

Can the poor afford mobile telephony? Evidence from Latin America¹

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Abstract

This study analyzes the cost of a low-volume basket of mobile services across a sample of Latin American countries, and contrasts these results with standard income and poverty indicators. The main goal is to establish how affordable mobile services are for the poor. Three general findings emerge. First, the poor generally pay a cost premium for using prepaid subscriptions that allow better expenditure control, though in many cases this premium is much lower than expected. Second, affordability is an important predictor of mobile penetration. Overall, while affordable handsets and the calling party pays system allow a significant number of low-income Latin Americans to become mobile subscribers, the results reveal that the current tariff structure has an inhibiting effect on service consumption by the poor. Third, since affordability is the most significant barrier to extending the reach of mobile services, as well as the range of services used by the poor, priority should be placed on policies aimed at reducing tariffs and stimulating the introduction of commercial innovations for low-income groups.

Keywords: mobile telephony; tariffs; affordability; Latin America; digital divide; universal access.

1. Introduction

There is little question that the significant worldwide increase in telephony penetration during the past decade has been largely a result of the explosive growth of mobile telephony services in developing countries (International Telecommunication Union [ITU], 2006). While in the developed world the introduction of mobile services offered a convenient complement to a fixed network that extended to almost every home and business, its impact has been more dramatic in emerging economies, where the large majority of the population had (and still has) limited access to traditional telephone services (Banerjee & Ros, 2004; Waverman, Meschi, & Fuss, 2005). With the introduction of mobile telephony, voice communication and an increasing number of value-added services have been made available to the world's poor for the very first time. According to industry sources, mobile services were available to over 80% of the world's population by the end of 2006, with an expected increase to 90% by 2010 (GSM Association, 2006).

As mobile networks reach deeper into emerging markets, and service availability becomes the norm, questions about the affordability of services to low-income groups become more pressing. How affordable are mobile services for those at the so-called bottom of the income pyramid? How much are the poor prepared to spend in mobile services? Which strategies are used by the poor to control mobile expenditure? Are shared-service models (e.g., Grameen Phone) a temporary fix or a long-term solution in low-income areas? This study tackles these questions by analyzing the cost of a low-volume basket of mobile

services across a sample of Latin American countries, and contrasting these results with standard income and poverty indicators. The goal is to establish how affordable mobile services are for different income groups in different market contexts, and determine the causes as well as implications of the variations observed across the region.

Estimating the affordability of mobile services is important not only for establishing the market frontier but also for designing effective universal access programs. If the affordability threshold for a certain income group or in a specific geographic area is unknown, it is almost impossible to estimate the market efficiency frontier, and thus to design appropriate subsidy schemes. While many recent studies discuss market failures from a supply-side perspective (i.e., from the perspective of how to make services available to a specific population or region), the issue of whether potential customers will be able to pay for services on a sustainable basis is rarely tackled (see for example Regulatel, 2006). By introducing this dimension, this study seeks to contribute to the design of more effective universal access tools.²

The results are based on tariff data gathered in Q2 2007 for seven Latin American countries (Argentina, Brazil, Chile, Colombia, Mexico, Peru and Uruguay) representing approximately 80% of the regional market, together with income and expenditure data from the respective national statistics institutes. In

² For a comprehensive analysis of the challenges involved in designing effective public service subsidies for the poor see Komives, Foster, Halpern and Wodon (2005).

each market, prices for every tariff plan (pre- and post-paid) offered by the major mobile operators were collected, though the analysis focuses on prepaid as this service modality represents over 90% of subscriptions in Latin America. Rather than comparing unit prices (e.g., the per minute cost of a local mobile call) this study uses a service basket methodology that better reflects typical mobile consumption patterns. The data was initially collected from operators' websites and later verified through telephone contacts and personal visits to points of sale.

Three general findings emerge from the results. First, that the poor generally pay a cost premium for using prepaid subscriptions that allow better expenditure control, though in many cases this premium is much lower than expected (thus explaining why the majority of the region's poor prefer to pay this premium). Second, that affordability is an important predictor of mobile penetration, since it captures not only relative tariff levels but also welfare variables, and thus ability to pay for mobile services. Third, that mobile operators in Latin America are lagging in the adoption of new business models specifically designed to attract low-income customers. Since affordability is the most significant barrier to extending the reach of mobile services, as well as the range of services used by the poor, priority should be placed on policies aimed at reducing tariffs and stimulating the introduction of commercial innovations for low-income groups.

