II. The demand gap: drivers and public policies

Raúl L. Katz and Hernán Galperin[1]

The debate about the digital divide in Internet use and broadband has largely revolved around the statistics on households that own a computer and have adopted broadband (service penetration, in other words). Thus, political discussion and public opinion have turned on the need to increase take-up by expanding telecommunication network coverage. The underlying premise is that the digital divide would be narrowed if the issues holding up infrastructure investment were resolved. Without denying that there is some causal relationship between investment and the divide, it is important to stress that one of the fundamental variables accounting for the digital divide lies on the demand side rather than the supply side. The purpose of this chapter is to analyse the divide from this perspective, both in industrialized countries and in Latin America.

First, quantitative information is presented to show that there is a demand gap, even in industrialized countries. On this basis, the chapter reviews the research carried out in the developed world, using statistics from different countries to identify common causal variables. It then examines the situation in Latin America, concentrating first on quantifying the demand gap for countries on which information is available. Following the same process as for developed countries, it presents the results of research done in Latin America with the aim of explaining the nature of the demand gap.

[1] Raúl L. Katz is an Adjunct Professor with the Division of Finance and Economics at Columbia Business School and Director of Business Strategy Research at the Columbia Institute for Tele-Information. Hernán Galperín is an Associate Professor at the University of San Andrés in Buenos Aires.

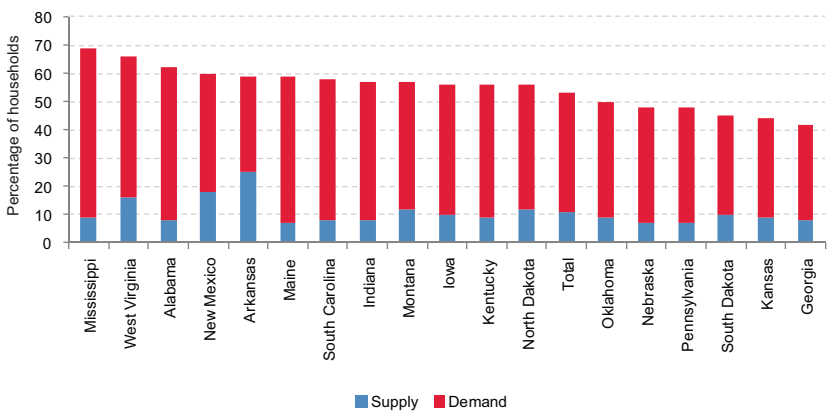
This diagnosis provides the basis for public policy recommendations to address some of the barriers to adoption.

A. Measuring the digital divide from the demand side

The digital demand gap is defined as the number or percentage of households or individuals who could subscribe to broadband but do not. Such statistics are not easy to calculate because technology coverage (i.e., households and individuals with access to broadband) is not usually measured by public-sector entities or regulatory agencies. A large number of national broadband strategies have been developed in recent years, however, and in-depth analysis of the size of the service coverage shortfall has been required for diagnostic purposes.

In the United States, according to the *Federal Communications Commission* (FCC), 96% of households had access to broadband via a cable modem in early 2008 and 82% via DSL. Current penetration statistics indicate that 64% of United States households have purchased the service. Thus, 32% of households could access broadband but do not. This gap naturally varies by state (see figure II.1).

Figure II.1
United States: states with the lowest broadband penetration rates, 2010
(Percentages)



Source: Prepared by the authors on the basis of data from the Federal Communications Commission (FCC), HSPD1207, table 14, and the United States Census Bureau.

As can be seen, the demand gap in a state like Mississippi is 60% while the supply gap (households not covered by the service) is just 9%. In

Georgia, where the service adoption rate is higher, the supply gap is 8% of households while the demand gap is 34%.

In Germany, the National Broadband Strategy published in February 2009 reported that 98% of households (39.7 million) were in a position to access broadband. Of these, 36.7 million were covered by DSL platforms, 22 million had cable television (meaning they could access broadband via cable modem) and 730,000 could access the Internet using wireless platforms such as satellite. Despite this coverage, just 58% had taken up the service. Information for other developed countries confirms that there is a gap of this kind everywhere (see table II.1).

Table II.1
Developed countries: size of the fixed broadband demand gap, 2011
(Percentages)

Country	Households covered	Households connected	Demand gap
Germany	98	58	40
Australia	89	69	20
Republic of Korea	100	93	7
Denmark	96	76	20
Spain	93	61	32
United States	96	61	35
France	100	77	23
Israel	100	83	17
Italy	95	55	40
United Kingdom	100	68	32
Sweden	100	89	11

Source: Prepared by the authors on the basis of data from the International Telecommunication Union (ITU), the European Union (EU), the Federal Communications Commission (FCC), the German Federal Ministry of Economy and Technology (BMWi), the Organisation for Economic Cooperation and Development (OECD).

In some developed countries (especially Germany, Italy, Spain, the United Kingdom and the United States), a large proportion of people who do not access the Internet via fixed broadband in the home are not prevented from doing so by lack of service availability but refrain for other reasons. So what are the factors accounting for this?

The demand gap issue becomes more complex when mobile broadband is viewed as a platform capable of providing Internet access. First of all, what is mobile broadband? The term can be applied to service subscriptions that include the acquisition of a modem enabling a computer to connect to the Internet (these are called USB modems, dongles or aircards). It also applies to technologies that allow Internet access via mobile phones. In

this case, smartphones are suitable terminals because their screen formats and interface systems provide an adequate platform for browsing the web, answering e-mails and accessing platforms such as Facebook, Google and YouTube. From the point of view of network technology, third- and fourth-generation (3G and 4G) network coverage provides the speed necessary for efficient access.

The second issue where mobile broadband is concerned is how to measure the demand gap. Since in this case the connection is provided to individual users (laptop or smartphone owners), the parameters used to measure the demand gap should be different to those used for fixed broadband: the population coverage of 3G and 4G networks and the percentage of subscribers who have a smartphone or mobile modem. This assumes that most smartphones operate on 3G or 4G networks, which is not necessarily the case, although the number of subscribers using terminals of this type on 2.5G networks is falling rapidly. Table II.2 presents estimates of the mobile broadband demand gap for some developed countries.

Table II.2
Developed countries: mobile broadband demand gap, 2011

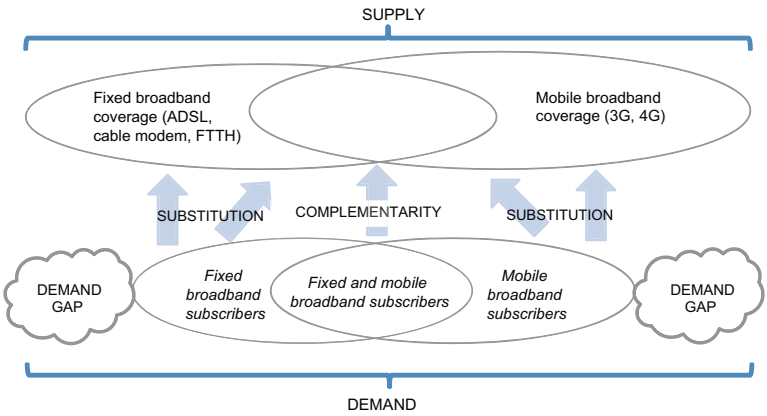
Country	Population covered (3G)	Mobile broadband penetration	Mobile demand gap
Germany	86.0	34.7	51.2
Australia	97.0	89.1	7.9
Republic of Korea	99.0	97.1	1.9
Denmark	97.0	57.5	39.5
Spain	90.6	36.7	53.9
United States	98.5	71.9	26.6
France	98.2	32.9	65.3
Israel	99.0	54.4	44.6
Italy	91.9	48.2	43.7
United Kingdom	95.0	42.6	52.4
Sweden	99.0	85.1	13.9

Source: Prepared by the authors on the basis of data from Wireless Intelligence and the International Telecommunication Union (ITU).
Note: Population coverage is based on 3G networks on the assumption that Long Term Evolution (LTE) networks will be rolled out in the same areas, at least initially.

