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MOBILE OPPORTUNITIES:

Poverty and Telephony Access in Latin America and the Caribbean

Background paper

Market Structure and Penetration in the Latin American Mobile Sector

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As in other regions of the world, the use of mobile telephony in Latin America increased dramatically during the last decade surpassing all expectations for the industry. Mobile telephony was initiated as a premium service used mostly by professionals and during the mid-1990s it became a device used by very low income groups. In Latin America, mobile telephony provides the only source of access to some of the poorest segments of the population and it has become the central mode of communications. Mobile networks will provide coverage to 90% of the world's population by 2010, compared with 80% in 2005. In the region, despite several economic slumps, the number of mobile subscribers increased from 4 million in 1995 to close to 300 million in 2005. The pro-poor accessibility of mobile services makes this industry's expansion an interesting area of study as a possible channel towards development. Mobile companies

are beginning to address the bottom of the pyramid as an important market to serve; adapting business models to serve the needs of low income consumers.

The fast market growth of mobile services arises through a dynamic technological innovation that promises to offer increasing opportunities for development.[1] The technological progress this industry experiences constitutes a crucial source of growth. The shift from analog to digital technology, standardization and market competition increased mobile subscription diffusion (Grueber, 2001). Indeed, compared to fixed telephony, mobile services arose in a relatively more competitive environment with more firms operating in the market since its inception. .

Competition between mobile carriers promoted diffusion, encouraged innovation, expanded the network and reduced prices (Rouvinen, 2004). Innovative pricing strategies such as prepaid subscription and calling party pays have contributed very significantly to the dramatic growth in mobile subscription. However, the literature on industrial organization concludes that the mobile industry sustains only a few number of firms in the market (Valleti, 2003; Gruber, 2005). Because entry to the mobile market is restricted by the available spectrum, this industry is inherently oligopolistic (Sung, 2006). Moreover, in Latin America today we observe a consolidated market; the Spanish firm Telefónica and the Mexican corporation Grupo Carso Telecom, owners of Telmex and América Móvil, have operations in twenty six countries of the region and together service sixty four percent of the regional mobile market.

This study is intended to evolve as a foundational piece of background research which will inform the Regional Dialogue on the Information Society (DIRSI) larger project on the mobile sector in Latin America. The objective in this paper is twofold. On the one hand, it seeks to analyse the process of consolidation that the region experiences today in the mobile market and on the other, identify the impact this market concentration has had on mobile penetration. The

[1] Technological change has modified market structure by blurring the frontiers between industries and thus having more players in the market. It is also offering more access to more services to a greater number of persons. Weiser (2005).

ultimate objective behind this analysis is to understand how the trend in market structure may impact the use of mobiles by low income sectors of the population in Latin America.

The findings in this paper are mixed. They do not identify a clear association between market concentration and mobile penetration. It suggests firms in the mobile market are competing for a regional position and not colluding; for example, the ARPUS in the mobile industry are decreasing. In accordance to results in other studies it finds that the most significant variables that have had an impact on mobile penetration are pricing strategies.

The first section of this paper will offer an overview of the process of consolidation in the mobile market in Latin America and the business strategies that mobile firms have followed. The following section will identify its market structure and the last section will explore the links between variables associated to market concentration and known to influence mobile penetration such as pricing and spectrum allocation. The final comments will identify the knowledge gaps and suggest new lines of research.

1. Process of consolidation in the Mobile Market in Latin America

Today the Latin American mobile market faces the increasing consolidation of two carriers in virtually every country. As Table 1 shows, América Móvil and Telefónica hold 64 percent of the Latin American market and have operations in 26 countries. Telecom Italy is the only other significant regional competitor with 12 percent of the market.

Table 1: **Latin America Consolidation (2005)**

Firm	Market (%)	Operates	Leader in

América Móvil	36	13 countries	Colombia, Ecuador, El Salvador, Guatemala, Mexico y Nicaragua
Telefónica Movistar	28	13 countries	Argentina, Brazil, Chile, Panama, Peru y Venezuela
Telecom Italia	12	5 countries	Bolivia
Others	24		

The two firms together have 64% of the Latin American market

Source: Telecom CIDE based on Rojas (2006)

This process of consolidation occurred after more than a decade of pro-market reforms where the objective was to promote a competitive market with numerous players. While the Spanish firm Telefónica consolidated a strong position after the acquisition of the mobile operations of Bellsouth in many countries of the region in 2004 and 2005, the Mexican firm Telmex and its associated firm, America Móvil, developed an aggressive acquisition policy in local telephony as well as in the mobile sector during the late 1990s. These results are unexpected, not only because the objective of the 1990s´ reforms was to generate an atomized market, but also because the companies that today control the market were far from being the strongest in the world.

This outcome may be explained, to a certain degree, by the support both companies received from their governments. During the 1990s, the reforms undertaken in the telecommunication sector in Spain and Mexico favored the creation of large companies with a strong position in all segments of this market. The strategy implemented in both cases was the result of policies that were directed towards the creation of National Champions and the success of these policies created the basis for their internationalisation. In the case of Spain, on the eve of the creation of the European Common Market, the Spanish government strengthened Telefónica before it faced competition in an open market. At the time, Spanish telecommunications were among the least modernized systems in Europe, so the government feared that Telefónica would be absorbed by the major European operators or, in the best possible scenario, that it would play a minor role within an integrated European telecommunications sector. Today, Telefónica in Latin America still receives

significant support from the Spanish government via fiscal incentives and in some cases such as Mexico it is supported by Telefónica in Spain.

The Spanish regulatory framework established a generous pricing policy, together with "cheap money" financing policy and the decision not to distribute dividends. During the first half of the 90s, the pricing policy was focused on financing the modernization of the company and on balancing tariffs. Telefónica benefited from the support of the Spanish government through solid financing mechanisms.[2] Telefónica began acquiring companies that held market power with exclusivity periods in Argentina, Chile, Peru and Brazil.

In the case of Mexico, as a cornerstone of the country's modernization process, Telmex was privatised and sold as a vertically and horizontally integrated company in 1990. Achieving a privatisation successfully meant overcoming a number of political and economic obstacles. A vertically and horizontally integrated company served the purpose of satisfying the demands of the key actors in the system: the national private sector and the unions, which were lobbying against the disintegration of the company and favored the creation of a National Champion. Furthermore, as in the Spanish case, policy makers believed Telmex had to be strengthen to face the competition of the powerful U.S. telecommunications firms. The mobile firm, Telcel, was also sold to Grupo Carso and was awarded the only national licence to operate in Mexico.

Initially, the Mexican group did not have a significant participation in the process of privatisation in Latin America. Its interest in the Latin American telecommunications sector began only during the second half of the 1990s and followed two different paths: the acquisition of privatised fixed telephony companies in Guatemala, El Salvador and Nicaragua and, the most important one, the expansion of its mobile telephony operations to several countries in South America that was initiated in 2003.

