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Driving Demand for Broadband Networks and Services

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Preface

An earlier version of this study was developed as part of the *info*Dev/World Bank Broadband Strategies Toolkit,[1] with generous funding from the Korea ICT4D Trust Fund. The authors thank the World Bank for authorizing its publication. We are grateful for the comments received while developing the original material, particularly the feedback from the following World Bank professionals: Tim Kelly, Lead ICT Policy Specialist; Carlo Rossotto, Lead ICT Specialist, Regional Coordinator, ECA, and MENA; and Masatake Yamamichi, consultant—ICT Sector Unit. Additional reviewers of the original material included Wonki Min, Ministry of Information and Communication—Republic of Korea; Toru Nakaya and Atsushi Ozu, Ministry of Internal Affairs and Communications—Government of Japan; Phillippa Biggs, Corporate Strategy Division—International Telecommunication Union; Akshaya Sreenivasan, Pennsylvania State University, John DeRidder, Independent Consultant, Australia; Suraj Ramgolam, National Computer Board—Mauritius; John Roman, Director of Broadband and Regulatory policy—Intel's Global Public Policy Group; and Renee Wittemeyer, Director of Social Impact—Intel.

This version contains numerous updates to the original case studies. In addition, whenever possible, data have been updated to reflect the rapidly changing landscape of broadband technology.

A large portion of the material contained in this study was generated throughout the course of multiple consulting engagements supporting the development and implementation of national broadband plans for Costa Rica (*Estrategia Nacional de Banda Ancha*) and Ecuador (*Plan Nacional de Banda Ancha*) as well as digital agendas for Colombia (*Plan Vive Digital*) and Mexico (*Estrategia Digital Nacional*). The authors are grateful for the fruitful collaboration with numerous individuals that occurred throughout the implementation of those projects. In particular, they thank Hannia Vega (former Vice Minister of Telecommunications of Costa Rica), Ana Valdiviezo (Head of Ecuador National Telecommunications Council), Diego Molano (Minister of ICT of Colombia), and Alejandra Lagunes (Coordinator of Mexican National Digital Strategy).

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[1] The original source material and additional case studies can be retrieved at http://broadbandtoolkit.org/en/home.

Additionally, portions of the work were developed while completing multiple studies for the International Telecommunications Union. The authors acknowledge their work with Nancy Sundberg, Senior Program Officer—Regulatory and Market Environment Division and Youlia Lozanova, Telecommunication—ICT Regulatory Analyst, both from the Telecommunications Development Bureau.

Finally, this study benefitted from numerous collaborations with a number of academics in the field of telecommunications policy. We thank, in particular, Prof. Hernan Galperin, from the Universidad de San Andres (Argentina); Prof. Alison Gillwald, from the University of Capetown (South Africa); Prof. Judith Mariscal, from the Centro de Investigación y Docencia Económica (México); and Prof. Eli Noam, from Columbia University (United States).

Several colleagues at Telecom Advisory Services worked with us in engagements that served as a basis for parts of the work contained in this study. In particular, we thank Dr. Ernesto Flores-Roux, Dr. Pantelis Koutroumpis, and Fernando Callorda.

Contents

Chapter 1
Introduction

This book focuses on the strategies for stimulating broadband demand. The debate around the digital divide has been, so far, driven mainly by statistics based on the number of households that have a fixed broadband connection and a computer, and individuals that have a wireless broadband device, such as a smartphone or tablet. Along these lines, policy emphasis has been made, to a large degree, to increase the deployment of broadband networks (in other words, the supply side). While the causality between network deployment and broadband penetration certainly exists, it is important to consider that a substantial portion of the digital divide is also explained by the demand gap, the reasons for which will be discussed in-depth throughout this book. While the supply gap measures the portion of the population of a given country that cannot access broadband because of lack of service, the demand gap focuses on the potential users that could buy broadband service (since operators offer it in their territory, either through fixed or wireless networks) but do not (see Fig. 1.1).

According to Fig. 1.1, the supply gap is defined by the number of households where either fixed or mobile broadband is not available (bb), while the demand gap is measured by the non-subscribing households of those where broadband is available (dd). Accordingly, the concept of digital divide represents the sum of both groups (bb + dd). While policy discussion has been intense regarding the need for providing universal coverage (and therefore, eliminating the supply gap), the demand gap has not benefitted from an equal level of attention.

