and behaved in expected directions. Also, types of uses relied on dichotomous measures (yes or no), which decreased the possibility to capture the frequency of each type of use. Finally, it is relevant to note that the variable 'years of experience' assumes continual access to the internet, when in fact many people could have intermittent access to the web. Future research could improve these measurements. Despite these shortcomings, this study relied on a national face-to-face probabilistic survey in both urban and rural areas, which strongly strengthens the generalizability of the findings.

Future research should explore how the digital inclusion process is informed by access device and evolves over time. For instance, do those who access it only through smartphones increase their digital skills and types of uses over time? Also, is there a reverse effect where the smartphone represents a port of entry to the digital world by lowering the barriers and also increasing feelings of self-efficacy and empowerment? These new directions of studies will help to explore the impact of access devices, the nuances of digital inclusion processes particularly among vulnerable populations, and to improve public policies that seek to increase affordable internet access.

Notes

1. Access to internet is mainly made by smartphones and computers. For example, while 90% of households have smartphones and 78% have computers, only 27% have tablets, 15% gaming consoles and 19% TV. (Subtel, 2016).

2. Chile's overall speed of mobile connection is 9.70 Mbps while European countries is around 14.0 Mbps and the leading countries like South Korea reach over 37.0 Mbps.
3. There is a small percentage (7%) who has internet access only through computers and not smartphones. They were treated as missing cases.
4. The causal-step approach from Baron and Kenny (1986) suggests that if the direct effect of access device on types of internet uses decreases or is no longer significant once the mediating variable (i.e., skills) is introduced, then there is a partial of full mediation.
5. The conditional process analysis developed by Hayes (2013) is based on a path analytic approach of ordinary least squared regressions and offers an estimate and a bootstrapped confidence interval that quantify the mediating (or indirect) effect of access device on types of internet uses channeled through digital skills, controlling for other variables. It also allows to detect a significant indirect effect even though one of the constituent relationships or paths is not (Hayes, 2009)

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References

Baron, R., & Kenny, D. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173–1182.

Bonfadelli, H. (2002). The internet and knowledge gaps: A theoretical and empirical investigation. *European Journal of Communication*, *17*(1), 65–84.

Borg, K., & Smith, L. (2018). Digital inclusion and online behaviour: Five typologies of Australian internet users. *Behaviour & Information Technology*, *37*(4), 367–380.
Castells, M. (2000). Toward a sociology of the Network society. *Contemporary Sociology*, *29*(5), 693–699.
Correa, T. (2016). Digital skills and social media use: How Internet skills are related to different types of Facebook use among 'digital natives'. *Information, Communication & Society*, *19*(8), 1095–1107. doi:10.1080/1369118X.2015.1084023
Correa, T., Pavez, I., & Contreras, J. (2017). Beyond access: A relational and resource-based model of household Internet adoption in isolated communities. *Telecommunications Policy*, *41*(9), 757–768. doi:10.1016/j.telpol.2017.03.008
DiMaggio, P., Hargittai, E., Celeste, C., & Shafer, S. (2004). From unequal access to differentiated use: A literature review and agenda for research on digital inequality. *Social Inequality*, 355–400.
Donner, J. (2015). *After access: Inclusion, development, and a more mobile internet*. Cambridge, MA: MIT Press.
Economic Commission for Latin America and the Caribbean (ECLAC). (2016). *Estado de la banda ancha en América Latina y el Caribe*. [State of broadband in Latin America and the Caribbean]. Available at http://repositorio.cepal.org/bitstream/handle/11362/40528/6/S1601049_es.pdf
Galperin, H. (2017). Why are half of Latin Americans not online? A four-country study of reasons for internet non-adoption. *International Journal of Communication*, *11*(2017), 3332–3354.
Gray, T. J., Gainous, J., & Wagner, K. M. (2017). Gender and the digital divide in Latin America. *Social Science Quarterly*, *98*(1), 326–340.
Hargittai, E. (2005). Survey measures of web-oriented digital literacy. *Social Science Computer Review*, *23*(3), 371–379.
Hargittai, E., & Hinnant, A. (2008). Digital inequality: Differences in young adults' use of the internet. *Communication Research*, *35*(5), 602–621.
Hargittai, E., & Hsieh, Y. P. (2012). Succinct survey measures of web-use skills. *Social Science Computer Review*, *30*(1), 95–107.
Hargittai, E., & Kim, S. J. (2010). *The prevalence of smartphone use among a wired group of young adults*. Institute for Policy Research Northwestern University. Chicago.
Hargittai, E., & Walejko, G. (2008). The participation divide: Content creation and sharing in the digital age. *Information. Community and Society*, *11*(2), 239–256.
Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs*, *76*(4), 408–420.
Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY: The Guilford Press. *Journal of Educational Measurement*, *51* (3), 335–337.
Helsper, E. (2018). Digital inequalities policies in Latin America are mostly words and little accountability, just like in Europe. *LSE Latin America and Caribbean Blog*. Available at http://eprints.lse.ac.uk/88439/1/latamcaribbean-2018-01-23-digital-inequalities-policies-in-latin.pdf
Howard, P. E., Rainie, L., & Jones, S. (2001). Days and nights on the internet: The impact of a diffusing technology. *American Behavioral Scientist*, *45*(3), 383–404.
Hyde-Clarke, N., & Van Tonder, T. (2011). Revisiting the 'leapfrog' debate in light of current trends of mobile phone internet usage in the greater Johannesburg area, South Africa. *Journal of African Media Studies*, *3*(2), 263–276.
The Inclusive Internet Index. (2018). *Executive summary*. Available at https://theinclusiveinternet.eiu.com/assets/external/downloads/3i-executive-summary.pdf
ITU. (2017). ICT facts and figures 2017. https://www.itu.int/en/ITUD/Statistics/Documents/facts/ICTFactsFigures2017.pdf.
James, J. (2009). Leapfrogging in mobile telephony: A measure for comparing country performance. *Technological Forecasting & Social Change*, *76*, 991–998.
Kaasinen, E., Roto, V., Roloff, K., Väänänen-Vainio-Mattila, K., Vainio, T., Maehr, W., & Shrestha, S. (2009). User experience of mobile internet: Analysis and recommendations. *International Journal of Mobile Human Computer Interaction (IJMHCI)*, *1*(4), 4–23.