This study is organised as follows. Section 2 discusses the existing literature on communications expenditure patterns and affordability, and provides

justification for the methodological approach. Section 3 presents the results for mobile tariffs across countries and discuss the main factors affecting price levels in each market (Section 3). Section 4 examines affordability by contrasting the above results with standard measures of personal income and welfare. Finally, the conclusion (Section 5) summarises the major findings and their regulatory implications, together with some of the pending queries for future research.

2. Telecommunications affordability: Theory and measurement

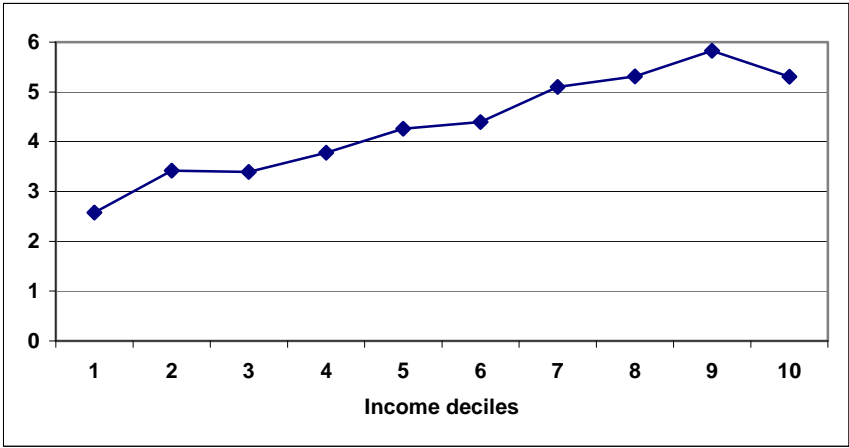
2.1. International benchmarking

There is wide agreement that the principle of universal access to telephone services has three basic dimensions: availability, accessibility and affordability (ITU, 1998). Availability and accessibility refer to the non-discriminatory supply of services. Affordability, on the other hand, refers to the ability to pay for the service by the various socio-economic groups. While the first two dimensions are more easily measurable, there is no agreement as to what constitutes affordable telecommunications. Similar questions permeate public policy debate with respect to other utilities. For example, the UK government considers that households are in 'fuel poverty' if more than 10% of their income is spent on heating. Likewise, if one agrees that access to telecommunications services is an increasingly important livelihood factor for the poor, what should be considered an acceptable level of expenditure on a minimum basket of

telecommunications services, above which access should be considered unaffordable?

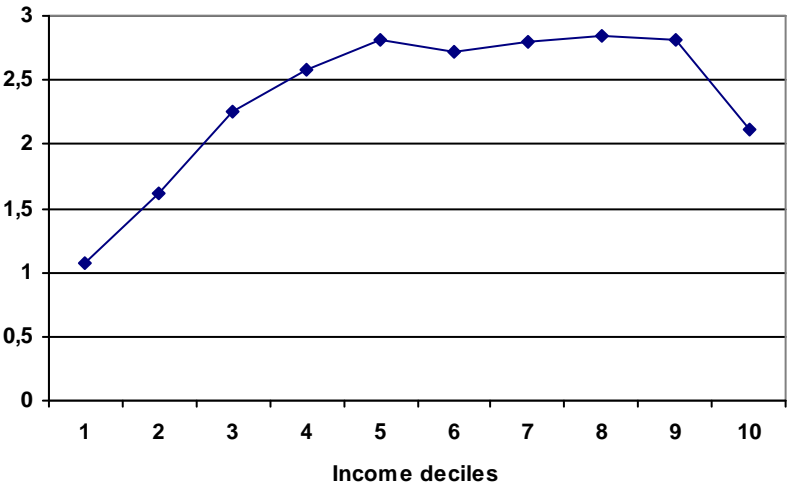
International comparisons show a high degree of dispersion in terms of household expenditure on telecommunication services. In developed countries, several studies suggest that high teledensity rates (above 80%) are achieved when a basic service basket represents 2.5% or less of average household expenditure (Milne, 2006). In general, this expenditure is considered essential, which means that the telecommunications share of total household expenditure decreases as household income increases. On the other hand, the available evidence suggests that in developing countries telecommunications expenditure behaves as a luxury good, i.e., that the share of such expenditure tends to increase as income rises, peaking in the medium-high strata only to fall slightly in some cases (Mexico and Brazil for example) among the richest households. This can be observed in Figures 1 to 4, corresponding to Mexico, Brazil, Peru and Colombia respectively. Similar findings are reported for other developing regions by Ureta (2005).