Another dimension to be considered in measuring the demand gap is the degree of substitution or complementarity between fixed and mobile broadband. For example, mobile broadband subscribers often subscribe to fixed broadband too, so that the two technologies complement each other by providing Internet users with an environment of total connectivity. In other cases, and especially in emerging countries, mobile broadband may

be a substitute for fixed broadband in three types of situations: (i) no fixed service is available in the user's area, (ii) the quality of the fixed service puts it at a disadvantage to the mobile service (low speeds, for example), or (iii) the user opts to consolidate by acquiring only a mobile service that provides connectivity and mobility. Where substitution has taken place, it is important to include mobile broadband-only subscribers in the total for broadband users before looking at the demand gap. Diagram II.1 illustrates the two types of demand gap.

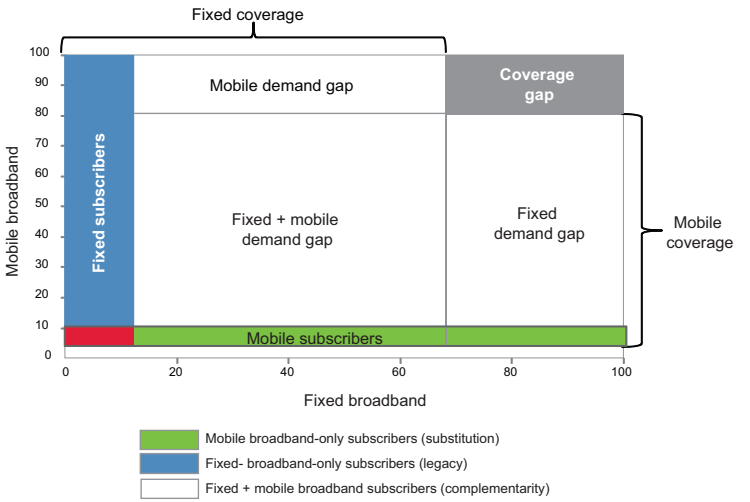
Diagram II.1
Fixed and mobile broadband substitution and complementarity



Source: Prepared by the authors.

There are two types of demand gap: users who only have access to a fixed broadband service and do not acquire it (this is fairly unusual, since fixed and mobile broadband tend to be rolled out in the same areas) and those for whom the only option would be mobile broadband but they do not acquire it. Mobile broadband users should therefore not be included in the population that is considered to be part of the demand gap because they are already purchasing an Internet access service that either complements or substitutes fixed broadband (see figure II.2).

Figure II.2
Quantification of the fixed and mobile demand gap
(Percentages)



Source: Prepared by the authors.

Thus, the demand gap should be quantified using the following formulas:

Demand gap = broadband coverage (C) – broadband subscriptions (S)

where

C = population covered by fixed and mobile broadband + population covered by fixed broadband only + population covered by mobile broadband only

S = fixed and mobile broadband subscribers (complementarity) + fixed broadband subscribers (legacy) + mobile broadband subscribers (substitution)

Using this formula to calculate the demand gap requires a firm understanding of parameters such as technological complementarity. The current lack of statistics of this kind makes it necessary to analyse the demand gap by technology type.

B. Understanding the demand gap

There is an extensive literature on the drivers of Internet adoption, particularly for broadband. These studies concur in identifying income,

educational attainment and household age structure as the main predictors for adoption of these services (Hauge and Prieger, 2010). A number of studies suggest that other factors are also involved, many of them specific to particular countries or regions. For example, Navarro and Sánchez (2011) have shown that, all other things being equal, the likelihood of Internet use drops by 6% in Latin America if the potential user is a woman. In the United States, studies have shown the importance of factors such as ethnicity and proficiency in English (Ono and Zavodny, 2008; NTIA, 2011). Other factors such as geographical location (rural versus urban), the presence of school-age children and the penetration rate in the individual or household's geographical area (essentially, the network effect) have also been identified in the academic literature as drivers of Internet adoption (Chaudhuri and Flamm, 2005; Vicente and López, 2006; Grazzi and Vergara, 2011).

Identifying the socioeconomic factors behind Internet adoption provides a first approach to the demand gap issue. Nonetheless, an analysis based on econometric studies does not allow a distinction to be drawn between non-adoption due to supply constraints (in rural or low-income areas, for example) and demand factors. Nor do these studies have much to say about the reasons for non-adoption when there is an adequate supply of services.

Studies based on surveys of people who are not Internet users do permit some progress in this direction. This section reviews the findings of studies in the most developed countries, where there is a substantial literature on the subject. As will be seen, findings regarding the factors that explain non-adoption in different countries are surprisingly consistent. The evidence for Latin America will be analysed in the following section.

To start with the United States, data from the most recent surveys show that 78% of adults use the Internet "at least occasionally" (Pew Center, 2012). Of the 22% of the population who are not users, most are individuals over 65 years of age, adults who have not completed secondary education, members of households earning less than US$ 30,000 a year and those with limited English proficiency, corroborating the findings of the studies cited above. What are the reasons for non-adoption? The responses of non-users reveal that the main factor is lack of interest or relevance (42%), followed by factors related to the affordability of devices and services (22%) and lack of usage skills (21%).

Focusing on the adoption of broadband in the home, the most recent data show that 62% of adults in the United States live in households with broadband service.[2] However, this percentage drops to 22% for adults who have not completed secondary education, 30% among those aged 65 and over and 41% among those with incomes of less than US$ 30,000 per year, replicating the patterns of adoption cited above (Pew Center, 2012). As table II.3 shows, the main reasons cited by those who do not have broadband at home fall into a pattern similar to those reported by non-users of the Internet, most notably a lack of interest or relevance (50%) and affordability constraints (19%).

Table II.3
United States: reasons for not adopting broadband in the home, 2009
(Percentages and number of observations)

Reason	Have narrowband service in the home	No Internet in the home	Weighted total	Percentage of adult population
Lack of relevance/interest	32	45	50	13
Cost (computer or connectivity service)	35	15	19	5
Service unavailable	17	16	17	4
Difficulty of use	16	22	13	3
Number of observations	92	566	658	

Source: J. Horrigan, Home Broadband Adoption 2009, Washington, D.C., Pew Internet and American Life Project, 2009.

A government report on the population that does not have broadband in the home corroborates these findings (NTIA, 2011). The main reason cited by individuals living in households without broadband is a lack of interest in the service (47%), followed by reasons related to affordability (24%) and lack of proper equipment (15%). If households that have a computer but do not subscribe to the service and households without either a computer or broadband are considered separately, service affordability reasons are more prominent in the first group, while the lack of relevance or interest predominates in the second (see table II.4).

[2] This figure comes from the Pew Internet Project survey and is for August 2011. Subscription data reported by operators yield essentially similar results: according to the FCC, 64% of households that have access to broadband subscribe to it (FCC, 2012).

Table II.4
United States: reasons for not adopting broadband based on the availability of a computer in the home, 2011
(Percentages and number of observations)

Reason	Households with a computer	Households without a computer	Weighted total
Lack of relevance/interest	28	52	47
Cost (computer or connectivity service)	37	21	24
Lack of suitable equipment (computer)	8	17	15
Other	27	10	14
Number of households (millions)	6.8	27.8	34.6

Source: National Telecommunications and Information Administration (NTIA), Exploring the Digital Nation, Washington, D.C., 2011.

In Spain, the most recent data show that 61% of households have a broadband connection (ONTSI, 2012). Among unconnected households, the main reasons cited for not accessing the service are lack of interest (66%), the cost of equipment or connectivity (42%) and lack of the skills or knowledge required to use the service (29%).[3] Interestingly, as table II.5 shows, the lack of relevance/interest is still a significant determinant even at the lowest income levels, where affordability and usage skills are, as would be expected, the most important factors. These findings confirm the importance of digital literacy initiatives aimed at lower-income sectors of the population.

