

# **Barriers to Internet Connectivity in Latin America: Evidence from large-scale household surveys**

Hernan Galperin, Ph.D.  
Research Associate Professor  
Annenberg School for Communication  
University of Southern California  
hernan.galperin@usc.edu

March 2015

## 1. Introduction

The benefits of Internet connectivity are seemingly obvious. Further, there is growing empirical evidence that Internet use results in measurable gains in income, employment and social inclusion (Galperin and Viacens, 2014). Yet only about half of all Latin Americans report using the Internet on a regular basis. According to the ITU (2014), the percentage of the region's population that uses the Internet at least once a year was 46.7%. The same figure for high-income OECD countries was 81.2%. Why aren't more Latin Americans connecting to the Internet on a regular basis? What are the key determinants of this connectivity gap?

This chapter examines these questions using data from large-scale household surveys in several countries in the region. The analysis serves two goals. The first is to replicate previous findings about the socioeconomic determinants of Internet access and use. Our results show that, after controlling for income, geographical location, age, education and having children in school age continue to be strong predictors of Internet adoption. This suggests that policy initiatives targeted at specific sociodemographic groups are critical complements to national broadband plans.

The second goal is to examine the barriers for connectivity from the perspective of non-adopters. Specifically, the chapter examines to what extent connectivity gaps are associated with affordability as opposed to other factors such as lack of interest and skills. In general the results show that, despite significant decreases in Internet access prices over the past five years, the cost of services continues to be a major barrier for adoption. However, the models

also suggest that lack of interest and skills also play a significant role in non-adoption, particularly among the elderly and less educated. By parsing out the effect of affordability from other reasons for non-adoption, the analysis contributes to our understanding of how best to address existing connectivity gaps in the region.

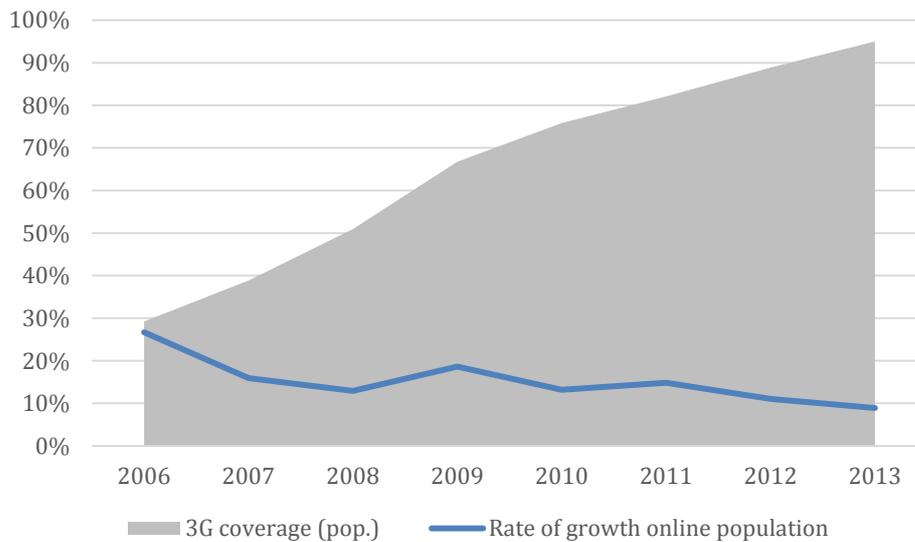
The chapter is organized as follows. The next section briefly reviews the existing literature on the determinants of Internet adoption and factors for non adoption. It also provides background information that helps to interpret the empirical findings presented in Section 3. The conclusion discusses policy recommendations and outlines a future research agenda.