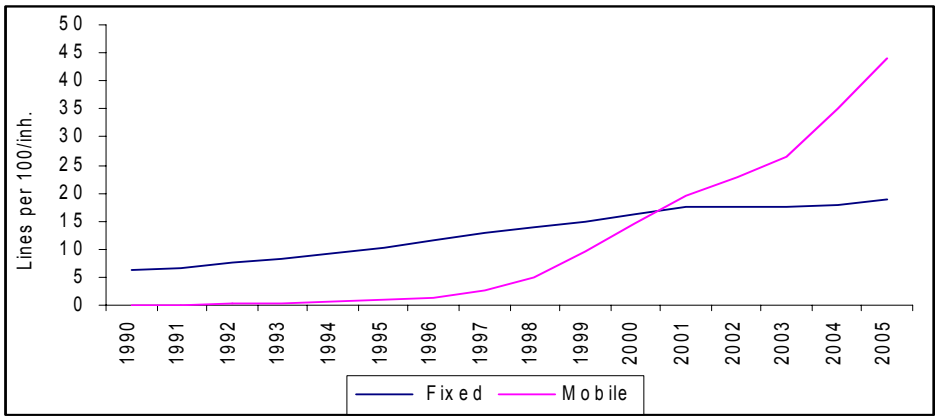
[2] This policy was not exclusively for the telecommunications sector, but was developed also in other sectors, such as infrastructure and banking.

In Latin America, those companies that competed in the fixed telephone segment of the market acquired a significant advantage that allowed them to consolidate a very strong position in the telecommunications market. The control of the incumbent position in Spain, Mexico, Argentina and Chile, for example, posed difficulties to competitors in overcoming first-mover advantages. The U.S.-based companies that entered the Latin American telecommunications market in what appeared to be the dynamic sectors at the beginning of the last decade, such as mobile and long distance, were not able to secure their position and today have lost all significant share of the Latin American market and preferred to return to their national market. Even pro-competitive regulatory policies were not enough to create a real level playing field that would counteract these initial strong positions.

Until 1997, mobile telephony was a secondary business option for the incumbent companies. Fixed teledensity by far surpassed mobile penetration and investment in fixed telephony, being sheltered from competition and operating within a relatively weak regulatory environment, seemed to promise a major source of income. Mobile telephony firms, on the other hand, were subject to a more significant degree of competition. Therefore, as the mobile companies were facing serious difficulties in generating positive EBITDAs,[3] the firms in the fixed sector owning mobile sister companies did not consider this branch of the business to be very promising. As Graph 1 shows, after 1998, while fixed teledensity tends to stagnate in most countries, mobile telephony begins to grow at two digit ratios. The average annual growth of mobile telephony users during the 2000-2005 period was 20.3% in the region, while growth in the case of traditional telephony was only 0.4%.

[3] EBITDAS (Earnings Before Interest, Taxes [income taxes], Depreciation, Amortization and [owners] Salaries)

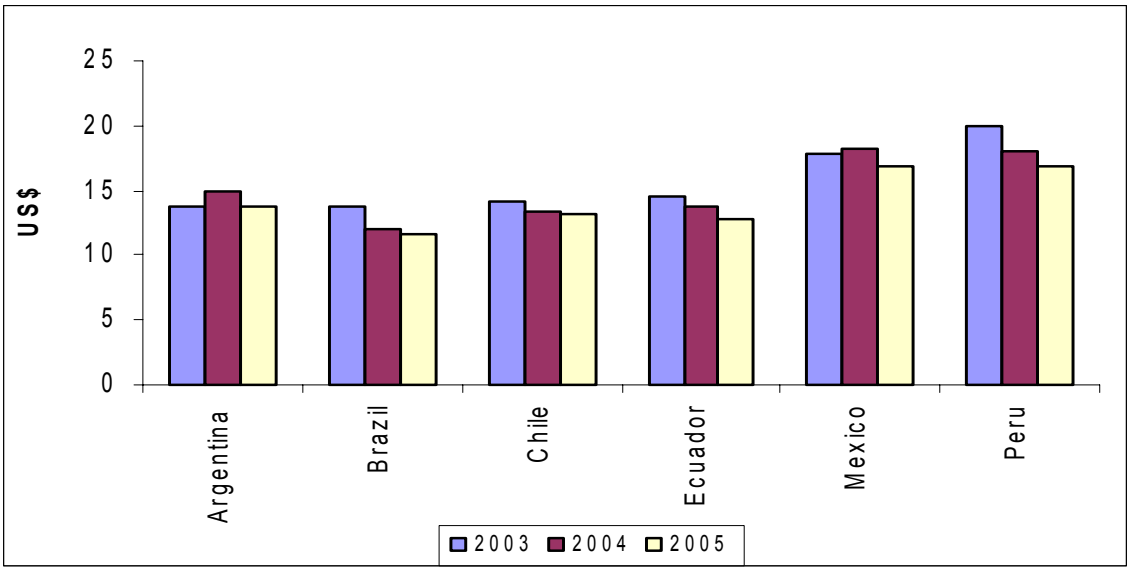
Graph 1: **Average penetration fixed and mobile in Latin America, 1990 - 2005**



Source: Telecom CIDE based on ITU (2005, 2006)

In this context, mobile telephony became the focus of attention for the region's two largest operators: América Móvil and Telefónica Móviles. The acquisition process of these two companies involved an aggressive campaign to attract customers and the incursion into local markets in the fight for regional positioning, which in some cases involved a reduction in average revenue per user (ARPU) (see Graph 2) during this time period as the number of users increased. This has generated a scenario of global survival as opposed to one of collusion among companies. However, as Graph 3 shows, mobile services continue to be in the forecast predictions a more profitable business than fixed services.

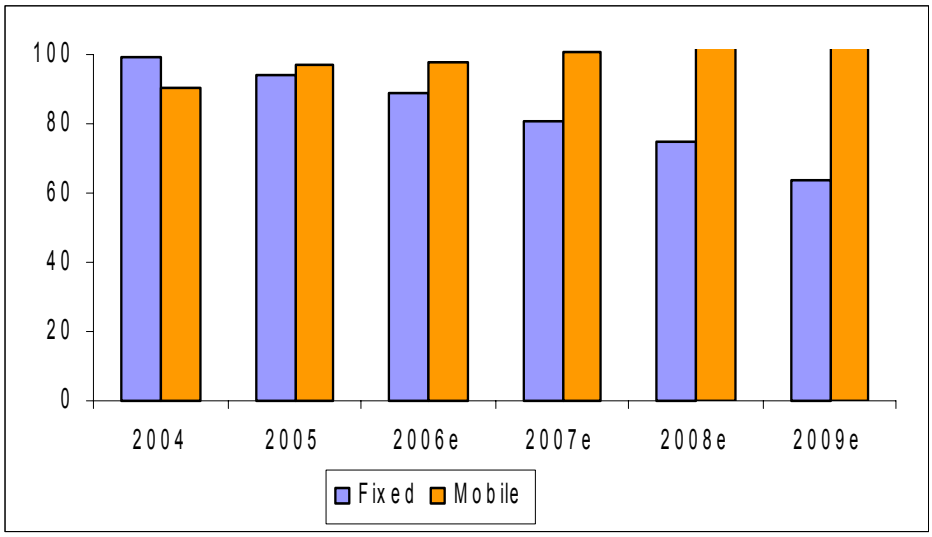
Graph 2: **ARPU, Latin American Selected Countries, 2003 - 2005**