Figure 1: **Percentage of communications expenditure (including pay TV) by income deciles (Mexico 2005)**



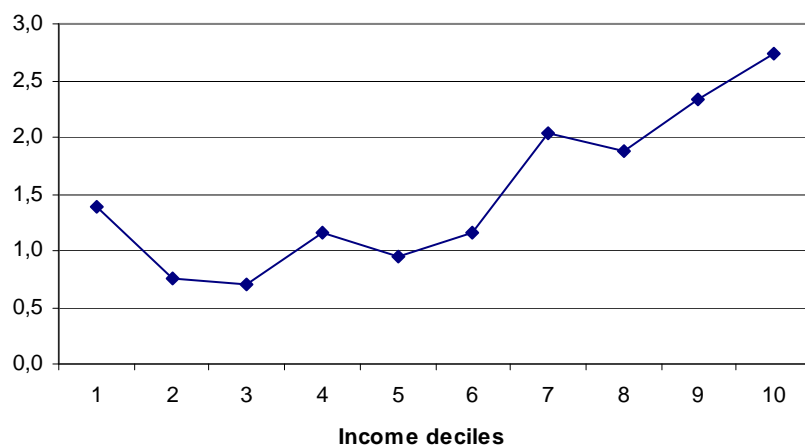
Source: INEGI Mexico.

Figure 2: **Percentage of telecommunications expenditure by income deciles (Brazil 2002-2003)**



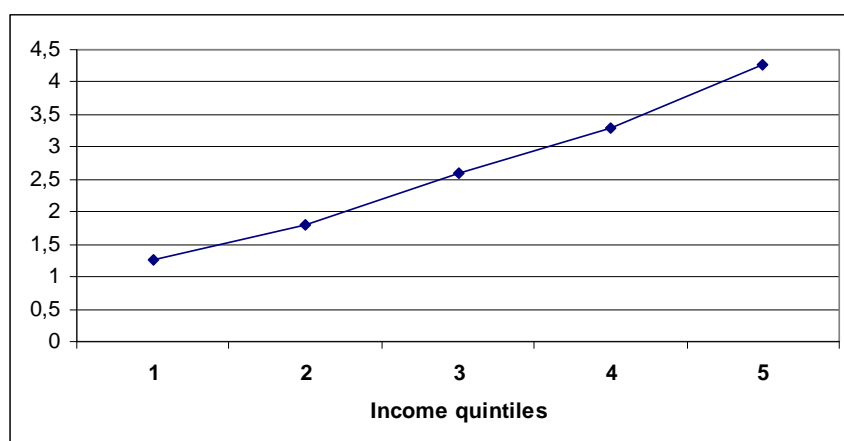
Source: IBGE Brazil.

Figure 3: **Percentage of telecommunications expenditure (except payphones) by income deciles (Peru 2004)**



Source: INEI Peru.

Figure 4: **Percentage of telecommunications expenditure by income quintiles (Colombia 2003)**



Source: DANE Colombia.

Further, recent telecommunications expenditure surveys in developing regions suggest that low-income households are prepared to spend a much larger share of their income on telecommunications services than low-income

households in the developed world. One study estimates that poor Nigerian households spend up to 8% of their income on telephone services (Intelecon, 2005), while another estimates telecommunications expenditure in the range of 10-14% for poor households in Tanzania (Souter, 2005). In India and Sri Lanka, a survey among low-income groups found levels of telecommunications expenditure ranging from 4 to 8% of household income (Moonesinghe, de Silva, Silva, & Abey Suriye, 2006). Operators' own estimates are also in the 5-10% range (Ericsson AB, 2007).

There are multiple possible explanations for the different estimations in telecommunications expenditure between national expenditure surveys and more focused telecommunications demand studies. National surveys may yet to capture the exponential increase in mobile telephony expenditure in recent years. On the other hand, one-off telecom demand surveys among low-income groups may tend to overestimate telephone expenditure as those employed in the informal economy (and thus disproportionately poor) often underreport income. This study relies on the more conservative figures obtained from national expenditure surveys, while acknowledging the need to revise estimates given recent changes in service availability for the poor.

2.2 Telecommunications services basket methodology

Following Milne (2000), it is assumed that there is a certain percentage ($T\%$) of personal income which, on average, potential customers are prepared to spend

on a basic basket of telecommunications services. If the cost of this basket exceeds T , the chances of customers buying this basket are small. If the cost is below T , the chances of buying are high. This study assumes T to be 5% of personal income. This rule-of-thumb figure is on the high-end of telecommunications expenditure estimates for developing countries (and well above estimates for developed regions), and has been often used as an affordability threshold by the ITU and regulatory authorities (Hudson, 2006).