## 2. Conceptual and empirical background

There is a vast research literature on the drivers of Internet adoption. Studies tend to agree that income, level of education, age and the presence of school-age children are the main predictors of adoption (Hauge and Prieger, 2010). Other studies suggest factors specific to certain countries or regions. For example, Navarro and Sanchez (2011) reveal that gender plays a role in determining the probability of adoption in certain countries in Latin America. In multiethnic countries such as the United States, several studies show the importance of ethnicity and English proficiency (Ono and Zavodny, 2008, NTIA, 2011). Other studies point to geographical factors such as urban location and the adoption rate in the location of the individual or household (Chaudhuri and Flamm, 2005; Vicente and Lopez, 2006; Grazzi and Vergara, 2011). Finally, other studies suggest that individual psychological factors need to be included alongside traditional sociodemographic characteristics (Helsper and Reisdorf, 2013).

In Latin America, earlier studies tended to emphasize supply-side constraints to Internet adoption. In other words, it was hypothesized that the key constrain to broader Internet use was the lack of adequate investments in Internet infrastructure and services. This hypothesis began to lose ground as service coverage expanded dramatically in Latin America throughout the first decade of the 21<sup>st</sup> century, driven largely by mobile networks. By 2014 the ITU estimated that over 80% of the population lived within reach of a broadband mobile network (3G or above). But despite greater coverage and falling prices (see below) the rate of growth of Internet users began to slow down (see Chart 1).

*CHART 1: Online population growth rate and mobile broadband network coverage in LATAM, 2006-2013*



Source: GSMA Intelligence and ITU.

As a result, researchers turned attention to demand-side constraints to adoption. Katz and Galperin (2013) provided the first estimates of what they called the “demand gap”, defined as the difference between the percentage of population covered by at least one provider and the percentage of Internet subscribers. According to their estimates, in 2011 the demand gap was already large: only about 1 in 3 households covered by fixed broadband subscribed to the service, while only 1 in 6 individuals subscribed to mobile broadband plans.

Recognizing the role of demand-side constraints opened a new set of questions. In particular, much attention has been paid to the role of affordability. Given that research consistently showed that Internet access prices in most of Latin America were above comparable benchmarks from both developed and developing markets (see Galperin and Ruzzier, 2013; OECD, 2011), it was hypothesized that cost played a key role in stifling demand. This contrasted with high-income countries, where studies showed that lack of interest and skills were far more important than cost in deterring adoption.<sup>1</sup>

Yet recent research shows that access costs have dropped significantly in Latin America since 2010, driven by increased competition, product innovations and more aggressive universal

<sup>1</sup> For example, Dutton and Blank (2013) report that only 5% of non users in Britain mention cost as the most important reason for not using the Internet.

service initiatives. Agüero (2014) reports that the average cost of the entry-level fixed broadband plan in the region has dropped 15% between 2010 and 2014, while the advertised cost of 1 Mbps of download speed has dropped by 59% in the same period. Prices have also decreased significantly in the mobile segment: the price of a postpaid subscription with a data allowance of at least 1GB has dropped 29% between 2011 and 2104, while prices for the the popular daily prepaid plans have dropped 37% on average in the same period.<sup>2</sup>

These changes in the access market raises several questions: does affordability continue to be the major barrier for Internet adoption in Latin America? How does affordability interact with other sociodemographic and motivational factors? Has adoption reached its ceiling given existing levels of digital literacy and content availability? How should public policies address the combination of affordability and other demand-side barriers for adoption?