Source: CIDE Telecom based on Asocel and operators

The mobile business is no longer an appendix of fixed operations, as the companies decided to separate both operations in order to maximize their operations. Telefónica de España restructured its operations by creating companies specializing in mobile communications, long distance, mobile telephony, data, WEB services and call centers. The companies lost their national personality and were integrated into regional companies maintaining the generalized use of the Telefónica brand. The business strategy is no longer determined by the company in the fixed business, but rather the different segments develop their own strategies and are coordinated at a higher level. Nevertheless, the companies do take advantage of possible economies of scope that generate significant advantages over specialized operators.

Graph 3: **Mobile overtakes Fixed (Forecast Revenue, $ Billions)**



Source: Analyses quoted by Monteiro (2005)

Indeed, as mobile telephony became a business with a very favorable perspective, the firms in the sector began to fight for global operations. One of the central objectives has been to hold a central position in Brazil; both Telefónica and Telmex – América Móvil entered the Brazilian market with large investments.

The biggest step undertaken by Telefónica to become the central operator of the mobile segment in the region was the purchase of all Bellsouth operations in Latin America. As can be seen in the next table, Telefónica holds mobile companies in thirteen countries, with participations (excluding the case of Mexico) that fluctuate between 24% in El Salvador and 73% in Panama, with a special emphasis on Brazil, where its participation is close to 50%. Telefónica España begins its mobile operations in Mexico in 2002 with the purchase of Pegaso, thereby strengthening its position as the second largest supplier of mobile services in the country.

In 2001, Grupo Carso follows a similar path and decides to separate TELMEX from TELCEL, the mobile company, which becomes the international conglomerate América Móvil. Through this company, the group expands its influence to the entire Latin American region and reaches the position described in the following table. As can be seen, it has operations in ten countries, with

participations that fluctuate (excluding the case of Uruguay) between 25% in Brazil and close to 76% in Mexico. América Móvil has entered the Chilean market through the acquisition of Smartcom, the third largest operator of that country.

2. Current Market Structure

The evolution of the market structure in the region shows some variation in the presence of mobile firms in the market. Table 2 shows this evolution and while the change in the number of mobile firms is not striking its composition was modified significantly. During the first period Telefónica already had a significant participation and América Móvil was initiating its operations in the region. An important change was the departure of European and U.S. based firms of the mobile market in Latin America. By the year 2000 firms such as British Telecom, France Télécom, and Bellsouth left the region. Only TIM from Italy maintained a position in Brazil and Argentina. Telefónica strengthen its position and América Móvil became a regional firm in the Latin American market. The companies that survived in the region are mostly owned by Telefónica and América Móvil.

Table 2: Mobile Firms in Latin America (selected countries)

Country	1995 - 2000	#	2000 – 2005	#	Variation
Brazil	Portugal Telecom, Telefónica, British Telecom, TIM, Bellsouth, Telia, SK Telecom, NTT, Telesystems, DDI.	10	Portugal Telecom, Telefónica, TIM, América Móvil, Brasil Telecom, Telemig, Oi.	7	-3
Argentina	Bellsouth (Movicom), Telefónica, France Télécom and TIM, Agea/Clarín	5	Telefónica, América Móvil, TIM, Nextel.	4	-1
Colombia	Milicom, Cable & Wireless, Bell Canada, Telefónica, AT&T	5	América Móvil, Telefónica, Ola, Avantel	4	-1
Chile	Bellsouth, Telefónica, Smartcom, Entel	4	América Móvil, Telefónica, Entel	3	-1
Ecuador	Bellsouth, Conecel	2	América Móvil, Telefónica, Alegro	3	+1
El Salvador	Telefónica, France Tëlécom, Telemóvil	3	Telefónica, América Móvil, Telemóvil, Digicel, Intelfon	5	+2
Guatemala	Comcel, Bellsouth	2	Comcel, América Móvil, Telefónica	3	+1
Honduras	Millicom/Motorola, Telia/Megatel	2	América Móvil, Millicom	2	0
Peru	Telefónica, TIM	2	Nextel, Telefónica , América Móvil	3	+1
Nicaragua	Bellsouth	1	América Móvil, Telefónica	2	+1
Panamá	Cable & Wireless, Bellsouth	2	Cable & Wireless, Telefónica	2	0
Paraguay	Telecel, Núcleo	2	Telecel, Núcleo, América Móvil, Vox	4	+2
Uruguay	Antel, Bellsouth	2	Antel, Telefónica, América Móvil	3	+1

Source: Telecom CIDE based on Rozas (2005)

By the year 2005, the operations of the Mexican group América Móvil and of the Spanish firm Telefónica Móviles covered fifteen countries in Latin America with a joint participation within some countries surpassing 90% of the market, as is the case of Nicaragua, Colombia, Ecuador and Mexico (see Table 3).

Table 3: **Market participation by country and segment (2005)**

Country / Segment	AMX (%)	TEM (%)	AMX+TMX (%)	AMX+TMX (%) 2005
Argentina	31	38	69	53.8
Brazil	22	34	56	75.5
Chile	17	47	64	35.1
Colombia	63	27	90	90.1
Ecuador	65	31	96	94.7
El Salvador	37	23	60	56.1
Guatemala	47	25	72	71.8
Honduras	34	--	34	28.3
Mexico	77	14	91	90.4
Nicaragua	67	33	100	98.4
Panama	--	53	53	73.1
Paraguay	10	--	10	0
Peru	35	60	95	52.0
Uruguay	14	36	50	36.7
Venezuela	--	44	44	45.7

Source: Telecom-CIDE based on the companies' annual report and regulator's web pages.

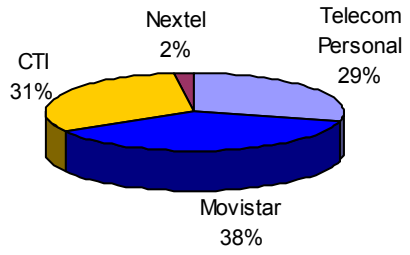
Note: Mobile density in the country is calculated as the number of subscribers per 100 inhabitants. Decimals were omitted.
AMX: América Móvil, TEM: Telefónica Móviles.

Graph 4 shows the current market participation[4]. In those countries where the number of firms has increased such as Paraguay, El Salvador y Uruguay, the entrants that have captured a significant portion of the market are owned by either Telefónica or América Móvil.