Table II.5
Spain: reasons for not adopting broadband, by income level, 2011
(Percentages and number of observations)

Reason/Monthly household income	<1 100 euros	1 100 to 1 800 euros	1 800 to 2 700 euros	>2 700 euros	Total
Lack of relevance/interest	67	65	48	42	66
Cost (computer or connectivity service)	52	39	42	16	42
Lack of usage skills	35	27	18	12	29
Number of households (millions)	2.5	1.2	0.3	0.1	5.6[a]

Source: National Institute of Statistics (INE), Survey on the Equipment and Use of Information and Communication Technologies in Households, 2011.
[a] The difference is due to the remaining respondents (1.4 million) not reporting their income.

In the United Kingdom, the most recent figures show that 80% of households have an Internet connection, overwhelmingly broadband (76%

[3] Survey on the Equipment and Use of Information and Communication Technologies in Households 2011 (INE). Percentages exceed 100% because respondents could select more than one reason.

of all households) (OFCOM, 2012a). In line with the findings of other studies, those living in households without a connection tend to be older (aged over 65) and on low incomes. The vast majority expressed no intention of subscribing to the service in the next 12 months, suggesting that the demand gap is persistent. Again, the main reason cited is lack of relevance (66%), well above cost-related factors (16%) and lack of usage skills (4%).

In 2010, cost-related factors were cited by 23% as the main reason for not subscribing to the service, while in 2011 the figure dropped to 16%. This suggests that as access and equipment costs decline, a gap increasingly associated with cultural or educational factors persists. Another significant finding is that 23% of non-users report that they have asked someone else to perform a task on the Internet (such as sending e-mail or searching for information) on their behalf. This indicates that, regardless of relevance, important barriers associated with usage skills persist (OFCOM, 2012b).

The review of studies on non-adoption of Internet and broadband in the most developed countries reveals results that are essentially consistent from one country to another and yield both a sociodemographic profile of unconnected households and the main reasons for non-adoption of the service. In sociodemographic terms, the results of survey-based studies bear out the evidence from econometric studies: unconnected households tend to be composed of older persons (over 65), low-income individuals and those who have not completed secondary education. In the United States, ethnicity and English proficiency factors (among the population of Spanish-speaking recent immigrants) also come in.

The findings of the different studies also concur on the reasons given for not adopting broadband in the home. Lack of relevance or interest consistently appears as the primary factor in non-adoption. As suggested by OFCOM (2010a), this response may mask reasons related to costs or a lack of usage skills, factors that consistently rank second and third in order of importance. However, the trend seems to indicate a decline in the importance of factors related to the affordability of equipment and connectivity services. Thus, the persistence of a core of between 20% and 40% of households not connected to broadband in developed countries suggests the need for long-term digital literacy policies aimed at promoting demand for services among the households described above.

C. The situation in Latin America

In the case of Latin America, it is important to first consider the role of shared Internet access at locations such as the workplace, school and public access facilities, both free (typically called *telecentros* in Spanish) and commercial (public kiosks and Internet cafés). While this type of access is marginal in more developed countries, the most recent figures for Latin America show that shared Internet access continues to be very significant, despite the sharp increase in the number of individual broadband subscriptions. As an example, the most recent figures in Peru show that 65% of Internet users use it at work or at public access facilities (INEI, 2012). In comparison, the most recent figure for Spain is a bare 17% of users (ONTSI, 2012).

The influence of shared access in the region has resulted in a significant gap between the number of Internet users and the number of broadband subscriptions, as shown in table II.6. This gap can be interpreted as latent broadband demand: demand for Internet access that does not turn into service subscriptions.

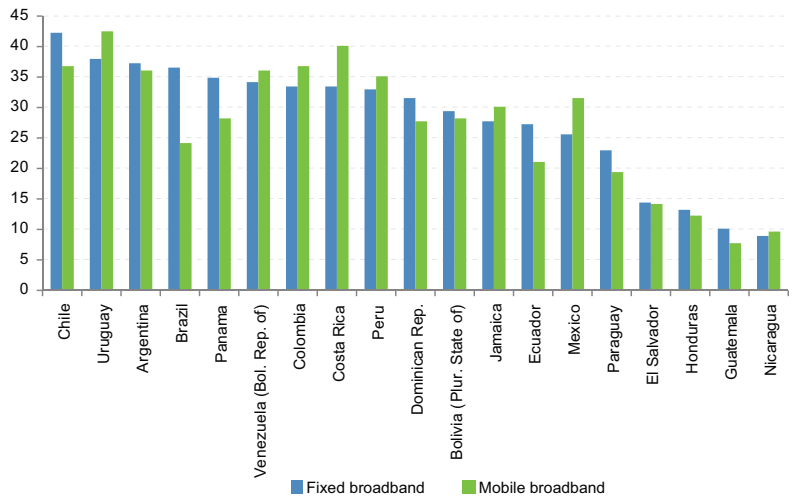
Table II.6
Internet users and broadband subscribers in Latin America, 2011
(Percentages)

Country	Internet users	Fixed subscribers	Mobile subscribers
Argentina	47.7	10.5	11.7
Bolivia (Plurinational State of)	30.0	0.7	1.9
Brazil	45.0	8.6	20.9
Chile	53.9	11.7	17.1
Colombia	40.4	6.9	3.7
Costa Rica	42.1	8.7	2.0
Dominican Republic	35.5	4.0	7.7
Ecuador	31.4	4.2	10.3
El Salvador	17.7	3.3	3.6
Guatemala	11.7	1.8	4.1
Honduras	15.9	2.7	3.7
Jamaica	31.5	3.9	1.5
Mexico	36.2	10.6	4.6
Nicaragua	10.6	1.8	1.0
Panama	42.7	7.9	14.5
Paraguay	23.9	0.9	4.5
Peru	36.5	3.5	1.4
Uruguay	51.4	13.5	9.0
Venezuela (Bolivarian Republic of)	40.2	6.1	4.2

Source: International Telecommunication Union (ITU), Telecommunications Database 2012.

As figure II.3 shows, latent demand measured by the difference between users and subscribers (per 100 inhabitants) is higher in some of the region's more mature markets. This suggests that despite a network effect which stimulates Internet adoption in countries with higher penetration, the market equilibrium point keeps this latent demand from turning into subscriptions.

Figure II.3
Latent fixed and mobile broadband demand in Latin America, 2011
(Percentage points)



Source: International Telecommunication Union (ITU), Telecommunications Database 2012.

The barriers preventing this latent demand from being converted into subscriptions are associated with several factors. First, determining whether there are coverage gaps that explain the magnitude of the latent demand observed in the region will then make it possible to estimate the effective demand gap (i.e., discounting coverage shortfalls) for several countries in the region. Lastly, the factors accounting for this demand gap are analysed on the basis of surveys conducted in various countries.

1. Broadband coverage

Broadband coverage in Latin America is relatively extensive. The following analysis of population coverage was carried out by extrapolating information provided by operators and regulators (see annex II.1).

Table II.7
Broadband coverage in Latin America, 2011-2012
(Percentage of population)

Country	Fixed broadband	Mobile broadband
Argentina	96	92
Bolivia (Plurinational State of)	40	29
Brazil	94	84
Chile	78	82
Colombia	81	96
Costa Rica	95	93
Ecuador	87	66
Mexico	62	77
Peru	59	63
Dominican Republic	n/a	70
Uruguay	98	n/a

Source: Prepared by the authors on the basis of the methodology detailed in annex II.1.

As table II.7 shows, other than in some Andean countries, the broadband supply gap in Latin America is not large. The population coverage of fixed broadband ranges from 98% in Uruguay to 40% in the Plurinational State of Bolivia, with an average of 79% for all the countries analysed. This is because ADSL services over the copper network have benefited from the historical deployment of telecommunication networks. As might be expected, cable television network coverage is concentrated in areas of higher population density and so overlaps with ADSL access.

For mobile broadband, this analysis is based on the deployment of 3G networks (based on EVDO and HSPA standards), which are by definition more suitable for Internet access. In this case, population coverage ranges from 96% in Colombia to 29% in the Plurinational State of Bolivia (with an average of 76% for all the countries surveyed).

2. *The demand gap*

Comparing broadband penetration and service coverage makes it possible to estimate the size of the demand gap (table II.8). In the fixed broadband segment, the average demand gap for the countries analysed is 50 percentage points: less than half the households covered by a fixed broadband service choose to subscribe to it.