Tackling the demand gap is critical for policy-makers, since even in some mature countries it can reach close to 30 % of served households. The research on the social and economic impact of broadband indicates increasing returns to scale derived from enhanced adoption. In other words, the higher the broadband and ICT adoption, the more important the economic and social benefits are.[1] In that sense,

[1] For an assessment of returns to scale in ICT, see Roller and Waverman (2001), Koutroumpis, (2009), Katz and Koutroumpis (2013).

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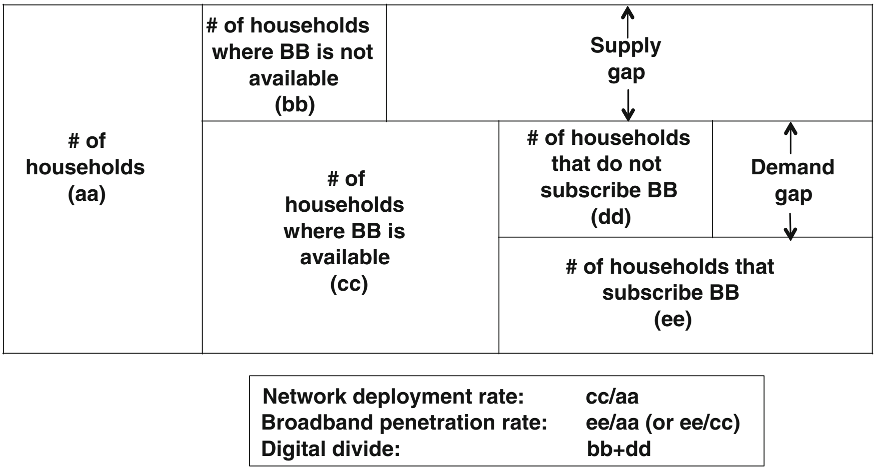

Fig. 1.1 Relationship between supply and demand gap

beyond deploying the necessary infrastructure, stimulating broadband adoption and usage is critical for achieving social development, economic performance, and overall welfare.

The ideal situation for a broadband market is one in which the technology is deployed and service provided by operators on a commercial basis that can be subscribed on a voluntary basis. Because broadband is a basic element of societal infrastructure, it is desirable for operators' business to be sound. Operators will continue to provide broadband service in the long term if they are able to achieve a sustainable profit under sound market mechanisms that can be achieved by government's proper supervision. In order to achieve this win–win relationship between stakeholders of users, operators, and government, an adequate amount of demand has to exist in the market. It is, therefore, necessary for policy-makers to enhance demand with the purpose of maintaining the win–win relationship, without distorting market competition. Also, there may be certain areas in which operators cannot make a profit and do not provide their service. This creates a supply gap, which requires governments to implement policies addressing these market failures.

This book introduces readers to the benefits of higher adoption rates; it examines the progress made so far by countries in the developed and emerging worlds in stimulating broadband demand. It provides an explanation of concepts, such as a supply and demand gap, broadband price elasticity, and demand promotion. In doing so, it also explains differences between fixed and mobile broadband demand gap, introducing the notions of substitution and complementarity between both platforms. Building on these concepts, the study provides a set of recommendations of the best practices, potential strategies, and case studies aimed at promoting broadband demand.

To reiterate, the focus here is not the supply gap, but rather the obstacles for adoption on the demand side. A supply gap is found in places where broadband infrastructure is rudimentary or exhibits limited deployment. This access gap may indeed derive from regulatory policies, but can also come from a lack of interest from investors and telecom operators. Addressing this gap and identifying the common parameters behind it is critical for most national broadband strategies. It is one of the primary purposes of policies aimed at extending universal broadband access and use.

In addition, this book focuses heavily on strategies to affect the behavior of subscribers, whether they are residential users or Small and Medium Enterprises. In this sense, it is less focused on the technological aspects, or even on specific regulatory approaches such as network neutrality. Building on the evidence and the best practices from past programs, the ongoing work in the field of broadband demand stimulation will be described and analyzed to provide a holistic tool and guide regulators and policy-makers. In line with constantly updated information resources, the module has direct links to the sources of information.