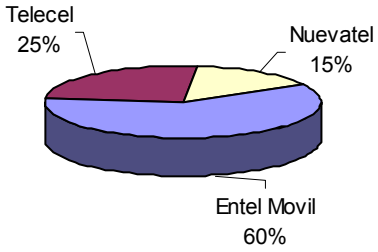
[4] Telefónica has changed the name of the firms it acquired in the region and used the generic name of Telefónica Movistar, except for the case of Brazil where the brand name is Vivo and is a joint venture with Portugal Telecom. América Móvil has adopted a different strategy. In Colombia, Ecuador and México it maintained the original brand names, Comcel, Porta y Telcel, respectively. In Argentina, Paraguay and Uruguay, it uses the generic name of CTI and in the Central American countries, as well as in Brazil the brand name is Claro.

Graph 4: **Market Share by Country, 2005**

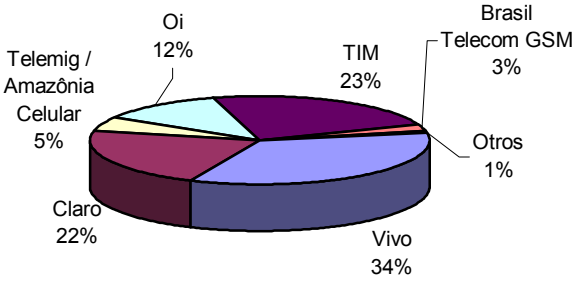
Argentina



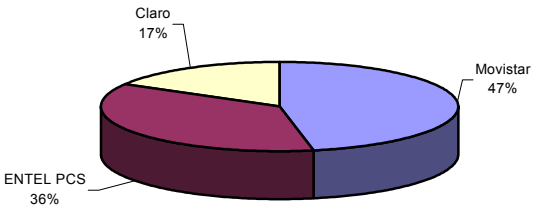
Bolivia



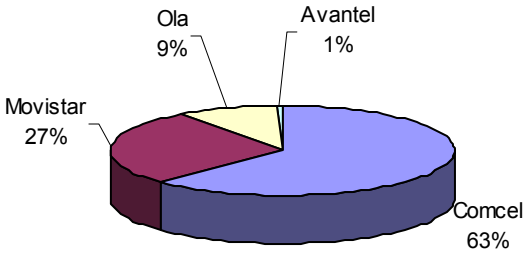
Brazil



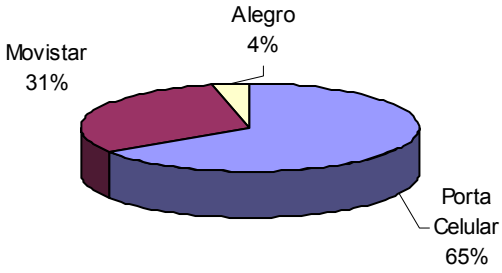
Chile



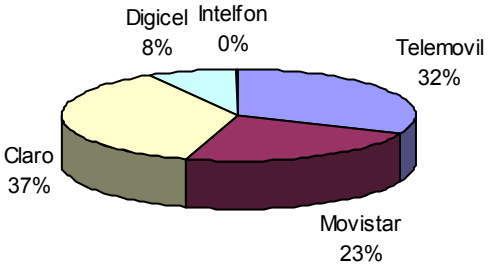
Colombia



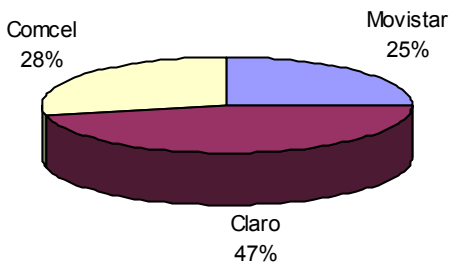
Ecuador



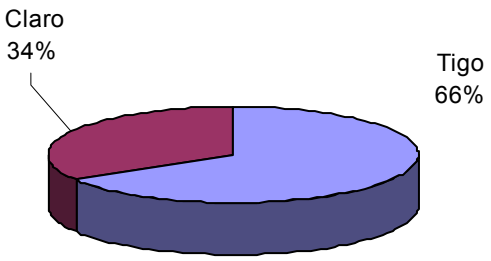
El Salvador



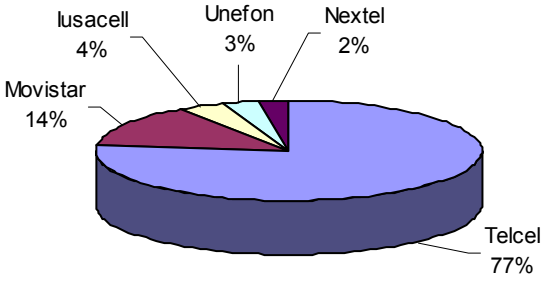
Guatemala



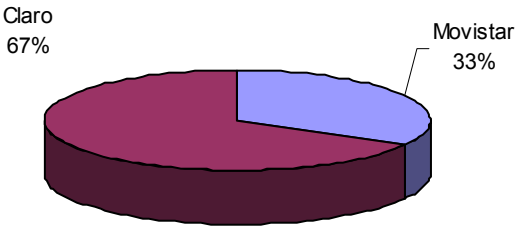
Honduras



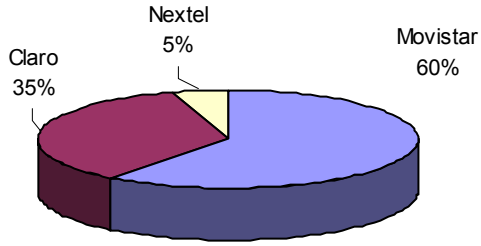
México



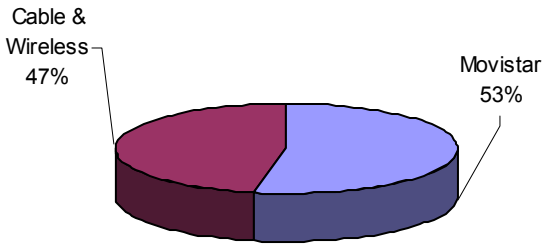
Nicaragua



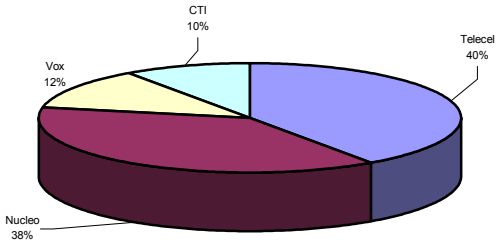
Perú



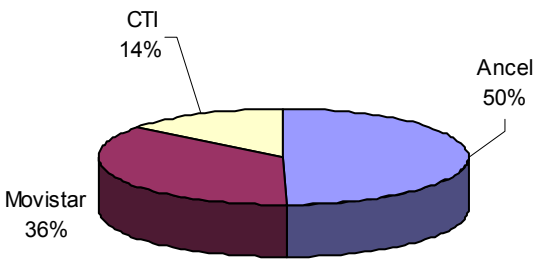
Panamá



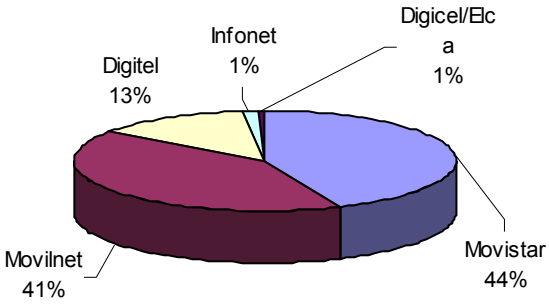
Paraguay



Uruguay



Venezuela



Source: Telecom CIDE based on operators web page and annual reports.