Table II.8
The fixed broadband demand gap in Latin America, 2011
(Percentages)

Country	Coverage	Household penetration	Demand gap
Argentina	96	39	57
Bolivia (Plurinational State of)	40	3	37
Brazil	94	29	65
Chile	78	44	34
Colombia	81	27	54
Costa Rica	95	32	63
Ecuador	87	20	67
Mexico	62	47	15
Peru	59	16	43
Uruguay	98	34	43
Average	79	29	50

Source: International Telecommunication Union (ITU), Telecommunications Database 2012.

The demand gap is even larger in the mobile segment, averaging 63 percentage points in the countries examined (see table II.9). In accordance with the theoretical framework explained in the first section, a significant portion of mobile broadband users are also fixed broadband users owing to the complementarity effect. As a result, the contribution of mobile broadband to reducing the demand gap has, so far, been smaller. Although exact figures cannot yet be calculated because the numbers using each technology are unknown, the rapid rate of deployment of mobile broadband suggests that the substitution effect will increase in importance. A progressive reduction in the overall demand gap can therefore be anticipated for the coming years.

Table II.9
The mobile broadband demand gap in Latin America, 2011
(Percentages)

Country	Coverage	Subscriber penetration	Demand gap
Argentina	92	19	73
Bolivia (Plurinational State of)	29	3	26
Brazil	84	21	63
Chile	82	17	65
Colombia	96	9	87
Costa Rica	93	11	82
Ecuador	66	11	55
Mexico	77	14	63
Peru	63	9	54
Dominican Republic	70	5	65
Average	75	12	63

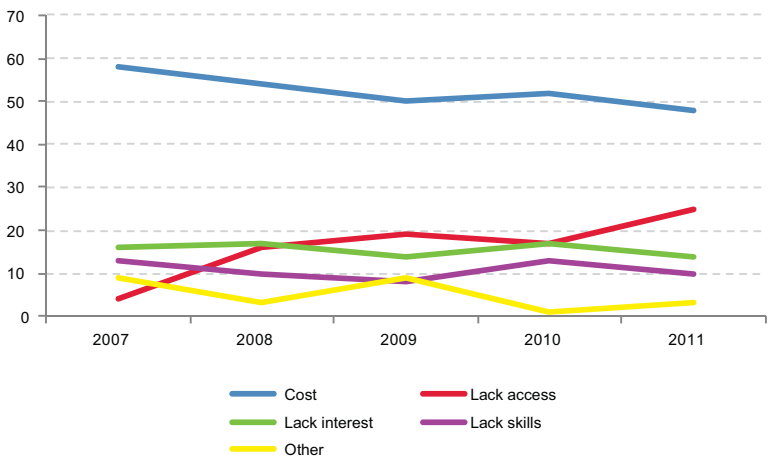
Source: Prepared by the authors on the basis of table II.7 data for coverage and the total number of HSPA, LTE and EVDO connections divided by the population, as reported by Wireless Intelligence.

In summary, the demand gap in the region remains large; a detailed analysis of the underlying factors is required so that policies can be developed to address it.

3. *Explaining the demand gap*

Studies conducted in different countries of the region have yielded relatively consistent results regarding the determinants of the demand gap. Figure II.4 presents the findings of the survey conducted by the Internet Management Committee in Brazil (CGI.br) to analyse why households with computers do not subscribe to a broadband service. As can be seen, the main reason is affordability, followed by (perceived) lack of availability, lack of interest and lack of skills. There was a 10 percentage-point decrease in reasons associated with service cost between 2007 and 2011, suggesting rising incomes in the country, falling prices and greater segmentation of supply. Meanwhile, lack of interest and lack of usage skills are factors that have remained relatively stable over time, suggesting the impact of structural factors linked to deficiencies in the education system.

Figure II.4
Brazil: reasons for not subscribing to Internet in the home, 2007-2011
(Percentages of households with a computer)



Source: CGI, Home ICT Survey.

Research results in Mexico reveal a similar pattern: among households with a computer but no Internet connection, the main reason cited is the cost

of connectivity (60%), followed by lack of interest (19%). In Chile, reasons associated with connectivity costs are less to the fore, being cited by 37% of households with a computer, followed by lack of interest (24%) and lack of usage skills (8%). In Costa Rica, by contrast, the cost factor is more prominent at 60%, followed by lack of skills (12%) and interest (7%). Table II.10 summarizes these results. As can be seen, with the possible exception of Chile, service costs are the main factor explaining the demand gap in Latin America, confirming the results obtained by Galperín and Ruzzier (2010). However, longitudinal analysis in the case of Brazil shows that as access costs fall, structural factors associated with human capital gain in prominence.

Table II.10
Latin America: factors explaining the demand gap
(Percentages)

Reasons cited for not having an Internet connection in the home (only homes with a computer)	Chile (2009)	Brazil (2011)	Costa Rica (2011)	Mexico (2010)
Price of the service	37	48	60	60
Lack of interest	24	14	12	19
Lack of usage skills	8	10	7	n/a
Other reasons (lack of availability, use in other locations, etc.)	31	28	21	21

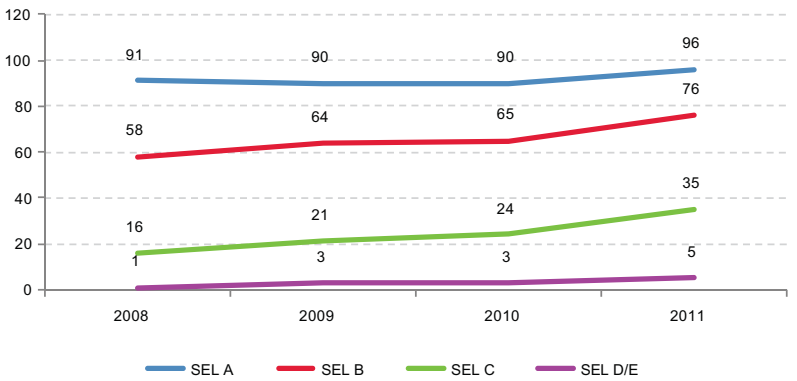
Source: Chile: Survey on Internet Broadband Access, Use and Users in Chile, Universidad Alberto Hurtado/SUBTEL, June 2009. Costa Rica: Second Assessment of the Digital Divide in the Use of Telecommunications Services in Costa Rica, Telecommunications Directorate, February 2011. Mexico: Survey on the Availability and Use of Information and Communication Technologies in Households, INEGI (2010). Brazil: Survey on the Use of Information and Communication Technologies in Brazil, CGI.br, November 2011.

The results of these studies make it possible to identify dimensions of the demand gap associated with sociodemographic factors that are discussed separately below.

(a) The socioeconomic dimension of the demand gap

As the results discussed have shown, analysis of the demand gap by income level corroborates the importance of affordability as a determinant of Internet adoption within households. Beginning with Brazil, figure II.5 shows the disparity between the highest-income group (socioeconomic level A), in which household Internet adoption is almost universal, and the lowest-income group (socioeconomic level D/E), in which household access is marginal. The trend among households of the so-called new middle class (socioeconomic level C) is striking, with home access more than doubling between 2008 and 2011.

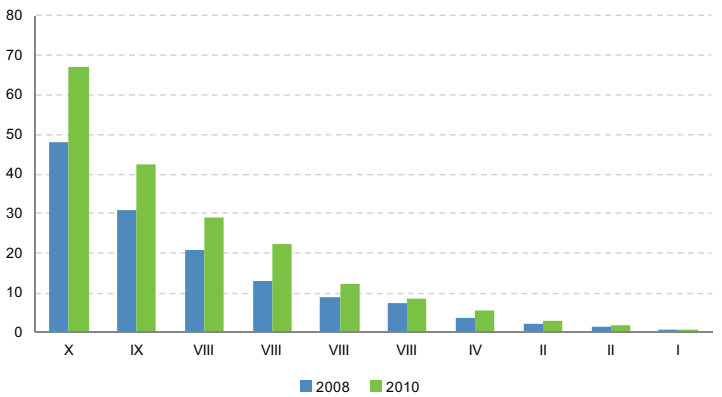
Figure II.5
Brazil: home Internet adoption by socioeconomic level (SEL), 2011
(Percentages)



Source: Survey on the Use of Information and Communication Technologies in Brazil, CGI.br.