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Chapter 2
Assessing the Broadband Demand Gap

Before implementing specific demand stimulation strategies, policy-makers must conduct a diagnostic that allows them to determine the size and sources of the demand gap. This process begins by estimating the percentage of the population that can purchase broadband, yet still do not. Once this gap is quantified, it is necessary to understand the drivers of this so-called "failure." Is it because a portion of the population cannot afford to purchase a subscription at current prices? Or is it because they lack the necessary digital literacy that allows them to access the Internet? It could also be the case that while potential users have a computer (or comparable device), they cannot find any online content, applications, or services that would motivate them to purchase broadband service.[1]

This chapter explains the different concepts and provides examples of methodologies for measuring the demand gap and constructing a diagnostic of structural factors affecting adoption. It would set the stage to explain a variety of approaches and policy solutions to meet the adoption targets.

2.1 Measuring the Broadband Demand Gap

Measuring the demand gap is the first step in the development of a diagnostic that will lead to the formulation of demand stimulation policies. Given the interrelationship of fixed and mobile broadband leading to complementarity and/or substitution scenarios, this exercise is not trivial. Moreover, measuring demand gaps in the aggregate for a whole country is not necessarily a suitable approach for the development of targeted policies. Therefore, any attempt at measuring the broadband demand gap has to be conducted at a disaggregated level (county, department). This section first addresses how to measure the demand gap in fixed broadband, then moves to the mobile broadband gap, and finally discusses the interrelationship between both domains.

[1] While one of these three reasons could be found to be the dominant one in certain population groups, the likely scenario is one of high correlation between the three variables.

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2.1.1 The Fixed Broadband Demand Gap

Demand gap is defined as the difference between either households or individuals that could gain access to broadband but do not acquire the service. This is not a statistic that is typically being tracked by either regulators or made public by operators. In recent years, however, policy makers, driven by the need to develop national broadband strategies and plans, have in some instances been able to estimate this metric.

While most countries have fairly accurate estimates of broadband subscribers, they lack a solid grasp of network coverage, defined as the proportion of the population of a given country that is "served" by broadband technology. This metric (and the supporting coverage maps) should be calculated both for fixed and mobile broadband.

In the case of fixed broadband, coverage needs to be estimated in terms of the number of households that are served by broadband providers (i.e., where residents have the option to purchase service from telecommunications carriers, cable TV operators, or fixed wireless providers such as WiMax). Even this number can be sometimes difficult to estimate. For example, the development of the United States' National Broadband Plan introduced the notion of the "underserved" household. "Underserved" means that the resident can get access to broadband, but at a download speed below the target stipulated by the broadband plan (in this case, 2 Mbps). Therefore, a first level assessment should consider three categories of fixed broadband coverage: "served," "underserved" (download speeds lower than the target), and "unserved" (no service at all). The problem with the "underserved" category is that in emerging countries, a large portion of households can gain access to service download speeds much lower than those stipulated in a broadband plan (for example, 256 kbps). Given the hurdle to improve the level of service to the "underserved" population, the general consensus is that for the time being, at least in emerging countries; attempting to reach mass-deployment levels of broadband, this category should not be considered as part of the estimation of the broadband demand gap.

Another difficulty in assessing fixed broadband coverage resides in the interpretation of operator-provided information. The introduction of certain modifications to existing telecommunications and cable TV networks enables broadband deployment in its most basic mode. In the case of telecommunications copper networks, xDSL service requires the installation of equipment at the central office, while in the case of cable TV, cable modem service requires the upgrading of its networks to bi-directional 750 MHz capacity. The implication of this situation is that a residence could have either wireline telephony or cable TV coverage, but the infrastructure is not upgraded to the point where it may have the capability of handling a subscriber's request for service. The question of interpretation, then, is whether that residence should be considered "served" or "unserved". It is generally accepted that, in the case of emerging countries, if a telecommunications

Table 2.1 Developed countries: fixed broadband demand gap (2011)

Country	Households covered (%)	Households connected (%)	Demand gap (%)
Australia	89	69	20
Denmark	96	76	20
France	100	77	23
Germany	98	58	40
Israel	100	83	17
Italy	95	55	40
Korea, Rep.	100	93	7
Spain	93	61	32
Sweden	100	89	11
United Kingdom	100	68	32
United States	96	64	32

Sources Katz and Galperin (2012) based on ITU data

fixed network or a cable TV system serves the customer, he/she should be included in the "served population" category.

With these two caveats in mind, the demand gap can be calculated by using a standard coverage metric estimation. For example, Table 2.1 presents data on the fixed broadband demand gap for select developed countries.

As shown in Table 2.1, the broadband demand gap is not only an emerging market phenomenon. In certain developed countries (such as Germany, Spain, Italy, the United Kingdom, and the United States), an important portion of households lack broadband connectivity for reasons other than service availability.