The number of firms in a market not always provides a clear account of market concentration. To obtain a more precise perspective we use the Herfindahl – Hirschman Index (HHI) as a measure of market concentration. [5] As table 4 shows mobile markets in Latin America have different concentrations; the HHI reaches values close to 5000 in those countries where there is a carrier that has more than 50 percent market share. Within these countries there are cases of artificial duopoly and where there are a greater number of companies. The former group includes Honduras, Nicaragua and Panamá. In the case of Honduras and Nicaragua, the dominant carrier has more than 60%, market share; however, it is important to consider that the industry has recently been privatized. In the case of Panamá, this distribution is more equitable.

Table 4: **Herfindahl – Hirschman Index in Selected Countries**

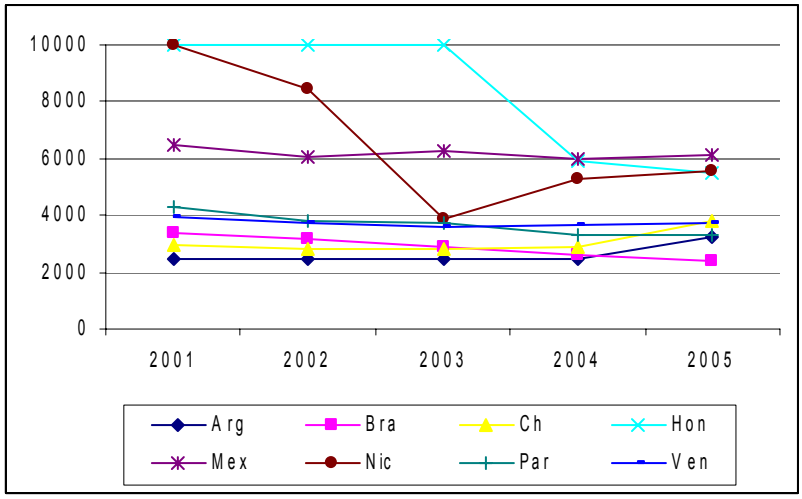
País	2001	2002	2003	2004	2005
Argentina	2477	2488	2483	2438	3232
Bolivia	4223	3966	4430	4798	4413
Brazil	3377	3192	2882	2631	2388
Chile	2961	2839	2796	2872	3801
Colombia	4215	4708	4582	4171	4752
El Salvador	3661	3449	3140	2857	2965
Ecuador	5145	5165	5411	5312	5267
Guatemala	3288	3435	3606	3274	3600
Honduras	10000	10000	10000	5900	5521
Mexico	6448	6035	6256	5957	6148
Nicaragua	10000	8484	3866	5248	5563
Panama	5063	5047	5001	5000	5020
Paraguay	4320	3823	3717	3326	3293
Peru	4435	3753	3629	3718	4891
Uruguay	6026	5955	5818	5384	3966
Venezuela	3978	3702	3575	3635	3767

Source: Telecom CIDE based on operators

The second group of countries with a high HHI includes Bolivia, Colombia, Ecuador, México and Peru. Even though in these cases there are three or more operators in the market, the dominant carrier has more than 60 percent market share. The case of Mexico shows the highest concentration with an HHI of more than 6000 and Telcel, the dominant carrier having 77 percent market share.

[5] The Herfindahl – Hirschman Index (IHH) is a measure of market concentration and thus of its structure. It is the sum of the participation of the firms in the market and takes the value of 0 and 1. Zero denotes no concentration while one reflects a fully concentrated market.

Graph 5: **HHI: Evolution, LA selected countries**



Source: Telecom CIDE

As graph 5 shows, in recent years the evolution of the IHH in Latin American has been uneven across countries. In Brazil, Paraguay and Venezuela, the level of concentration has diminished between 2001 and 2005. Brazil has the lowest concentration level in the region while in Argentina and Chile the HHI increased probably due to the acquisition of Bell South's by Telefónica Móviles in 2005.

In Honduras and Nicaragua, concentration decreased spectacularly due to the recent process of privatization and the entrant companies positioned themselves in the market rapidly. The case of Nicaragua stands out as the HHI has fluctuated drastically in a short period of time. When the market was liberalized, three firms entered, Telefónica, Alo PCS and Enitel (the latter property of América Móvil),and in 2003 América Móvil acquired another firm, PCS , creating a monopoly. In Honduras the situation is different; in 2003 the entrance of América Móvil created a more competitive market.

Finally, the last case shown in Graph 5 is Mexico whose HHI is the highest in the region reaching a level of 6 thousand units with Telcel an associated firm to América Móvil holds a dominant position and Telefónica has not been able to increase its participation significantly. Today, the entrance of Telefónica and América Móvil into the different markets of the region determines the concentration of the market.

3. Penetration trends

As the previous sections have revealed the mobile market in Latin America shows a significant concentration. In order to identify the outcome of this concentration we now turn to an analysis of the penetration trends and their association with concentration in the region. The growth in penetration rates are determined by numerous factors including income, technological innovation and regulation. It is clear that higher income countries have higher level of penetration but our interest in this section is to analyze the role of regulatory variables as they relate to market structure and mobile penetration.

A critical distinguishing feature of mobile services is that it provides extensive coverage. However, coverage can only be provided by a limited number of firms when there is scarcity of radio spectrum (Grueber, 2005). In this context, firms may respond by product differentiation which is typically implemented during the early phase of diffusion and by price competition. The following sections will then explore the issues surrounding pricing and spectrum allocations as they represent two crucial regulatory factors that are, according to the literature, determinants of market structure as well as drivers of growth in the mobile market.

4. Pricing and penetration trends

Price setting in the mobile market is complex; at the wholesale level it includes interconnection between networks.[6] At the retail level there are two basic ways to set prices, calling party pays and receiving party pays. Even though the latter is the most appropriate in terms of allocative efficiency, calling party pays (CPP) has received more attention (Gruber, 2005).

In fact, CPP as a pricing strategy contributed to support the rapid development of mobile use and dramatically changed the access to voice communications.