For Mexico, figure II.6 shows that the home Internet penetration growth rate between 2008 and 2010 was greater in higher-income deciles, suggesting a widening of the adoption gap between socioeconomic groups.

Figure II.6
Mexico: home Internet adoption by income decile, 2008-2010
(Percentages)

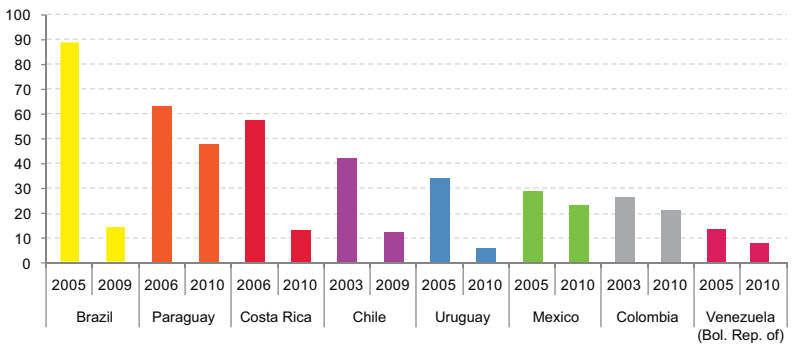


Source: National Institute of Statistics and Geography (INEGI), Estadísticas sobre disponibilidad y uso de tecnologías de la información y comunicación en los hogares, Mexico City 2010.

The findings confirm the importance of economic variables in explaining the demand gap in the countries of the region. The conclusions regarding trends are not decisive, however: whereas in Brazil the increase

in adoption among lower middle-class households suggests a progressive narrowing of the penetration gap by socioeconomic level, the trend in Mexico reveals a widening of the gaps between income deciles. In general, as figure II.7 shows, there has been a gradual convergence in access levels by socioeconomic level, particularly in medium-high income countries such as Brazil, Costa Rica, Chile and Uruguay. In any event, these findings merit more comprehensive longitudinal studies, which would also make it possible to identify the factors accounting for differences in trends between countries, which could be associated with changes in household income, developments in service supply or policies aimed at universalizing access.

Figure II.7
Home Internet adoption gap by income quintile (Q5/Q1)



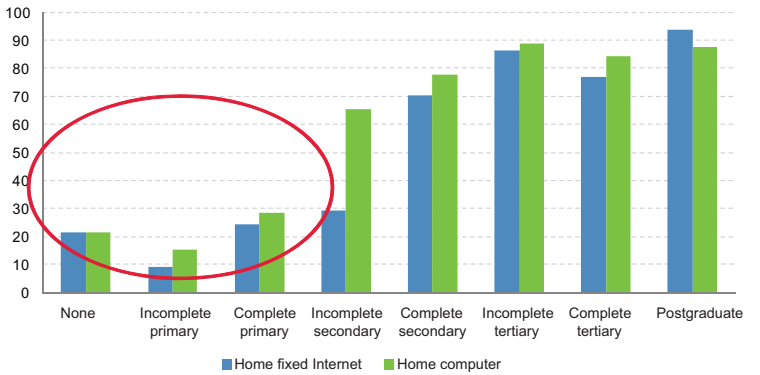
Source: Observatory for the Information Society in Latin America and the Caribbean (OSILAC), on the basis of household surveys conducted in the respective countries.

(b) The education dimension

Survey findings suggest that, after affordability, non-adoption of home Internet services is mainly due to interest and usage skill factors that are closely connected with the stock of human capital. This points to the education dimension of the demand gap, which operates as a proxy for determinants related to interest and usage skill.

In all the countries analysed, there are access gaps between individuals with different levels of education. As an example, figure II.8 shows that the level of home Internet adoption in Costa Rica is more than twice as high among those who have completed secondary education as among those who have not.

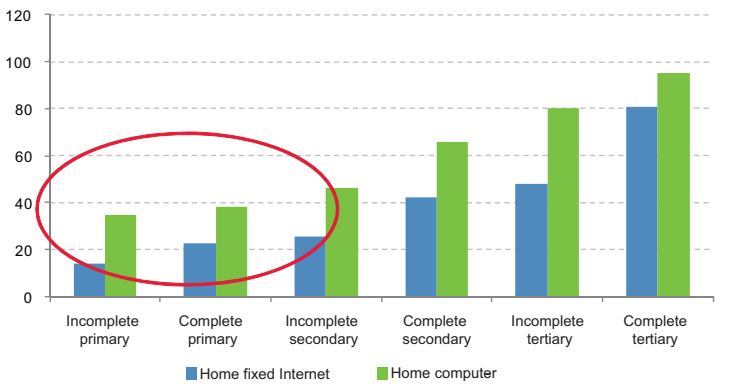
Figure II.8
Costa Rica: residential Internet and computer use by educational level of the household head, 2010



Source: Costa Rica, Telecommunications Directorate, 2011.

The Chilean case supports this finding, as figure II.9 shows. The home Internet adoption rate in Chile is less than 25% among those who have not completed secondary education but as high as 42% among those who have. This confirms that completing secondary education is an important educational threshold that fosters interest and promotes the usage skills needed to take advantage of Internet access in the home.

Figure II.9
Chile: residential Internet and computer use by educational level of the household head, 2009

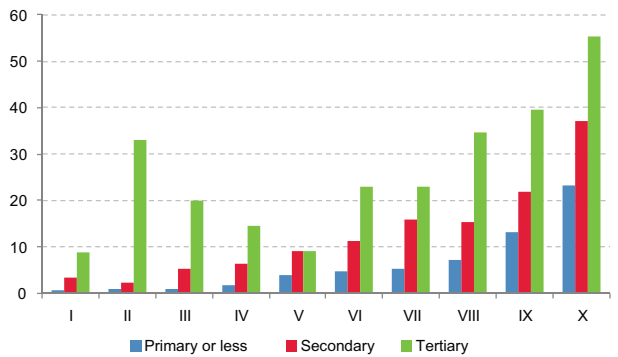


Source: Universidad Alberto Hurtado, Encuesta sobre acceso, uso y usuarios de Internet banda ancha en Chile, Santiago, Chile, 2009.

The problem with these results is the strong correlation between education attainment and socioeconomic level, making it difficult to isolate

the effect of education on adoption by discounting the known effect of socioeconomic level. While this type of analysis is beyond the scope of the present paper, figure II.10 shows that the effect of education persists even after income deciles are controlled for.

Figure II.10
Costa Rica: residential broadband penetration by education level and income decile, 2010



Range	Decile
Less than 37 888	I
37 888 to 54 124	II
54 125 to 69 933	III
69 934 to 88 499	IV
88 500 to 109 889	V
109 890 to 138 845	VI
138 846 to 183 332	VII
183 333 to 253 406	VIII
253 407 to 416 537	IX
416 538 and more	X

Source: Prepared by the authors on the basis of National Institute of Statistics and Census (INEC), Household Survey, July 2010.

This analysis yields two conclusions. First, it highlights the direct relationship between income level and access to ICTs in the home. The cut-off would appear to be around an average income for the seventh decile. From this decile up, the higher the level of education, the greater the Internet and broadband adoption rate. In households with incomes below the sixth decile, a higher level of education does not result in a significant increase in service penetration, except in decile II.

Second, the educational level of the household head is an important variable for the level of broadband adoption in Costa Rica; the level of service take-up is more than 30% in decile II households with university-level education. This would indicate that the influence of education in decile II is significant. One hypothesis could be that this decile includes recent university graduates whose incomes have not increased significantly. Meanwhile, groups with higher levels of secondary and tertiary education and incomes above decile VIII levels have a utilization rate of around 50%.