In the United States already in 2009,[2] for example, 96 % of households were served by cable modem technology, while 82 % could acquire broadband service from the telecommunications operator. However, as indicated in the statistics of Table 2.1 in 2011, only 64 % of households purchased service. Therefore, 32 % of households could have access to broadband services, but choose not to acquire a subscription. As expected, the demand gap in this country varies by state as shown in Fig. 2.1.

As Fig. 2.1 indicates, the broadband demand gap is larger in less-developed states. In Mississippi, for example, it is 60 %, while the supply gap (non-served households) is 9 %. In a more economically-developed state such as Georgia, where service penetration is higher, the supply gap is 8 %, while the demand gap is 34 %.

In a European country such as Germany, according to the National Broadband Strategy published in February of 2009, 98 % of all households (39,700,00) could already access broadband service. Of these, 37,600,000 could be served by xDSL, 22,000,000 were served by cable TV (and therefore could buy broadband via cable

[2] Rather than providing the latest statistics, the purpose of the following examples is to demonstrate how to calculate the demand gap and provide a comparison among countries based on orders of magnitude.

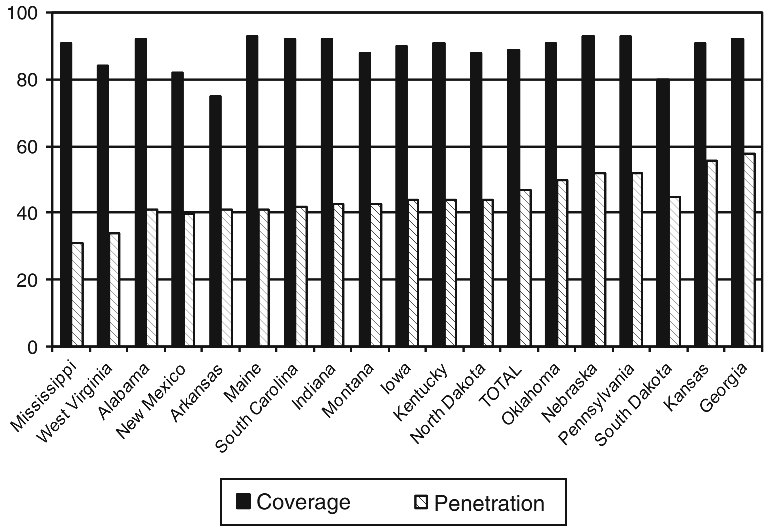

Fig. 2.1 United States: supply and demand gap for states with lowest broadband penetration (percent of households) (2009). *Source* FCC (Table 14 of HSPD1201); US census Bureau

modem), and 730,000 could access broadband via fixed wireless or satellite. However, despite the near-complete coverage, only 58 % of households purchased broadband, signifying a demand gap of 40 %.

The fixed broadband demand gap is, as expected, a more serious problem in emerging countries. Table 2.2 presents statistics for coverage and demand for Latin America countries.

Latin America displays an average demand gap of 43 %, which means that less than half of covered households are purchasing broadband subscriptions. As Table 2.2 indicates, more extensive coverage results in a higher demand gap. These metrics, typical of emerging countries, indicate that supply in Latin America does not appear to be the dominant hurdle to increasing broadband penetration. They demonstrate, rather, the criticality of demand stimulation strategies targeting either the affordability or the awareness structural factors.

2.1.2 The Mobile Broadband Demand Gap

Measuring the demand gap in mobile broadband presents methodological problems as in the case of fixed broadband networks. First, it is generally agreed that policy makers should consider at least 3G networks to be the technology benchmark when measuring mobile broadband coverage. While 3.5G, HSPA, or LTE networks are the obvious platforms to provide a relatively smooth Internet access experience, in

Table 2.2 Latin American countries: fixed broadband demand gap (4Q2012)

Country	Coverage (%)	Household penetration (%)	Demand gap (%)
Argentina	96	40	56
Bolivia	40	4	36
Brazil	94	34	60
Chile	78	50	28
Colombia	81	32	49
Costa Rica	95	36	59
Ecuador	80	26	54
Mexico	62	53	9
Peru	59	20	39
Average	76	33	43

Sources for coverage Katz and Galperin (2012); penetration based on ITU

emerging country contexts, it is advisable to measure coverage once again at a slightly lower speed, such as the one comprised by the whole WCDMA family.[3]

Secondly, the concept equivalent to the "underserved" category in fixed broadband exists in the case of mobile broadband as well: in this case, it is labeled the "gray" zones. These represent the areas covered by wireless networks affected by either capacity or signal propagation limitations. Again, while some national broadband plans have been very emphatic about measuring these zones (see Germany's National Broadband Strategy), in the case of emerging countries, it might be convenient to set this measurement aside for the next few years.