Katz, V. S. (2017). What it means to be 'under-connected' in lower-income families. *Journal of Children and Media*, *11*(2), 241–244. doi:10.1080/17482798.2017.1305602

Litt, E. (2013). Measuring users' internet skills: A review of past assessments and a look toward the future. *New Media & Society*, *15*(4), 612–630. doi:10.1177/1461444813475424

Livingstone, S., & Helsper, E. (2007). Gradations in digital inclusion: Children, young people and the digital divide. *New Media & Society*, *9*(4), 671–696.

Maler, W. (2018). Mobile phones and inequality: Findings, trends and future directions. *New Media & Society*. Online first. doi:10.1177/1461444818765154

Mossberger, K., Tolbert, C. J., & Hamilton, A. (2012). Broadband adoption| measuring digital citizenship: Mobile access and broadband. *International Journal of Communication*, *6*, 2492–2528.

Napoli, P., & Obar, J. (2014). The emerging mobile internet underclass: A critique of mobile internet access. *The Information Society*, *30*, 323–334.

Navia, P., & Ulriksen, C. (2017). I tweet, then I vote. The effect of media consumption and the use of social networks on electoral participation in Chile, 2009-2013. *Cuadernos.info*40), 71–88. doi:10.7764/cdi.40.1049

OECD. (2015). Todos juntos ¿Por qué reducir la desigualdad nos beneficia … . En Chile? Available at https://www.oecd.org/chile/OECD2015-In-It-Together-Highlights-Chile.pdf

Open Signal. (2017). Global state of mobile networks. Available at https://opensignal.com/reports/2017/02/global-state-of-the-mobile-network

Pavez, I., Correa, T., & Contreras, J. (2017). Meanings of (dis)connection: Exploring non-users in isolated rural communities with internet access infrastructure. *Poetics*, *63*, 11–21. doi:10.1016/j.poetic.2017.06.001

Pearce, K. E., & Rice, R. E. (2013). Digital divides from access to activities: Comparing mobile and personal computer internet users. *Journal of Communication*, *63*(4), 721–744.

Pew Research Center. (2016a). *Hispanics and mobile access to the Internet. Pew Research Center. Available at http://www.pewhispanic.org/2016/07/20/3-hispanics-and-mobile-access-to-the-internet/*

Pew Research Center. (2016b). *Smartphone ownership and internet usage continues to climb in emerging economies. Global report. Available at http://www.pewglobal.org/files/2016/02/pew_research_center_global_technology_report_final_february_22__2016.pdf*

Reuver, M., Nikou, S., & Bouwman, H. (2016). Domestication of smartphones and mobile applications: A quantitative mixed-method study. *Mobile Media & Communication*. Online first. doi:10.1177/2050157916649989

Robinson, L., Cotten, S., Ono, H., Quan-Haase, A., Mesch, G., Chen, W., … Stern, M. (2015). Digital inclusion and why they matters. *Information, Communication and Society*, *18*(5), 569–582.

Stork, C., Calandro, E., & Gillwald, A. (2013). Internet going mobile: Internet access and use in 11 African countries. *info*, *15*(5), 34–51.

Subsecretaría de Telecomunicaciones (Subtel). (2016). Séptima Encuesta sobre Acceso, Usos y Usuarios de Internet en Chile. Available at http://www.subtel.gob.cl/wp-content/uploads/2016/05/Informe-VII-Encuesta-de-Acceso-Usos-y-Usuarios-de-Internet_VF.pdf

Subsecretaría de Telecomunicaciones (Subtel). (2018). Proyectos FDT [Telecommunication Development Fund Projects]. Available at https://www.subtel.gob.cl/quienes-somos/divisiones-2/fondo-de-desarrollo-de-las-telecomunicaciones/proyectos-fdt/

Tsetsi, E., & Rains, S. A. (2017). Smartphone internet access and use: Extending the digital divide and usage gap. *Mobile Media & Communication*, *5*(3), 239–255.

Valenzuela, S., Somma, N. M., Scherman, A., & Arriagada, A. (2016). Social media in Latin America: Deepening or bridging gaps in protest participation? *Online Information Review*, *40*(5), 695–711.

van Deursen, A. J., & van Dijk, J. A. (2014). The digital divide shifts to differences in usage. *New Media & Society*, *16*(3), 507–526.

van Deursen, A. J., & van Dijk, J. A. (2018). The first-level digital divide shifts from inequalities in physical access to inequalities in material access. *New Media & Society*. Online first. doi:10.1177/1461444818797082

van Deursen, J., & van Dijk, J. (2010). Internet skills and the digital divide. *New Media & Society*, *13* (6), 896–911.
van Dijk, J. (2004). Divides in succession: Possession, skills, and use of new media for societal participation. *Media access: Social and psychological dimensions of new technology use*, 233-254.
Witte, J., & Mannon, S. (2010). *The internet and social inequalities*. New York: Routledge.