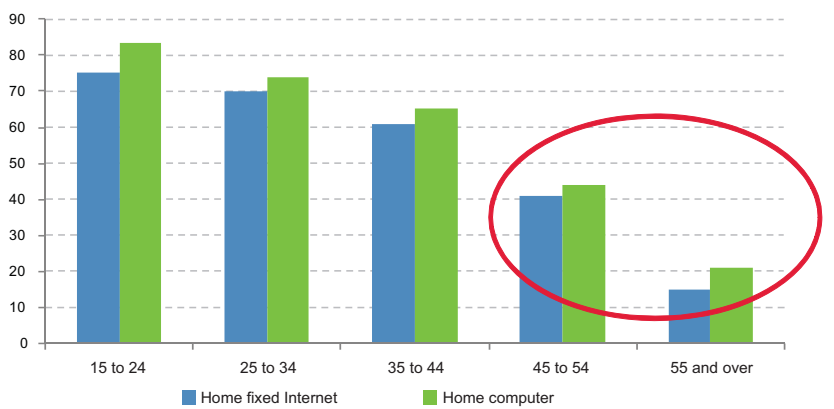
The interaction between the two variables (socioeconomic status and education) thus reveals a complex relationship: while income is crucial, education acts as an adoption incentive, especially in middle- and upper-class households.

(c) The generation dimension

As discussed above, all studies show a strong generational component to Internet adoption. While young people tend to use new technologies intensively regardless of their level of education or income, adoption is significantly lower among older persons. Internet usage data suggest that there is a threshold at around the age of 30, after which the adoption rate for this technology falls off significantly both in the home and elsewhere. The case of Chile is illustrative: above the age of 30, the percentage of non-Internet users doubles (Universidad Alberto Hurtado, 2009). In Peru, the percentage of Internet users drops from 61% among young persons aged 19 to 24 to 37% among adults aged 25 to 40 (INEI, 2012). In Brazil, 81% of young people aged up to 24 use the Internet, while less than half (48%) of adults aged 35 to 44 do.

Consequently, the likelihood of a household subscribing to an Internet service is associated with two factors related to household age composition. First, the age of the household head is a determinant of the penetration level. As figure II.11 shows, the older the household head, the lower the level of service penetration. What is at work in this case is a direct effect linked to the adoption drivers discussed earlier.

Figure II.11
Costa Rica: home Internet and computer use, by age group, 2010



Source: Costa Rica, Telecommunications Directorate, 2011.

On the other hand, studies suggest an indirect effect linked to the presence of school-age children in the home. Data for 2009 confirm this effect in Chile, as the percentage of households with Internet access rises

from 39% to 43% among those with school-age children (Universidad Alberto Hurtado, 2009). In Peru, the effect is even more significant: the proportion of Internet-connected households is 57% among those with school-age children, as against 43% among households without school-age children (INEI, 2012). This effect is replicated in Costa Rica, although when income and education are controlled for it is not found consistently but is associated primarily with households whose heads have a lower level of education.

In summary, the evidence bears out findings on what are known as "digital natives", showing that there is a strong age effect on the likelihood of Internet adoption. Despite the differences in the age groups used by different countries, the results suggest that the threshold separating the digital natives group (among whom Internet usage is widespread) from the so-called digital immigrants is located at around the age of 30. Regarding the household access demand gap, the evidence suggests that the presence of school-age children in the home has a positive effect on the expected adoption rate, but the magnitude of this effect is small compared to that of the factors discussed earlier. These results highlight the importance of implementing digital literacy programmes to offset any age-related disadvantages and thereby reduce the demand gap.

(d) Other dimensions of the demand gap

The analysis reveals that the demand gap is associated, in the following order, with factors of income, education and household age composition. While the evidence indicates that these factors are common to all countries in the region, some studies also point to other factors operating more specifically in particular contexts or countries. This suggests a need to tailor demand-boosting initiatives to the unique characteristics of the demand gap in the different countries of the region.

In some countries, evidence suggests that there is still a gender gap in Internet adoption. This is the case in Chile, where the data for 2009 indicate that the likelihood of a household having Internet access is reduced by 7 percentage points if the household head is female (Universidad Alberto Hurtado, 2009). The magnitude of the gender gap is similar in Peru, where Internet usage is also 7 percentage points lower (31% as against 38%) among women (INEI, 2012). The result in Costa Rica is consistent with this: while 63% of men use the Internet in the home, only 54% of women do (Telecommunications Directorate, 2011).

Brazil and Mexico, by contrast, do not present any significant gender differences in penetration levels, suggesting that the gap tends to disappear in countries with higher penetration. This is consistent with the findings of Hilbert (2011), who ascertained in a recent paper reviewing evidence from 25 countries in Latin America and Africa that differences in ICT adoption by gender tended to disappear when controlled for education and income.

In countries where a significant portion of the population is indigenous, data reveal the existence of a usage gap associated with Spanish-language proficiency, replicating the findings in the United States regarding English-language proficiency among immigrant populations. In Peru, for example, just 8% of the population whose childhood language is other than Spanish uses the Internet, compared with 40% of those for whom it is Spanish. These results need to be analysed in greater depth, however, given that ethnic factors are strongly associated with economic and educational factors and therefore do not provide a prima facie basis for determining the marginal effect of language or ethnicity on the demand gap. Nonetheless, the results are indicative of a need for development initiatives to target demand in these groups, as they labour under a number of disadvantages with regard to Internet use.

D. Public policies to close the demand gap

The analysis presented above provides a framework for designing public policies to stimulate broadband adoption. The following recommendations are organized in accordance with the different dimensions of the demand gap identified in the previous section.

1. Policies for addressing the affordability barrier

The evidence shows affordability to be one of the main determinants of the demand gap in the region. In other words, for a significant portion of households in Latin America (even those that already have a computer), the supply of connectivity is not aligned with income. Considering this, three types of tools should be considered to better match supply to income levels and characteristics in this segment of the population.

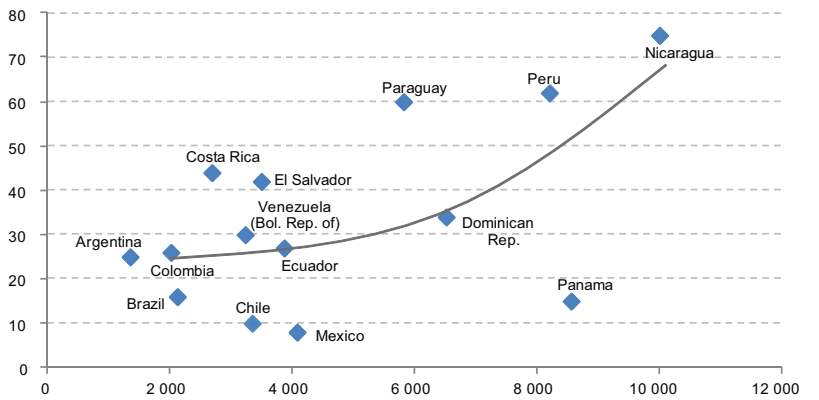
A first set of policy tools aims to encourage competition in order to bring down access prices. The tools available to achieve this goal can be divided, generally speaking, into two major groups: those designed to increase competition between platforms, and those that encourage competition

between services on a single platform (Cambini and Jiang, 2009). While the first model is associated with policies in the United States, the second is particularly applicable in the European Union.

As Katz (2009a) has shown, for various reasons the competition-between-platforms model dominates in Latin America. The first question to ask, therefore, is how likely it is that competition between vertically integrated operators might bring about a significant reduction in prices. The second is what should be done if competition between operators does not bring prices down far enough. In this case, what kind of public initiatives can be deployed to encourage the introduction of price plans designed to make broadband more affordable?