In order to estimate telephony service affordability for low-income groups a service basket methodology is utilized. This enables standardisation of the various plans and tariffs offered by the different operators in each country, while also allowing for international comparisons. For this purpose the mobile service baskets proposed by the OECD were selected, with some minor adaptations that reflect the commercial models found in Latin America (mostly notably the predominance of *calling party pays*). While any basket of services is by definition arbitrary, results from recent user surveys reveal that the OECD low-volume mobile service basket is a reasonable proxy for the actual consumption patterns of low-income mobile users in Latin America (Galperin & Mariscal, 2007).

Considering the research objectives, this study focuses on the low-volume user basket, which comprises 25 short outgoing calls (less than two minutes) and 30 text messages (SMS) per month. A combination of four destinations is considered: local calls to fixed lines, national calls to fixed lines, on-net calls,

and off-net calls. The basket also considers a combination of peak-time calls, off-peak time calls, and weekend calls.³ As is well known, every mobile operator offers a wide variety of plans and options. Tariffs for every plan offered by the largest three mobile operators in each country were collected, based on which the monthly cost for a low-volume user was calculated for each operator using the least expensive post-paid plan (i.e. the plan with the lowest monthly charge) and the lowest denomination pre-paid card. This choice is based on the assumption that the poor, as a result of income volatility, prefer to purchase in small amounts even if this implies a price premium on a per unit basis (Prahalad, 2004).⁴ Country averages are obtained by weighing tariffs based on each operators' national market share.

3. How much does mobile telephony cost in Latin America?

3.1 Low-volume prepaid mobile basket

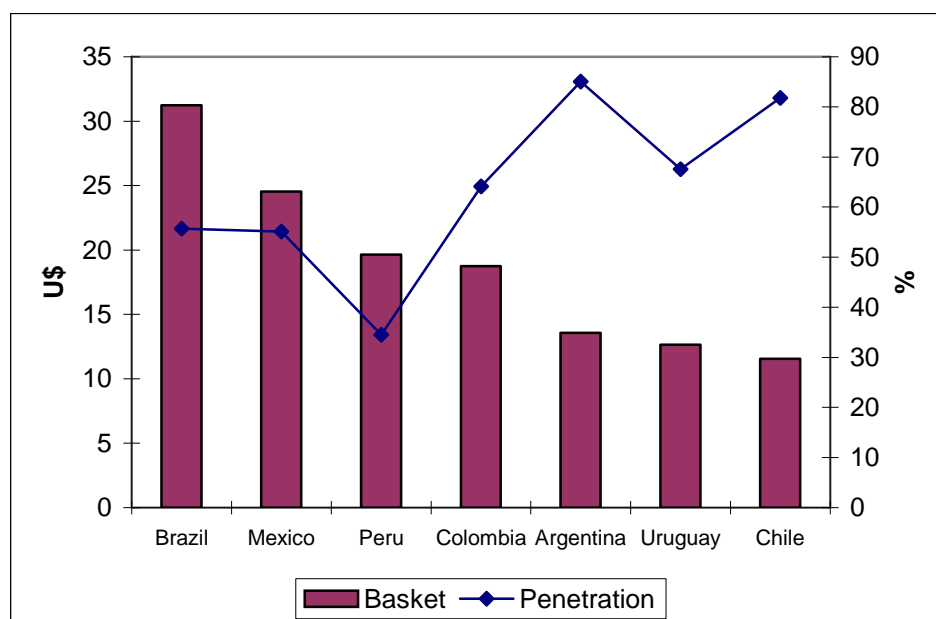
Figure 5 summarises the results obtained for the recurring (monthly) cost of a low-volume mobile basket under a prepaid plan, which as noted best approximates the mobile consumption patterns of the poor. The results assume that it is possible for prepaid users to purchase the exact amount of minutes and SMS included in the service basket, which is often not the case since users

³ A detailed discussion about the basket, including weighing for destinations, times of day and length of calls, can be found in OECD (2002).

⁴ The value of the baskets has been estimated both in current US dollars and in purchasing power parity (PPP) dollars. There is an intense debate about which is more appropriate for comparing the price of services across countries (Taylor and Taylor 2004). For simplicity and space reasons we choose to report figures and tables in current US dollars only, noting any differences arising from PPP calculations where appropriate.

are limited by the minimum amount for prepaid recharge offered by operators (this assumption is relaxed below).

Figure 5: **Monthly cost of a prepaid low-volume mobile phone service basket (current US dollars) and mobile teledensity (Q2 2007)**



Source: Wireless Intelligence (for teledensity) and own calculations.