Thirdly, mobile broadband adoption needs to consider the device utilized to access the Internet. The first category of devices includes, quite naturally, all modems that can be relied upon to access the Internet from a PC, a laptop, or a netbook. These devices include dongles, USB modems, and air cards. The integrated devices such as tablets, and smartphones that provide adequate screen formats and interface to surf the web, respond to emails, and access common web platforms such as Google, YouTube, or Facebook comprise the second category. This category would exclude feature phones, which, by virtue of their small screen formats and keyboards, have limited broadband access ability. For example, the pioneering work of Horrigan (2012) on the value of mobile broadband to close the digital divide in the state of Illinois focuses only on smartphone adoption.

In light of these issues, how should mobile broadband coverage and adopters be measured? Beyond shipment statistics and installed base for selected operators, the number of subscribers that own an Internet suitable device connected to a 3G or higher performance network is not readily accessible. On the other hand, the

[3] For example, when Japan implemented its (1) New IT Reform Strategy which was set in 2006 by IT Strategic Headquarters (headed by the Prime Minister) and (2) the Digital Divide Elimination Strategy which was set in 2008 by the Ministry of Internal Affairs—both of which aimed to eliminate all broadband zero areas by the end of FY2010 (March 2011), 3.5G was considered the minimal broadband service.

Table 2.3 Developed countries: mobile broadband demand gap (2011)

Country	Population covered (%)	Population connected (%)	Demand gap (%)
Australia	97	89.10	7.9
Denmark	97	57.51	39.49
France	98.20	32.86	65.34
Germany	86	34.76	51.24
Israel	99	54.36	44.64
Italy	91.86	48.19	43.70
Korea, Rep.	99	97.13	1.87
Spain	90.60	36.68	53.92
Sweden	99	85.10	13.90
United Kingdom	95	42.56	52.44
United States	98.50	71.91	26.59

Source Katz and Galperin (2012)

number of 3G and 4G subscribers is easier to access. Therefore, it would be advisable to gather those statistics to measure the mobile broadband demand gap. Mobile broadband coverage should be measured in terms of 3G coverage, a metric provided by either the ITU or commercially available databases such as GSMA Intelligence. However, the estimates provided by these sites are only presented at the national level, preventing a detailed regional analysis.

Table 2.3 presents statistics on mobile broadband demand gap for selected developed countries.

As the Table 2.3 indicates, with a few exceptions (Australia, Republic of Korea, United States), the mobile broadband demand gap of countries studied is higher than the fixed broadband demand gap. These numbers should be interpreted with the caveat that the latter measures the household gap while the former measures population.

In the case of emerging countries such as those of the Latin America region, the mobile broadband demand gap is even higher (see Table 2.4).

As Table 2.4 indicates, the average mobile broadband demand gap in Latin America is 57 %, which means that 57 % of the Latin American population could purchase a mobile broadband connection but do not. This difference requires an analysis of the obstacles faced by users to acquire broadband service. An understanding of such factors will allow policy makers to deploy the relevant initiatives to tackle these obstacles. This is addressed in Chap. 3, 4 and 5 below.

2.1.3 Demand Gap and the Interrelationship Between Fixed and Mobile Broadband

Until now, we have treated the demand gap within fixed and mobile broadband as two independent phenomena. This treatment is somewhat artificial since both technologies are offered within adopters' same universe. Naturally, each platform

Table 2.4 Latin American countries: mobile broadband demand gap (2012)

Country	Population covered (%)	Population connected (%)	Demand gap (%)
Argentina	92	21.87	70.13
Bolivia	29	6.92	22.08
Brazil	84	32.83	51.17
Chile	82	27.04	54.96
Colombia	96	8.69	87.31
Costa Rica	93	36.22	56.78
Ecuador	86	21.92	64.08
Mexico	77	20.63	56.37
Peru	63	11.70	51.30
Average	78	20.86	57.14

Fuentes For coverage, Katz and Galperin (2012); penetration based on GSMA Intelligence

meets specific requirements. Mobile broadband adds the mobility premium to the Internet access experience. At the same time, at least for now, due to given technology and shared resource limitations, mobile broadband networks are not the most suitable platform to fulfill certain applications, like downloading movies or playing massive parallel games. This factor notwithstanding, it is generally assumed that, given their ease of deployment, mobile broadband networks are very appropriate to fulfill coverage requirements in emerging countries. If that were to be the case, how should policy makers think about the interplay between both platforms?