The Latin American experience shows that healthy competition between broadband platforms does lead to a race to introduce better services (competition for speed) and lower prices. The downward price trend resulting from competition can be observed in many countries of Latin America: the lower the level of industry concentration (as measured by the Herfindahl-Hirschman index), the lower the average price of fixed broadband service (see figure II.12).[4]

Figure II.12
Latin America: concentration of fixed broadband supply and average download price per Mbps
(Herfindahl-Hirschman index and PPP dollars)



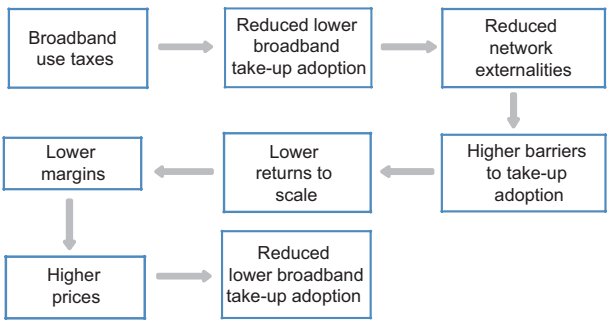
Source: Prepared by the authors on the basis of data from H. Galperín, "Precios y calidad de la banda ancha en América Latina: Benchmarking y tendencias", Documento de Trabajo, No. 12, Buenos Aires, Centro de Tecnología y Sociedad/Universidad de San Andrés, 2012; and R. Katz, 2010-2012: Avances importantes en el desarrollo del sector de telecomunicaciones en América Latina, Caracas, Andean Development Corporation (ADC), 2012.

[4] The chart excludes the countries with prices at either extreme (the Plurinational State of Bolivia and Uruguay).

There is evidence that this process is under way in the region. As Galperín (2012) shows, the implicit download price per Mbps of fixed broadband plans in Brazil dropped by 40% between 2010 and 2012. This trend, spurred by competition between cable operators such as Net Serviços and telephone operators such as Telefônica and Oi, is the result of strategies designed to capture what is the largest market in terms of size and growth, the so-called C-segment of the population. However, the lower prices resulting from competition may not be sufficient to ensure that the most disadvantaged can access the service. This requires consideration of a second set of more closely targeted tools designed to stimulate demand and reduce financial barriers to access among these sectors. The main element in this toolkit needs to be the reduction or elimination of taxes on basic connectivity plans, either across the board or for low-income individuals and households.

Studies have shown that the tax burden associated with broadband services is particularly high, discouraging consumption in both the fixed and mobile segments.[5] The tax impact on broadband is negative across several dimensions (see diagram II.2). According to this analysis, which is borne out by the tax reduction policy and tax incentives introduced in the United States to promote broadband adoption, a high tax burden raises barriers to adoption by impacting affordability. Broadband network externalities further constrain adoption. Then, because of the high fixed costs involved in delivering broadband, a low adoption rate raises the average cost, reduces margins and prevents operators from cutting prices, generating a third limitation on adoption.

Diagram II.2
Impact of fiscal policy on broadband penetration



Source: R. Katz, "La brecha digital: oferta o demanda?", Notas Enter, No. 135, Madrid, 7 July, 2009.

[5] See Galperín and Ruzzier (2010) for an analysis of the fixed segment and Katz and others (2011) for the mobile segment.

Considering the significant price elasticity of broadband services in the region, as revealed by studies such as those of Galperín and Ruzzier (2010) and Macedo and Carvalho (2011), reducing the tax burden could have an immediate impact on the level of service adoption. Several countries in the region have implemented such initiatives, notably Brazil, where basic access plans in several states have been exempted from the ICMS, a state goods and services tax with rates of up to 35%, as part of the National Broadband Plan, and Colombia, where broadband services for lower income strata have been exempted from value added tax (VAT).

A third set of tools involves a more proactive role for government in the broadband supply structure. In countries where the incumbent telephone operator is government-controlled, supply initiatives involving very low-cost connectivity plans have been implemented. While offering a limited service in terms of speed (between 256 kbps and 512 kbps) and data download capacity, they do provide basic access options that work as a first connectivity step for low-income households. Uruguay (the Universal Hogares plans offered by ANTEL) and the Bolivarian Republic of Venezuela (the ABA plans of CANTV) furnish notable examples. It is noteworthy that these plans involve a mixed payment system (a fixed monthly payment with the option to purchase incremental data download capacity on top of the monthly allowance), a model that has been crucial in achieving mass adoption of mobile telephony services.

In other cases, governments have opted for direct investment in backbone infrastructure initiatives, making it possible to structure a supply of low-cost connectivity plans in which the private operator commits to providing the service in accordance with government-mandated quality and price parameters in exchange for access to the network backbone. Examples are the National Broadband Plan in Brazil and the Argentina Conectada plan in Argentina. Lastly, there are the more traditional supply subsidies in areas of low private-sector return, where governments set service features in advance and tender out the service to a private operator which then receives the subsidy. Todo Chile Comunicado in Chile and Vive Digital in Colombia operate in this way (see the chapter by Galperín, Mariscal and Viecens in this book).

In conclusion, there is a wide range of public policy tools that can encourage lower prices and the segmentation of supply into products that are attractive to households with limited budgets. Experience suggests that the combination of healthy competition between access platforms, a reduced

tax burden and strategic State investment in non-competitive segments of the network can significantly lower barriers to broadband affordability in the region.

2. Policies for addressing the skills barrier

The usage skills dimension of the demand gap presents enormous challenges for the countries in the region, as it is associated with structural deficiencies in education systems. Without attempting to cover the broad debate on the issue, it can be said that there are two types of initiatives to meet these challenges. First, there are instruments designed to address specific gaps in computer and Internet usage skills. These initiatives are usually implemented outside the formal education system and are often associated with vocational training plans or other types of social integration initiatives.

There are several examples of such initiatives, both in the region and in more developed countries. They typically involve provision of shared access by the State, combining connectivity with digital training at access points. Vive Digital in Colombia, Pontos de Cultura in Brazil and Puntos de Acceso Digital in Argentina are just some examples. Implementation often targets specific population segments, examples being programmes that seek to integrate young persons into labour markets by providing ICT training (Mariscal, Gutiérrez and Botelho, 2009).

Despite the benefits yielded by these initiatives, there are no rigorous studies of the outcomes of such programmes in the region. This type of analysis is important because these programmes compete in several respects with the wide range of shared access and training options that exist in the private sector. Moreover, as Garrido and others (2012) have argued in their review of the literature on ICT skills and applicability, the success of such programmes largely depends on a good match between the type of training received and the characteristics of the target population, as well as demand in the local job market.

In the second place, there are longer-term initiatives tied to the national education system that seek to equip people with the long-term ability to use and adopt new technologies. The most ambitious initiatives involve efforts to generate ICT skills within the education system by seeing to it that all State schools have equipment and broadband connectivity. Programmes of this type have been widely adopted in the region, including in Uruguay (the Ceibal plan), Argentina (the Conectar Igualdad plan) and Chile (the Enlaces programme).

These plans have been the subject of a great deal of debate that is beyond the scope of this chapter. In particular, the evidence on the educational results of these initiatives has been much discussed.[6] However, there is consensus on the need to adapt the education system to the new technology skill requirements created by Latin America's ongoing integration into a world that is increasingly interconnected from both an economic and a cultural point of view. Conceptually, this change should take place at all the different levels of education (primary, secondary and tertiary) and be supplemented by training initiatives for segments of the adult population that are at a disadvantage in terms of their ICT training opportunities.

In this regard, initiatives undertaken by some countries that have been leaders in broadband adoption deserve a close look. These include digital literacy initiatives implemented in the Republic of Korea, which has launched an online education programme for 10 million people (about 20% of the population) focused on promoting skills among older persons, housewives, members of the armed forces, prisoners, persons with disabilities and other groups that have fallen behind in Internet adoption.

3. Policies for addressing the lack of interest/relevance barrier

Lack of interest or relevance consistently comes up as one of the reasons cited by non-Internet users, regardless of their usage skills or income. This factor does not represent a barrier as such, and it is associated with preferences and incentives that vary from person to person. This represents a challenge for the development of public initiatives to address this dimension of the demand gap. However, Internet adoption studies have revealed a variety of mechanisms that come into play in the adoption decisions made by potential users, suggesting several possible public policy tools.

First, Internet access is of little worth in itself in the absence of so-called complementary goods that confer value on such access. They include applications and content that users value and should therefore be attractive enough to encourage people to purchase the service. With applications whose main function is communication between users (e-mail, social networking and file sharing programs), usage value increases with the number of users (the classic network effect), suggesting that the very dynamics of adoption

6 See IDB (2011), among others.

will lead to a gradual closing of the demand gap in the medium term. However, the evidence indicates that this may not be enough of an incentive for certain groups of users to become broadband subscribers, particularly when many of these occasional users prefer to avail themselves of the numerous public access points that exist in the region.