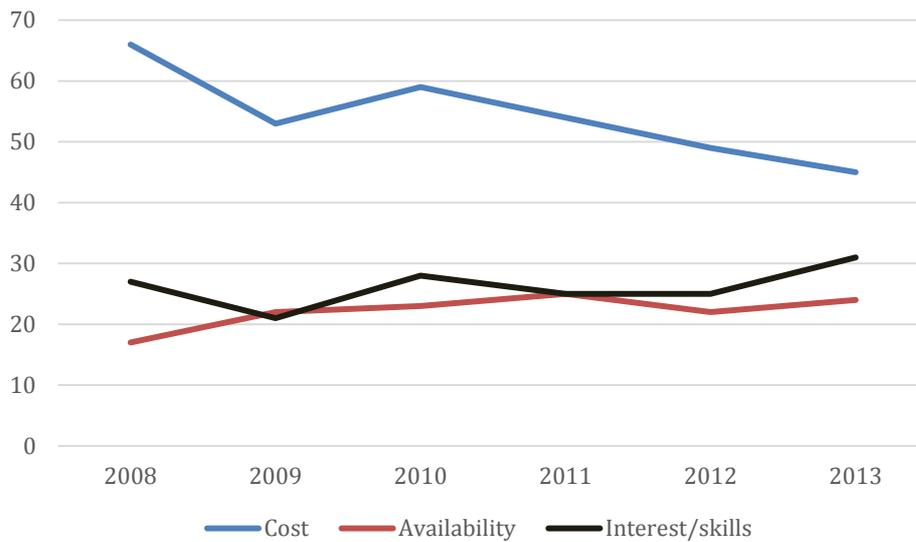
### 3. Findings

Survey results indicate that affordability remains the main barrier for non adoption by Latin American households. However, long-term trends suggest that cost factors are becoming less relevant, while motivational (interest) and skill-related factors are growing in importance. Chart 2 presents results for Brazil from CETIC's ICT Households and Enterprises survey. As shown, while 66% of respondents cited cost as a reason for non adoption in 2008 only 45% did so in 2013. At the same time, other demand-side factors have been consistently growing, suggesting that unconnected Brazilian households lack either proper incentives or skills to benefit from connectivity. The slight upward trend in supply-side factors (i.e., availability) is counter-intuitive, given growing network coverage as shown above. It is likely that this reflects increased demand for connectivity among residents in poorly connected areas. In fact, in the sparsely populated Northern region (which includes states in the Amazon basin) almost half of respondents in the 2013 survey cite lack of availability as a reason for non adoption.

---

<sup>2</sup> For more information on pricing data see <http://dirsi.net/web/web/en/indicators>.

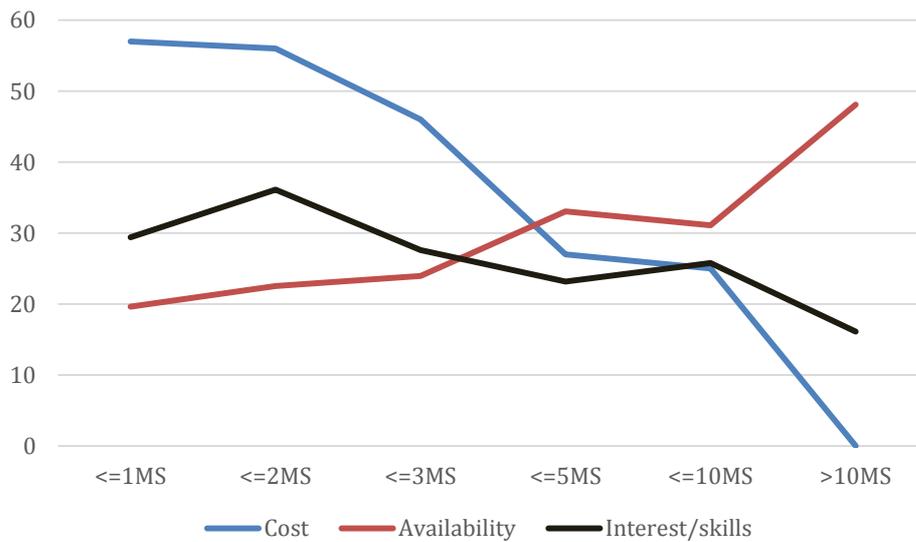
*CHART 2: Brazil: Reasons for not having Internet in HHs with computer (multiple response), 2008-2013 (in %)*



Source: CETIC.