[6] Empirical studies show that price competition in the mobile market is of the Cournot Type, that is, price is set above marginal cost and decrease with the number of entrants to the market (Gruber, 2005)

Interconnectivity with the fixed users of the incumbent company had important effects on the development of mobile telecommunications in Latin America. The main issue here was defining the criteria for access charges. Normally, the fixed telephony operators operating within the same concession zones determine symmetrical access charges. The most common modality had been the receiving party pays one, whereby the company originating the call retains the full payment of the user. The second modality is to establish a formula to share the income, usually distributing 50% to each of the operators involved in a successful communication. In the case of mobile telephony, due to the differences in convergence, coverage and maturity between fixed and mobile technologies, symmetrical access charges did not allow for mobile operators to generate enough income to finance their companies. Therefore, initially the most common solution was for the user of mobile telephony to pay for both, outgoing and incoming calls. The high costs for the user of this solution greatly limited the number of subscribers.

A number of changes in the regulatory environment as well as in the business strategy of several mobile telephony companies, created the conditions to change this limitation to the growth of the sector. One was the adoption of CPP and the other prepaid systems that allowed users to use the telephone without a large expenditure at the forefront.

Table 5: **Mobile Telephony, basic information, 2005**

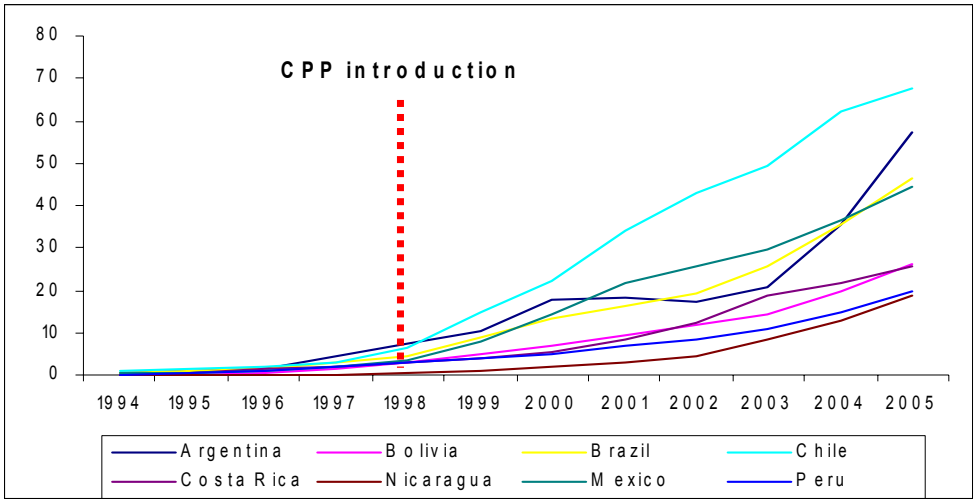
Country	Users (Million)	Penetration (%)	Prepaid (%)	ARPU (US $)	Prepaid Introduction	CPP Introduction
Argentina	25	57.27	70	13.7	1998	1997
Bolivia	2	26.37	85	12.5	1997	1996
Brazil	92	46.25	80	11.7	1998	1994
Chile	12	67.79	82	13.3	1998	1997
Colombia	28	47.92	81	12.6	1996	1994
El Salvador	2.5	35.05	82	17.9	1998	1999
Ecuador	8	47.22	87	12.8	1996	1998
Guatemala	5	25.02	90	14.3	1998	1999
Honduras	2	17.79	86	15.2	1998	2000
México	51	44.34	91	18.3	1993	1999
Nicaragua	1.2	21.77	92	15.9	1999	1998
Panama	1.7	41.88	90	33.3		1997
Paraguay	1.5	30.64	83	10.0	1997	1997
Peru	7	19.96	80	16.9	1997	1996
Uruguay	0.8	18.51	83	11.3	1998	1995
Venezuela	16	46.71	92	20.2	1997	1991

Source: Telecom Data

Brazil adopted the CPP modality from the beginning, ANATEL has established maximum access charges, which were applied by the different mobile companies. In 1997, Chile changed its regulations to introduce the “calling party pays” (CPP) modality, which transferred the payment for mobile calls to the originating party. Additionally, the country’s regulatory agencies determined access charges for mobile companies by applying the same methodology to them as to operators in non competitive conditions, thereby having the fixed operators pay the charges for the call. As table 5 shows the modality of CCP was extended to practically all countries in the region.

The favorable interconnection arrangements with CPP offered mobile companies the financial resources for subsidizing the acquisition of new customers which accounts for the rapid growth of the sector (Gruber, 2005). Through these pricing strategies, mobile access increased dramatically; what initially appeared as a means of communications restricted to the highest income groups, was transformed into the principal means of access to telecommunications of the poorer sectors of the region. As graph 6 shows the adoption of CCP led to a significant increase in mobile penetration and to a substitution from fixed to mobile (see Graph 1).

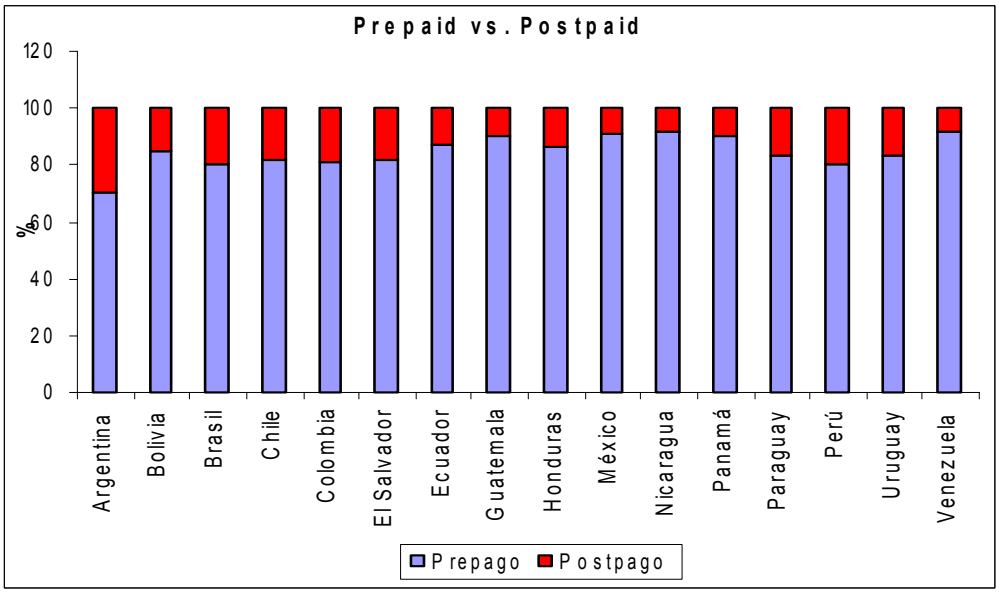
Graph 6: **CPP impact on mobile adoption**



Source: Telecom CIDE

The introduction of the prepaid option significantly increased mobile usage in the region. As Graph 7 shows, most of mobile usage in Latin America is prepaid.