At the initial steps of diffusion processes, mobile broadband technology represents a complementary technology to fixed broadband. The early adopter of mobile broadband is, most likely, already a subscriber of fixed broadband. In this situation, mobile broadband complements fixed broadband by providing the added value of mobility. An example of this situation is that of Mexico (see Fig. 2.2).

As the Mexican example indicates, mobile broadband subscribers through the end of 2010 were likely already fixed broadband customers belonging to high socio-demographic segments for which mobile broadband represented an added value proposition to meet their Internet connectivity needs.

However, the complementarity consumption pattern is not the only trend. In many cases, especially in emerging countries, mobile broadband represents a substitute to fixed broadband. This occurs under three possible situations: (1) when the fixed broadband service is not being offered in the area where the customer resides, (2) when the quality of fixed service is at a disadvantage with respect to the mobile offering (for example, in terms of speed), or (3) when the user decides to consolidate services to reduce expenditures and acquires the mobile service that provides both connectivity and mobility. It is important to mention that the last situation can occur in the context where the applications and services to be accessed are interchangeable between the two platforms. While this is possible, as it was mentioned earlier, there are services that are better suited to the fixed technology and cannot be fully accessed by mobile broadband. Additionally, a

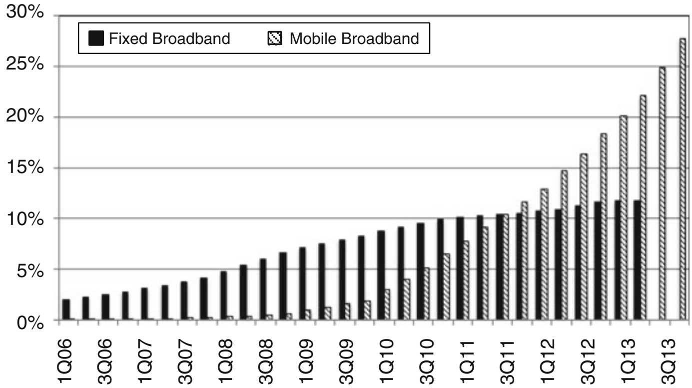

Fig. 2.2 Mexico: penetration of fixed versus mobile broadband (2006–2013). *Source* Katz (2012)

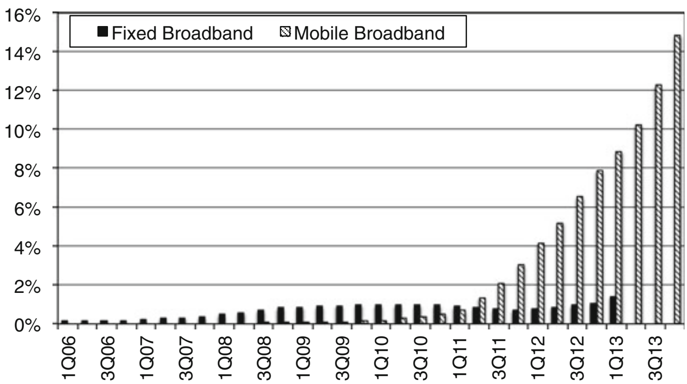

Fig. 2.3 Bolivia: penetration of fixed versus mobile broadband (2006–2013). *Source* Katz (2012)

limiting factor of mobile broadband's substitution power is the prevalent pricing plans that institute caps on the amount of data subscribers can download on a monthly basis. However, as will be shown in Chap. 4, capped mobile broadband offerings are highly suited to deliver broadband service to population at the bottom of the socio-demographic pyramid.

The case of Bolivia is a good example of substitution of fixed broadband by mobile broadband service (see Fig. 2.3).

Bolivia is a country that arrived fairly late to the Internet revolution. At the outset of mobile broadband in the country, the adoption of the fixed platform had not reached 1 %, a common scenario in many emerging countries. Not surprisingly, the high price of the offering contributed to this limited adoption. In the second quarter of 2010, the least expensive plan for a 2.5 Mbps download speed cost the equivalent of US$ 325/month. That year, a wireless service providing