The first striking result is the significant price dispersion between markets, which also obtains in US PPP dollars (not shown). Overall, the highest tariffs were observed in Brazil and Mexico, with Chile, Uruguay and Argentina at the opposite end. Most important, the results suggest that the price of the low-volume prepaid mobile basket has a strong effect on mobile service take-up. Although the limited number of observations does not allow quantification of this effect, Figure 5 clearly shows that penetration levels comparable to developed nations (80% or higher) only obtain when the affordability threshold is reduced to a point where the poor become part of the addressable market.

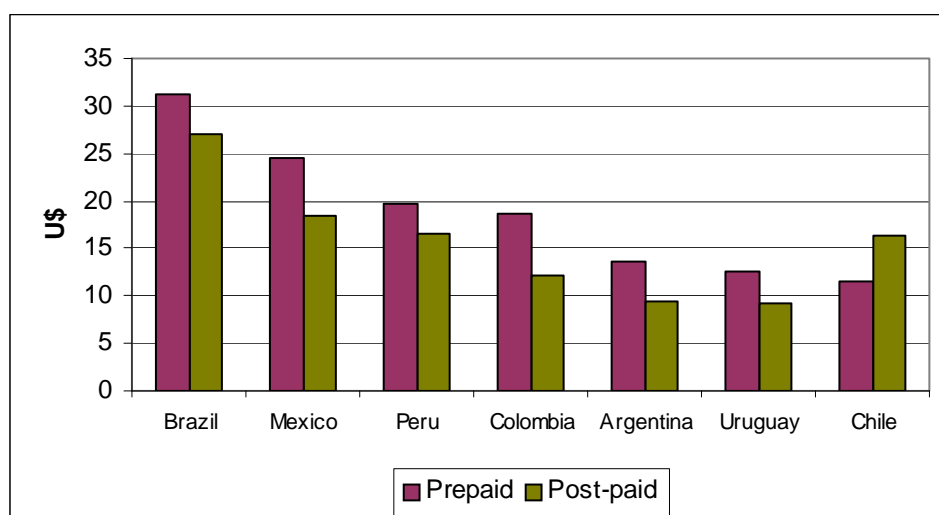
The two cases that seem to deviate from the general trend are Uruguay and Peru. In the first, it is hypothesized that a relatively well-developed fixed telephony network (compared to other countries in the region) and effective universal service programs led by the public operator ANTEL reduces mobile take-up incentives for low-income households. In the case of Peru, as discussed in more detail below, low income levels combine with relatively high tariffs (and important network deployment challenges in certain areas) to create significant affordability barriers for the nation's poor.

3.2 Prepaid versus post-paid

Various studies have demonstrated the formidable impact that the introduction of pre-payment systems have had on mobile take-up in the developing world (Samarajiva 2007; Mariscal & Rivera, 2006). Nevertheless, given the differences in per minute costs between prepaid and post-paid, some observers have argued this has unduly punished poor users with little or no access to formal credit. On the other hand, some recent studies have questioned this argument, noting that, when one considers the actual patterns of mobile use by the poor (i.e., very low outgoing call volumes), prepaid and post-paid costs are roughly equivalent, and in some cases even favourable to prepaid (LIRNEasia, 2006).

In Figure 6 this question is examined by comparing the cost of a similar low-volume basket of mobile services under the two service modalities. In general low-volume prepaid users are paying a premium with respect to post-paid users, though this premium is found to be lower than expected, and certainly much lower than what per minute costs reflect. A notable exception is Chile, a highly developed and competitive market where the prepaid option is cheaper. This suggests a potentially convergent trend between prepaid and post-paid prices as operators vie for bottom of the pyramid users (the recent increase in take-up for mixed plans that combine fixed and variable charges suggests a similar trend). Overall, the results reveal that poor users are willing to pay the prepaid premium in order to have more control over their monthly mobile expenditure.

Figure 6: **Prepaid versus post-paid costs for a low-volume mobile basket (current US dollars)**



Source: Own calculations.

3.3 Micro prepayment and per second billing

As noted, the analysis above assumes that users are able to buy the exact amount of minutes and SMS included in the low-volume mobile basket (or for that matter any desired basket of mobile services). Yet this is not the case since operators set a minimum amount for prepaid recharges that often represents a significant percentage (in some cases nearly half) of the monthly cost of a prepaid low-volume mobile basket. The higher the minimum prepaid amount, the higher the incentives for low-income users to forego recharging and look for alternatives such as payphones and informal mobile service resellers. This also helps explain why, according to some estimates, over a third of low-income mobile users in Latin America are without credit at any given time (Galperin & Mariscal, 2007).