Not surprisingly, as shown in Chart 3, the relevance of cost factors is strongly associated with income. Affordability factors are cited by over half of the respondents on the lower end of the income pyramid, dropping to zero at the higher end. However the pattern for motivational and skill factors is less clear, suggesting an inverted u-shaped curve that peaks near the bottom of the income distribution. Interestingly, availability is inversely related to income, suggesting that coverage remains a challenge even in markets with high-demand potential.

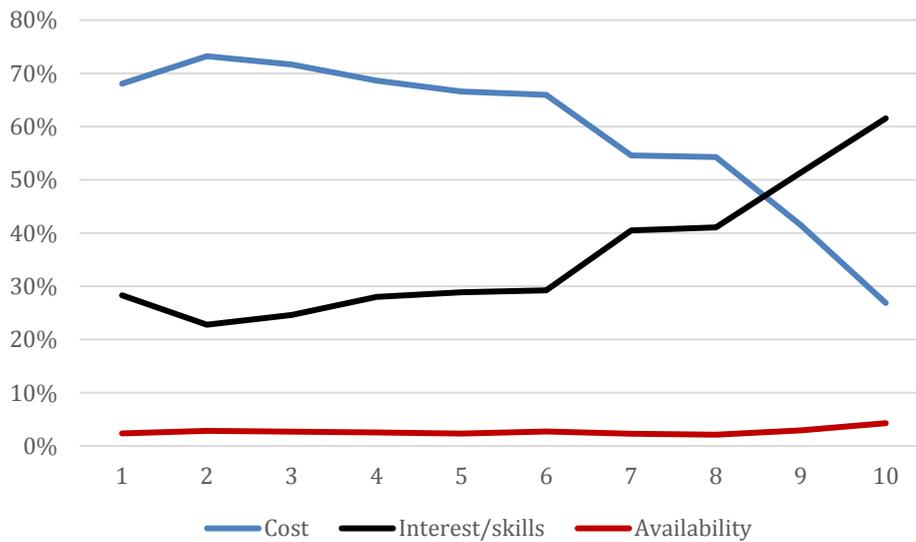
*CHART 3: Brazil: Reasons for not having Internet in HHs with computer (multiple response) by HH income (in Minimum Salaries), 2013 (in %)*



Source: CETIC.

A similar pattern is found in other countries. Chart 4 presents results from Colombia’s ENCV. ENCV is a large, nationally-representative household survey administered by DANE (Departamento Administrativo Nacional de Estadística) that includes a small set of questions about Internet access in the household and individual Internet use. The results show a similar pattern for cost, which drops sharply after the 8th income decile. In this case, other demand factors show a stronger correlation with income, particularly in the upper half of the distribution. Availability is surprisingly cited by very few respondents across all income groups, though this is probably related to the more limited coverage of the sample used.

*CHART 4: Colombia: Reasons for not having Internet in HHs (single response) by HH income (in deciles), 2013*



Source: DANE.

In order to better understand how sociodemographic factors interact with demand for Internet services and use, we build several probit models using microdata from Colombia's ENCV survey. Table 1 presents results for two probit regression models. Model 1 estimates the probability of having Internet at home, while Model 2 estimates the probability of using the Internet at least once in the past year (2013). To facilitate interpretation, average marginal effects (rather than coefficients) are presented.

TABLE 1: Colombia: Probit regression for having Internet at home and individual use (average marginal effects)