This being so, public initiatives should aim at providing high value-added applications and demonstrating tangible benefits to potential users in the form of time or money savings or skills acquisition. This is the case with e-government applications that are designed to optimize citizen interaction with government and offer benefits in terms of user access to government services. The linkage between broadband connectivity plans and the development of e-government platforms is a cornerstone of national broadband plan design. There are numerous ongoing experiences of this type in the region that should be monitored so that best practices can be shared with the rest of the countries.

A similar dynamic arises with content. A decade ago, the lack of content in Spanish and Portuguese was a barrier to the widespread adoption of Internet services. Today, the content available in both is very extensive, if less so than in other languages, and government initiatives should therefore be aimed at high-impact social content (like that designed to complement ICT initiatives in schools) or content aimed at specific segments of the population (in the region's indigenous languages, for example).

Public initiatives play an important role as catalysts for new private-sector ventures to provide local digital content and applications. Where applications are concerned, a regulatory environment conducive to the development of e-commerce is vital to provide legal security for providers and customers alike. For content, the region has a substantial installed capacity for audiovisual production that has, in recent years, expanded to multimedia content along with information technology services, another industry that has grown significantly over the last decade. Programmes to foster closer ties between university-based research and the production sector are also needed for the development of larger private ventures in the local content creation sector. Promotion of these high innovation content activities and the skilled jobs they provide is essential and forms part of several national broadband development plans in the region.

Lastly, bandwidth consumption is akin to what is known in the literature as an "experience good" (Shapiro and Varian, 1999). This means

that consumers lack information about the quality and value associated with a good, the only known information being its price. It is in the act of consumption that the value of the good is revealed and demand for it generated. In policy terms, this highlights the importance of public access initiatives that can successfully bring technology to segments of the population with limited opportunities to experience the service in other areas such as the workplace or school.

4. Programmes targeting specific population segments

The evidence set out above suggests that the demand gap has specific sociodemographic components calling for demand promotion policies designed to target different population groups. The data reviewed here have revealed three groups on which such policies should operate. First comes the strong generation component of the demand gap, manifested in a progressive decline in the likelihood of adoption from the age of 30, with a sharp drop in the adoption rate after age 55. Clearly there is a need for digital literacy plans designed for adults and older persons, like those implemented in the Republic of Korea. In several cases, these programmes have proved more effective when they have combined training with subsidies for the purchase of computers and the provision of distance learning programmes.

Secondly, there is some evidence of a persistent gender gap, albeit one that is significantly smaller than in the past. The gap is particularly noticeable among households headed by women compared with male-headed households, as the data for Chile show. Digital literacy and equipment programmes for this segment should consider the particular characteristics of such households, taking advantage of the possible presence of children there, which evidence shows to be a factor that boosts the incentives for adoption, albeit marginally. Again, there have been success stories with vocational training for women linked to ICT training that has addressed the gender gap as part of a broader issue of employment opportunities.

E. Conclusions

While recognizing that investment in broadband infrastructure plays an important role in reducing the digital divide, this chapter has studied a topic that is less often mentioned: the demand gap. The statistical information that is beginning to be generated by national studies has made it possible

to reach an incipient understanding of the importance of this gap. Of the variables accounting for the demand gap, some are structural (e.g., household age composition and education level) while others reflect the intensity of competition in the broadband market and economic performance in general (e.g., affordability).

As regards the most important barrier identified in national studies (the issue of affordability), two types of initiatives can address this. On the one hand, competition between platforms over the long run is the right model to trigger price reductions among the operators serving the market. This will involve not only the traditional telecommunications operators and cable television service providers, but also, in the coming years, operators providing mobile broadband. While this was originally conceived as a technology that would be acquired by the same population sector that subscribed to fixed broadband (complementary), various indications suggest that this product will become a substitute for fixed broadband and bring prices down over the medium term.

The second initiative to address the affordability barrier is government intervention in broadband provision, either directly (as in Uruguay and the Bolivarian Republic of Venezuela), through backbone infrastructure investments and agreements with private operators (Brazil and Argentina), or by means of traditional systems of supply subsidies (Chile and Colombia). These initiatives aim to provide basic access plans at a very low cost, allowing low-income households to gain an appreciation of the service and turning many users who now access the Internet at shared access points into subscribers. By reducing the demand gap, these initiatives can generate the economies of scale and network externalities necessary for the healthy development of the broadband ecosystem in the region's markets.

The skills barrier, for its part, can be influenced by public policies—not just traditional ones involving the formal education system, for instance, but continuing education initiatives as well. Some governments have made significant progress in this area as they have pursued universal broadband policies. Others, facing a need to create jobs in the short term, have preferred to allocate resources to infrastructure deployment to cover households that are served poorly or not at all by existing networks. This chapter has highlighted the need to support such initiatives with others that target the factors inhibiting increased penetration among the population already covered by broadband. Ultimately, an understanding of both aspects of the digital divide is required for public policymaking based on the goals to be maximized.

Because broadband is a complex general-purpose technology, its adoption involves the management of a larger number of variables than is the case with mobile telephony, whose exponential growth in the region has made up for the shortcomings of fixed telephony service coverage. Closing the demand gap seen not only in Latin America but in many countries of the industrialized world will require more active participation by governments and the private sector in order to address and remove the barriers to adoption.

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Annex II.1
Methodology and sources used to calculate broadband coverage

The methodology and sources used to estimate broadband coverage are listed below. Estimates were calculated at the lowest possible level of disaggregation considering the availability of data in each case. They are based on the total population of each administrative unit and therefore tend to overstate coverage, since in many cases the population residing in a given administrative unit (usually municipal or departmental) is not fully served.

Fixed broadband coverage:

- Argentina: authors' estimate based on 2012 coverage data published by the Ministry of Planning for towns, except in the provinces of Córdoba and La Rioja, where the estimate was carried out at the departmental level.
- Bolivia (Plurinational State of): authors' estimate based on 2012 coverage data from the operator Entel. The estimate was carried out at the whole city level, so coverage is overstated.
- Brazil: 2010 information published by ANATEL.
- Chile: authors' estimate based on SUBTEL data for 2011.
- Colombia: authors' estimate based on municipalities with at least 50 fixed broadband connections as of the second quarter of 2011, according to Ministry of Information Technology and Communications data (based on SIUST).
- Costa Rica: authors' estimate based on coverage data from providers per district in "Estrategia Nacional de Banda Ancha", book 2, Diagnóstico.
- Ecuador: authors' estimate based on the cantons where providers reported having at least one customer in service for 2011.
- Mexico: Ministry of Communications and Transport estimate for 2011.
- Peru: calculated from the number of residents in districts where there was at least one client with ADSL as of December 2010.
- Uruguay: information provided by ANTEL, November 2012.

Mobile broadband coverage:

- Argentina: authors' estimate based on 2012 coverage data from operators published by the Ministry of Planning for towns, except in the provinces of Córdoba and La Rioja, where the estimate was carried out at the departmental level.
- Bolivia (Plurinational State of): authors' estimate based on 2011 coverage data from Entel.

- Brazil: 2011 information published by ANATEL.
- Chile: authors' estimate based on SUBTEL data for the population without access to 3G coverage in 2011.
- Colombia: authors' estimate based on 2012 municipal coverage data from Movistar.
- Costa Rica: authors' estimate based on SUTEL 3G coverage testing of ICE.
- Dominican Republic: authors' estimate based on Orange 2011 coverage data.
- Ecuador: based on Movistar coverage; a canton is considered to have 3G service if the provider covers the most populated part of it.
- Mexico: based on COFETEL information on the population with 3G service coverage for 2011.
- Peru: calculated from the number of residents in districts where there is a 3G connection (348 districts covered by 3G out of a total of 1,833) as of December 2010 for mobile telecommunications. The estimate matches the one reported by the ITU.