Graph 7: **Prepaid vs. Postpaid**

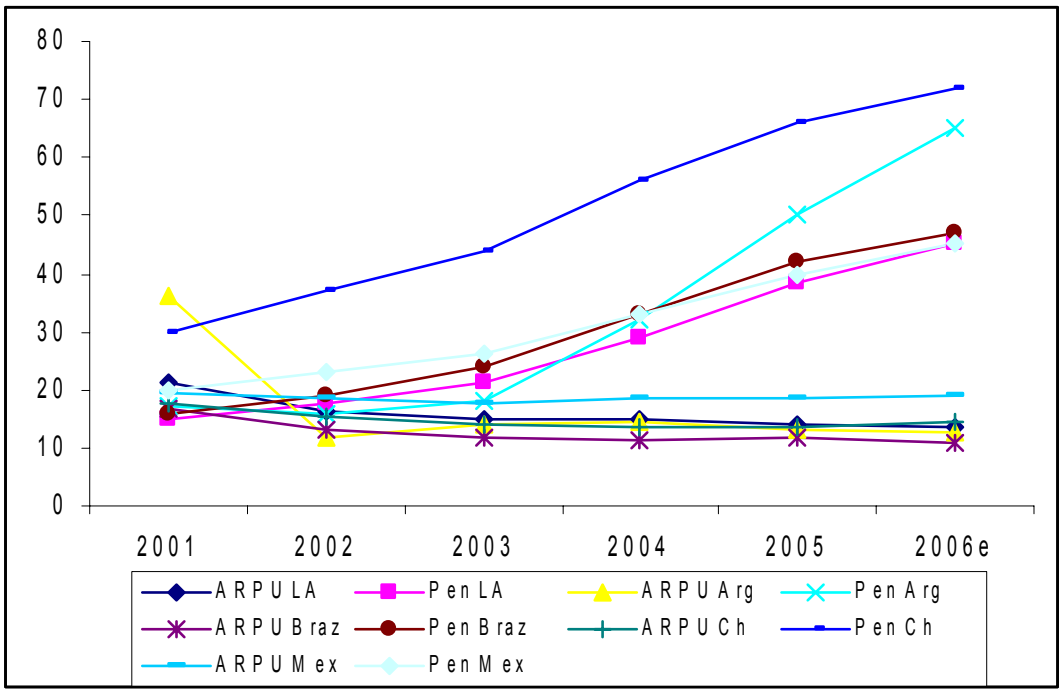


Source: Telecom CIDE

What can be observed in the Latin American case is price competition. With more carriers there have been new pricing strategies and more penetration. This has lead to decreasing ARPUS as new subscribers are low income users

which is a tendency observed at the worldwide level (Gruber, 2005). As a region and at the country level, ARPUS have decreased. This trend is observed in Argentina, Brazil, Chile and México (Graph 8).