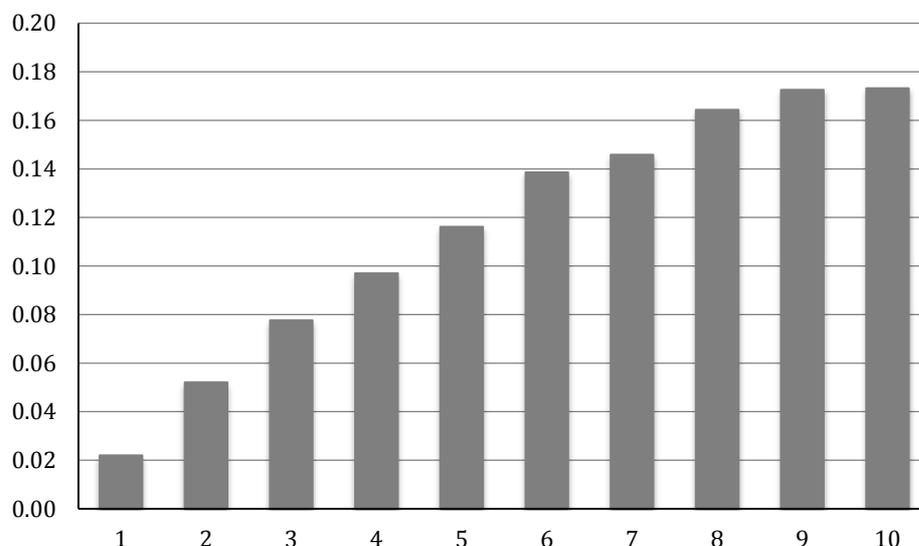
	MODEL 1: HH Access	MODEL 2: Individual Use
Urban	0.128 (0.006)***	0.100 (0.005)***
HH size	0.028 (0.002)***	0.004 (0.001)**
Male	0.014 (0.005)**	-0.004 (0.004)
Age	0.002 (0.000)***	-0.001 (0.000)***
Children in school age	0.081 (0.006)***	0.157 (0.005)***
Primary complete	0.051 (0.007)***	0.024 (0.006)***
Secondary incomplete	0.106 (0.008)***	0.074 (0.007)***
Secondary complete	0.190 (0.009)***	0.150 (0.007)***
Higher incomplete	0.307 (0.022)***	0.233 (0.016)***
Higher complete	0.318 (0.012)***	0.259 (0.009)***
Log(Income) in USD PPP 2005	0.109 (0.003)***	0.046 (0.003)***
Access to internet at HH		0.260 (0.006)***
Observations	20,818	46,550

Standard errors in parentheses. Reference category for education is Primary Incomplete.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The results confirm previous findings about the significance of income, education and geographical location as key determinants of Internet access in the household. Households in urban areas have a much higher (12.8 p.p.) probability of being connected than rural households, after controlling for income and a variety of sociodemographic factors. The effects of income and education are equally strong, but interestingly they are also non linear. Chart 5 shows how the average marginal effect of a 1% increase in income is far larger at the top of the income distribution than at the bottom (about 8 times larger). In other words, the effects become larger as income and education grow.

CHART 5: Colombia: Average marginal effects of income on access at HH by income decile



Source: DANE.

The effect of location is equally strong in the model predicting individual use. However, education and in particular income have a much smaller effect on use than on access at home. This suggests a differentiated usage pattern among lower income individuals, who favor access in public locations (at work, in schools, at cybercafés) or through mobile devices. The effect of age presents an interesting pattern: it has a positive effect on the probability of access at home, but a negative effect on the probability of use. This confirms the importance of public access locations and mobile access for connecting the youth. Having children in school age is also found to be a strong predictor of both access at home and use. It is worth noting that the effect is twice as large for use as for access at home, suggesting the presence of spillover effects from children to adults use even in the absence of connectivity at home.

Another interesting result is how the small but significant effect of gender in the household access model disappears in the individual use model. This means that, despite the fact that women are more likely to live in unconnected households, they are, *ceteris paribus*, equally likely to be Internet users. Lastly, but not surprisingly, having Internet at home is the strongest predictor of use, controlling for all other socioeconomic factors. This confirms studies suggesting that the Internet is an experience good (Kraut et al., 1999), whose value is difficult for an individual to predict *ex ante*, and as such grows with use over time.