In many parts of Asia and Africa, micro-prepayment systems have lowered the affordability threshold by enabling users to add small amounts of credit to a prepaid mobile account (sometimes enough to make only one short call or to send a few SMS). There is evidence that this is valued by low-income users, for often they need to add credit in small increments for immediate consumption (Smith, 2004). There are also advantages for operators since an electronic micro-prepayment system makes the credit distribution chain safer and more efficient. In Latin America micro-prepayment is still in its infancy. Moreover, the findings suggest that the existing minimum denominations for prepaid cards create challenges for low-income users in adjusting their expenditure to their desired consumption levels.

In order to examine the potential impact of micro-prepayment systems on mobile telephony affordability in Latin America, the cost savings that would result if users were able to buy the exact amount of minutes and SMS included in the low-volume mobile basket were calculated. This is by definition an exploratory exercise, as the per minute cost at which operators would be willing to offer micro-prepayment is unknown. That said, using the current per minute cost of the lowest denomination prepaid card provides a helpful approximation.

The findings are shown in Table 1. The micro-prepayment effect is the difference between the current cost of the low-volume mobile basket of services (using the minimum available recharge denomination) and the theoretical cost were users able to buy the exact amount of minutes and SMS included in the basket. As the table reveals the potential cost savings for low-volume users can be significant, ranging from 2% in Colombia to 14% in Chile. In other words, the introduction of micro-prepayment would significantly lower affordability barriers by allowing low-income users to better adjust expenditure to desired mobile use.

Table 1: **Effect of micro-prepayment on cost of prepaid low-volume mobile basket (in current US dollars)**

<i>Country</i>	<i>Current cost (no micro-recharge)</i>	<i>With micro-recharge</i>	<i>Micro-recharge effect (%)</i>
Argentina	15.09	13.58	10%
Brazil	33.34	31.23	6%
Chile	13.39	11.56	14%
Colombia	19.23	18.75	2%
Mexico	26.41	24.52	7%
Peru	21.28	19.65	8%
Uruguay	14.33	12.64	12%

In addition, the potential cost savings that would result from the implementation of per second call billing were calculated.⁵ Currently, only Chile and Peru operate under per second billing. In the rest of the countries in the sample, operators use billing units ranging from 6 to 60 seconds.⁶ Given that low-income users tend to make short calls, changes in the billing unit can make a significant difference in overall mobile expenditure. As shown in Table 2, the introduction of per second billing would help reduce affordability barriers by lowering mobile expenditure for low-volume users up to 24%.

⁵ This is also an exploratory exercise which assumes that operators do not change tariffs as they introduce per second call billing.

⁶ In Brazil, the billing unit is a tenth of a minute (i.e. six seconds), with a minimum charge of 30 seconds. Given the duration of the calls included in our basket, this is equivalent to per second billing for our purposes.

Table 2: **Effect of per second billing on the cost of prepaid low-volume mobile basket (in current US dollars)**

<i>Country</i>	<i>Current cost (with micro recharge)</i>	<i>With per second billing</i>	<i>Per second billing effect (%)</i>
Argentina	13.58	\$10.50	23%
Brazil	31.23	\$31.23	0%
Chile	11.56	\$11.56	0%
Colombia	18.75	\$14.25	24%
Mexico	24.52	\$18.81	23%
Peru	19.65	\$19.65	0%
Uruguay	12.64	\$11.53	9%

In sum, the results reveal a wide margin for the introduction of commercial innovations that help extend the market frontier by reducing affordability barriers for low-volume users. Moreover, these innovations do not necessarily jeopardize profitability. The case of SMART in the Philippines reveals that short-term reductions in average revenue per user (ARPU) as a result of the introduction of micro-prepayment can be more than compensated in the long run by increased traffic and reductions in operating costs.⁷

4. Affordability analysis

In order to establish the affordability of a basic basket of mobile services for the typical Latin American poor this study examined its cost relative to traditional welfare variables across the sampled countries. Neither household nor individual expenditure variables are considered due to the lack of comparable data. Instead this study relied on three aggregate measures of individual

⁷ See Pyramid Research (2005).

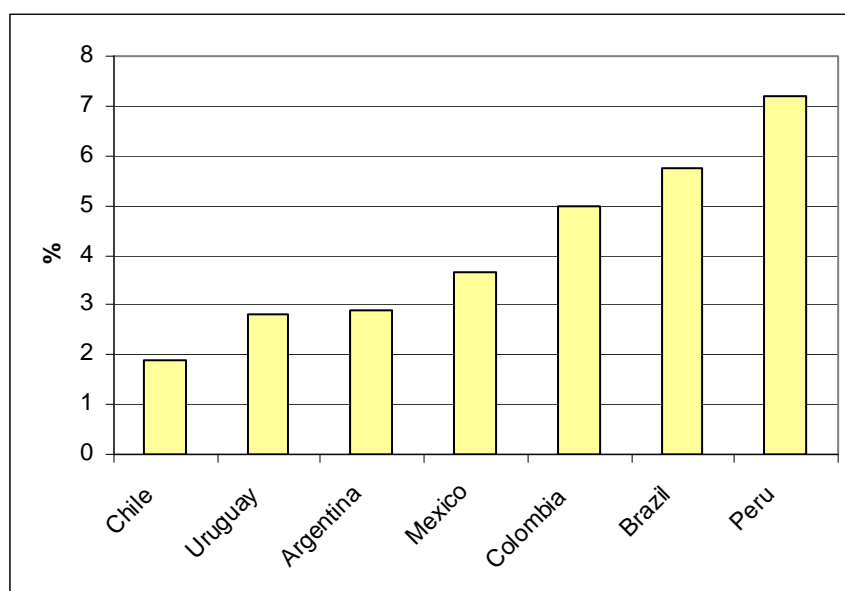
welfare: 1) gross domestic product (GDP) per capita; 2) minimum wage; and 3) individual poverty line.

4.1 Gross domestic product (GDP) per capita

Comparing the monthly cost of a service basket against GDP per capita is a commonly used proxy to determine the general affordability level of a given service. Results for a prepaid low-volume mobile basket are presented in Figure 7. The figure reveals that only Peru and Brazil are above the 5% affordability threshold, whereas in Chile, Argentina and Uruguay the affordability level is comparable to that in more developed countries (hovering between 2 and 3%). The key insight from this first-order approximation is the suggestion that low teledensity levels in Peru (see Figure 5 above) result from a combination of relatively high tariffs *and* low affordability.⁸

⁸ A similar result obtains using PPP dollars.

Figure 7: **Monthly cost of prepaid low volume mobile basket as a percentage of monthly GDP per capita (current US dollars)**

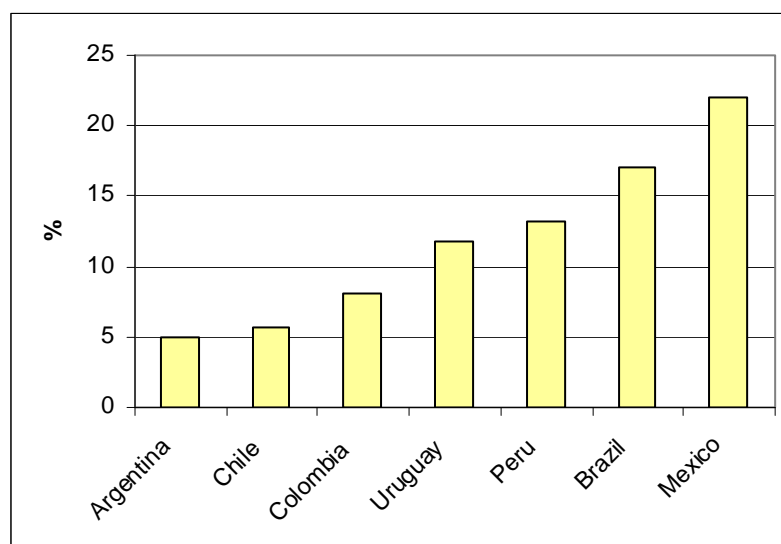


Source: IMF and own calculations.

4.2 Minimum wage

While the above analysis is useful as a first-order approximation to service affordability at the national aggregate level, the cost of a prepaid low-volume mobile basket as a percentage of the minimum wage represents a more reliable indicator of service affordability for the poor. This is true despite the fact that most of the region's poor are employed in the informal sector, and thus not affected by minimum wage levels set by governments (Interamerican Development Bank [IADB], 2006). With this caveat in mind, the results are presented in Figure 8.

Figure 8: **Monthly cost of prepaid low-volume mobile basket as a percentage of minimum monthly wage (current US dollars)**