A similar model is created to analyze which are the most significant barriers for uptake cited by those living in households without access. The results are presented in Table 2 (once again average marginal effects rather than coefficients are presented to facilitate interpretation). As expected, all else being equal, urban households are more likely to cite affordability as the main barrier to adoption, while rural households are more likely to cite availability. Interestingly, men are less likely to cite cost but more likely to cite lack of skills than women. The effects of age are as expected: the older are less likely to cite cost and more likely to cite interest as the main barrier to adoption. Interestingly, the effect of education is more relevant to skills than interests. In other words, education has little effect on motivational factors but a strong effect on skill-related factors determining access at home. This suggests a latent demand for targeted digital training programs to promote household access among the less educated.

TABLE 2: Colombia: Probit regression for reasons for not having Internet at home (average marginal effects)

	Reasons for No Access in HH				
	Cost	Interest	Skills	Availability	Others
Urban	0.072 (0.008)***	-0.011 (0.008)	-0.011 (0.004)*	-0.055 (0.004)***	-0.001 (0.003)
HH size	0.032 (0.003)***	-0.018 (0.003)***	-0.020 (0.002)***	0.003 (0.001)***	-0.001 (0.001)
Male	-0.040 (0.008)***	0.019 (0.007)*	0.015 (0.004)***	0.009 (0.003)**	0.000 (0.002)
Age	-0.003 (0.000)***	0.002 (0.000)***	0.001 (0.000)*	-0.000 (0.000)	-0.000 (0.000)
Children in school age	0.179 (0.012)***	-0.145 (0.011)***	-0.053 (0.006)***	0.016 (0.004)***	0.011 (0.003)***
Primary complete	0.033 (0.010)***	-0.000 (0.010)	-0.026 (0.006)***	-0.002 (0.003)	-0.002 (0.003)
Secondary incomplete	0.021 (0.011)	-0.002 (0.011)	-0.031 (0.006)***	0.010 (0.004)*	0.002 (0.003)
Secondary complete	0.008 (0.012)	0.014 (0.012)	-0.054 (0.006)***	0.017 (0.006)***	0.009 (0.004)*
Superior incomplete	-0.014 (0.036)	0.033 (0.034)	-0.055 (0.016)*	0.048 (0.024)**	0.000 (0.009)
Superior complete	-0.062 (0.018)***	0.048 (0.017)**	-0.076 (0.006)***	0.057 (0.011)***	0.019 (0.007)***
Log(Income) in USD PPP	-0.051 (0.004)***	0.042 (0.004)***	-0.011 (0.002)**	0.013 (0.002)*	0.011 (0.001)***
Observations	15,527	15,527	15,527	15,527	15,102

Standard errors in parentheses. Reference category for education is Primary Incomplete.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The most interesting finding in Table 2 is the size of the effects of having children in school age. Parents with school-age children are much more likely to cite cost as the key barriers for household uptake (18 p.p.), and much less likely to cite lack of interest or skills. In other words, parents clearly see the value of home connectivity for students, but many are unable to afford the cost of existing services. Overall, about two-thirds (62%) of households with children in school are not connected to the Internet. This finding is particularly relevant in light of growing evidence about the positive effect of having Internet access at home on educational achievement (see Muñoz and Ortega, 2015).

#### 4. Conclusions

It is often assumed that, as coverage increases and access prices decrease, Internet uptake will become near universal, much like other utilities have become in developed nations throughout the 20th century. Recent research based on large-scale surveys of adopters and non adopters has nonetheless shown that the drivers for Internet adoption are far more complex. Cost factors remain a significant barrier for households in Latin America. Yet while income is a very significant predictor of household uptake, it is a much less significant predictor of use. Further, affordability strongly interacts with specific sociodemographic characteristics such as having children in school age.

These results point out the need for further investigation about the determinants of Internet adoption in Latin America. They also underscore the policy value of the high-quality data produced by large-scale national surveys. So far, policy initiatives aimed at promoting Internet uptake in Latin America have rarely targeted specific groups. Further, they have favored supply-side programs that seek to extend infrastructure coverage and offer low-cost access packages. The results presented confirm that cost and availability continue to be important barriers for uptake, yet they also suggest that targeted programs that also address motivational and skill-related factors may be necessary, and possibly more effective from a cost-benefit perspective.