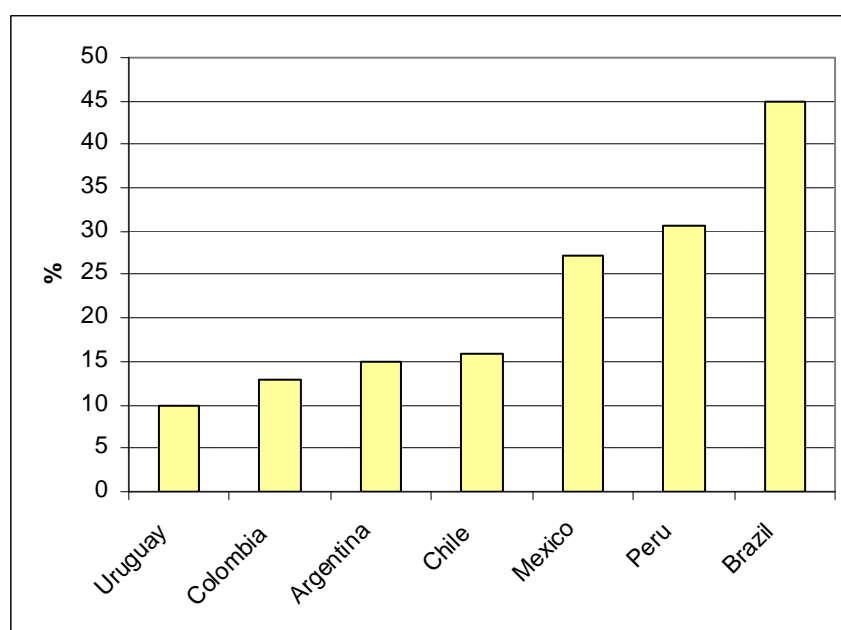
Source: UN-ECLAC and own calculations.

From this analysis, it is interesting to note that Colombia moves closer to the group of countries with high affordability levels (i.e., Argentina and Chile), while Brazil and Peru continue to be at the low end of the affordability spectrum. The most interesting result is Mexico's fall from a moderately affordable market at the aggregate level to the least affordable market when one considers mobile tariffs from the perspective of those living on minimum wage. In absolute terms, it should be noted that only Argentina and Chile have acceptable affordability levels, while the remaining countries in the sample fall far above the 5% affordability threshold.

4.3 Poverty line

Finally the cost of a prepaid low-volume mobile basket relative to the official poverty line (for individuals), as defined by the national statistics office in each country, was examined (Figure 9). This is possibly the best approximation as to the affordability of a basic basket of mobile services for the poor. The results reveal that, generally speaking, a low volume mobile basket is well beyond the means of most of the region's poor, far exceeding the 5% income threshold for those living at or below the poverty line. Brazil, the region's largest market, still stands out for its low affordability levels, followed by Peru and Mexico. Not surprisingly, these are the three countries in the sample with the lowest teledensity levels as shown in Figure 5 above.

Figure 9: **Monthly cost of prepaid low volume mobile basket as a percentage of individual poverty line (current US dollars)**



Source: National statistics offices and own calculations.

Yet even in countries where mobile services appeared to be more affordable such as Argentina and Colombia, the cost of a prepaid low-volume basket exceeds 10% of the poverty line, and thus is well beyond the reach of the average poor. Overall, while affordable handsets and the calling party pays system may allow a large number of low-income Latin Americans to become mobile subscribers, the results reveal that the current tariff structure has a significant inhibiting effect on service consumption by the poor.

5. Conclusions and policy implications

Mobile telephony markets in Latin American seem to be entering a new phase of slower customer base growth in a context of near universal availability of services. While entry barriers continue to drop as mobile handsets (both new and used) become more affordable, current prepaid tariffs as well as the established commercial models continue to pose significant access and usage challenges for the poor. While the combination of prepaid subscriptions and regulatory policies favouring service take-up (such as CPP and high fixed-to-mobile interconnection rates) have boosted penetration, the results show that services are generally priced far above the ability to pay of the average poor. This creates an inhibiting effect on consumption, favouring cost-cutting strategies such as beeping, or simply using alternative services (payphone and street resellers) for outgoing calls. While these practices are tolerated by operators and regulators alike, they are unlikely to provide the basis for a sustainable market in the longer term.

Enhancing competition through increased radio spectrum allocation, reducing taxation, and implementing number portability are among the initiatives worth considering. Regulatory incentives may also be needed to promote innovations such as per second billing and micro-prepayment. More important, governments need to rethink public policies that are premised on the mobile phone as a luxury good complementary to traditional wired services. Despite the affordability barriers discussed above, mobile telephony has long become the most cost-effective and accessible voice communication alternative for the poor.

However, universal access programs in Latin America and elsewhere continue to be focused on fixed telephony and, to a lesser extent, shared telephony and Internet access. This means that the poor bear the entire cost of mobile phone services, while in many cases other higher-income groups benefit from subsidised access to local fixed telephony. This and other recent studies (e.g., Navas-Sabater, Dymond, & Juntunen, 2002; Garbacz & Thompson, 2007) reveal that subsidy schemes focused exclusively on traditional fixed services are inappropriate for the access structure in emerging regions. Reforming universal access policies to reflect how the poor in Latin America access telephony is a task long overdue.

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