Finally, affordability barriers need to be better problematized. For example, while many policy initiatives refer to the ITU's Broadband Commission target of access costs below 5% of average per capita GDP, there is no scientific basis for such a target (see Barrantes and Galperin, 2008). Further, average incomes are a very poor indicator of the ability of the

population to pay for services, particularly in countries with high income inequality as is the case of Latin America. As our results show, adoption drivers and barriers vary significantly across income groups. Finally, a finer understanding of the interaction between mobile and fixed access is needed to move beyond simplistic characterizations of the digital divide, as well as to define appropriate comparison yardsticks that a) account for different user preferences; b) account for differences in infrastructure development between countries; and c) are based on evidence about actual use patterns. A complex but stimulating research agenda thus lies ahead.

## REFERENCES

Barrantes, R., & Galperin, H. (2008). Can the poor afford mobile telephony? Evidence from Latin America. *Telecommunications Policy* 32(8): 521-530.

Chaudhuri, A., & K. Flamm (2005). An Analysis of the Determinants of Internet Access. *Telecommunications Policy*, 29, 731-755.

Dutton, W., & Grant, B. (2013). *Cultures of the Internet: The Internet in Britain*. Oxford: Oxford Internet Institute.

Galperin, H., & Ruzzier, C. (2013). Price elasticity of demand for broadband: Evidence from Latin America and the Caribbean. *Telecommunications Policy* 37: 429–438.

Galperin, H., & Viacens, F. (in press). Connected for development? Theory and evidence about the impact of the Internet on poverty alleviation. *Development Policy Review*.

Grazzi, M., & S. Vergara (2011). Determinants of ICT Access, en M. Balboni, S. Rovira y S. Vergara (eds.), *ICT in Latin America: A Microdata Analysis*. Santiago de Chile: CEPAL.

Hauge, J., & J. Prieger (2010). Demand-Side Programs to Stimulate Adoption of Broadband: What Works? *Review of Network Economics* 9, 3.

Heslper, E., & Reisdorf, B. (2013). A quantitative examination of explanations for reasons for Internet nonuse. *Cyberpsychology, Behavior and Social Networking* 16(2): 94-99.

ITU (2014). *Measuring the Information Society Report*. Geneva: ITU.

Katz, R., & Galperin, H. (2013). The demand gap: Drivers and public policies. In Jordán, V., Galperin, H., & Peres, W. (eds.), *Broadband in Latin America: Beyond Connectivity*. Santiago de Chile: CEPAL, pp. 33-68.

Kraut, R., Mukhopadhyay, T., Szczypula, J., Kiesler, S. & Scherlis, B. (1999). Information and Communication: Alternative Uses of the Internet in Households. *Information Systems Research* 10(4): 287-303.

Muñoz, R. & Ortega, J. (2015). ¿Tienen la banda ancha y las TIC un impacto positivo sobre el rendimiento escolar? Evidencia para Chile. *El Trimestre Económico* 82(1): 53-87.

Navarro, L., & M. Sánchez (2011). Gender differences in Internet use, en M. Balboni, S. Rovira, y S. Vergara (eds.), *ICT in Latin America: A Microdata Analysis*. Santiago de Chile: CEPAL.

NTIA (2011). *Exploring the digital nation*. Washington D.C.: NTIA.

OECD (2011). *Review of Telecommunication Policy and Regulation in Mexico*. Paris: OECD.

Ono, H., & M. Zavodny (2008). Immigrants, English Ability, and Information Technology Use. *Social Forces* 86, 4, 1455-1479.

Vicente, M., & A. López (2006). Patterns of ICT Diffusion across the European Union. *Economic Letters*, 93, 45-51.