Graph 8: **ARPUS vs. Penetration**



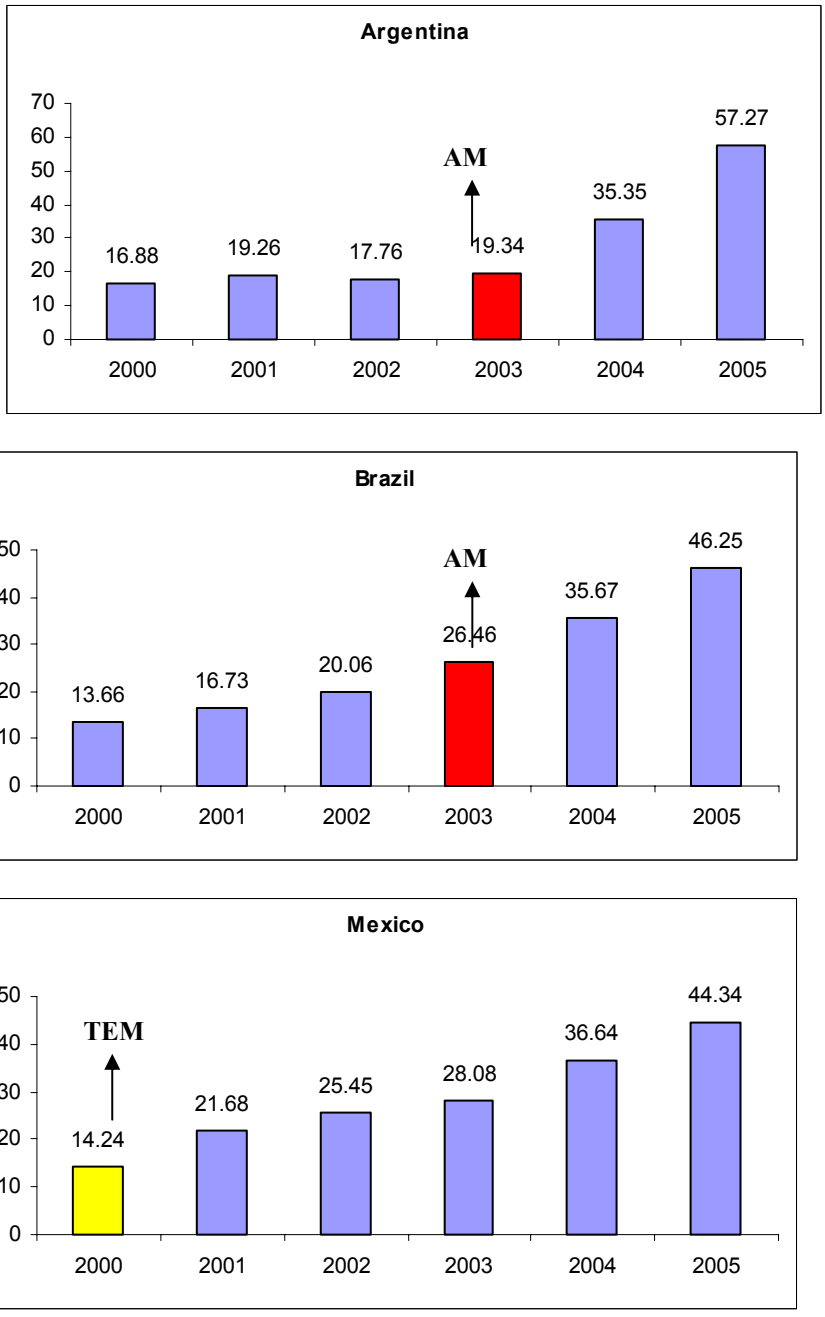
Source: Telecom CIDE based on Pyramid

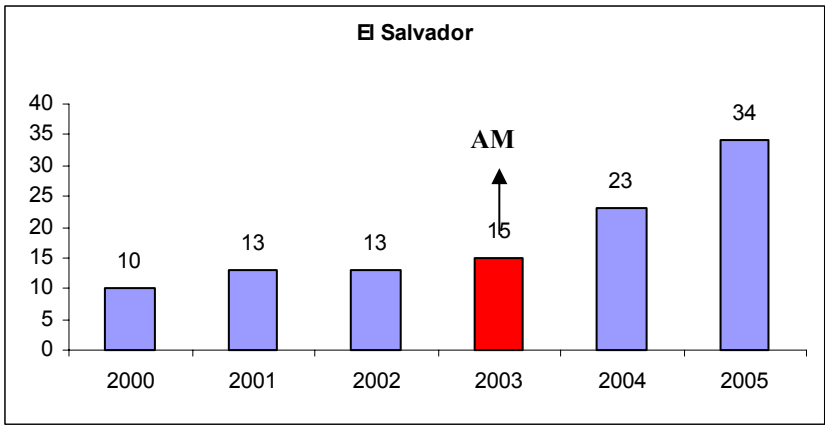
5. Other variables

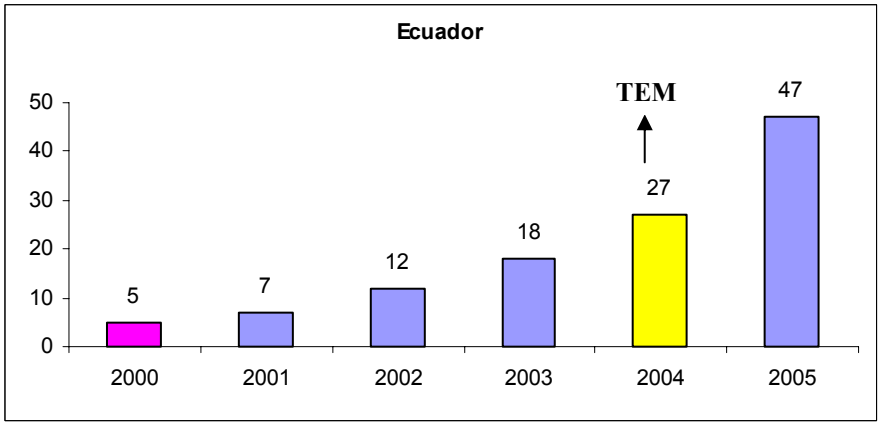
5.1 Entry

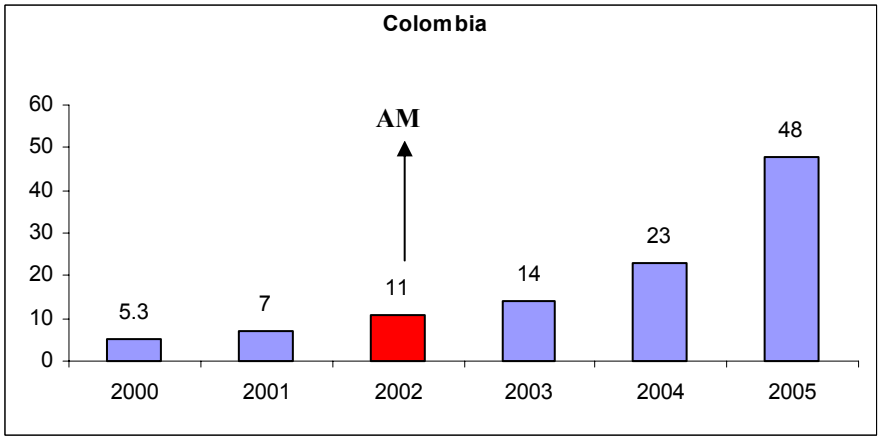
As Graph 9 shows, the entry of either Telefónica or América Móvil into the market may be associated with an increase in penetration. The year after the entry of any of these firms the penetration increases. It is too early to observe the impact in countries such as Chile and Perú since the entry of these firms occurred last year.

Graph 9: **Market Entry and Penetration**









Source: Telecom CIDE

5.2 Technological standards

The worldwide expansion of mobile telephony is associated with the introduction of digital technologies in the early 1990s. Because with digitalization less radio spectrum was used it was possible to increase mobile usage as well as quality (Rouvinen, 2004). Moreoever, with an increased user base, network effects and economies of scale made mobile telephony a very

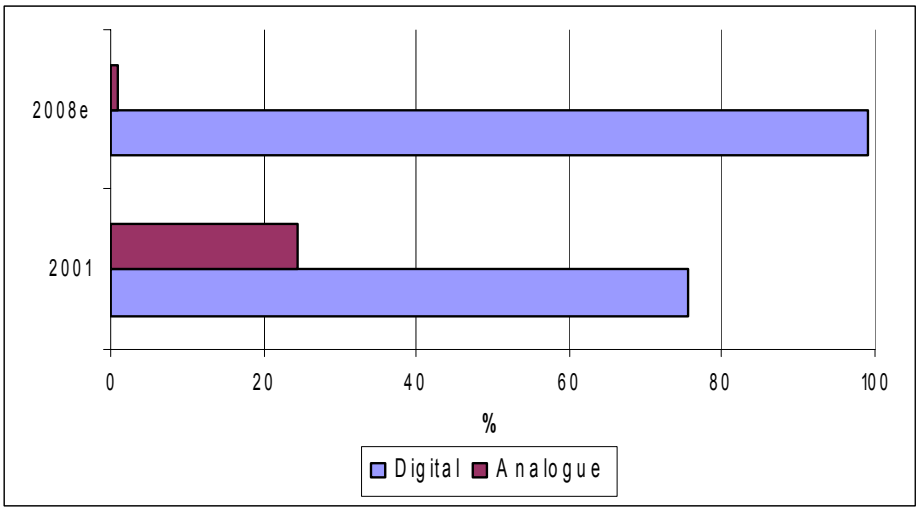
valuable service. Regulators must decide if to allow competition between technologies, that is choosing a technological standard, or within technologies, that is, issuing licensees to multiple operators (Koski & Kretschmer, 2005)

In Latin America there is a rapid migration from analogue technologies to digital, as can be seen in Table 6; it is expected that by 2008 all of the network will be digital (Graph 10). Empirical studies find that standardization does not promote price competition while other policy instruments such as number portability are more effective in inducing mobile diffusion. (Koski & Kretschmer, 2005)

Table 6: **Mobile network adoption by technology: Latin America and Caribbean, 1990 – 2002**

Technology	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Analogue	5	8	5	11	9	0	4	0	2	2	1	0	4
Digital	0	0	0	0	6	3	11	11	35	27	23	9	15

Graph 10: **Diffusion of analogue and digital mobile Telecommunications in Latin America**



Source: Telecom CIDE based on 3G Americas

5.3 Spectrum Allocation and Penetration Trends

Radio spectrum is a key input for the supply of mobile services; it is a public good for exclusive use when it is used by a mobile firm. Other services such as radio diffusion compete for spectrum allocation and thus leave only a portion for mobile use. This fact along with the high sunk costs associated with the installation of a mobile network leads to a mobile market with a limited possible

number of firms. Rivadeneyra (2004) finds that the average number of firms a mobile market has is 3.8. Whereas a study provided by Goldman and Sachs sustains those carriers with less than 25 percent of market share do not reach a break even point and argue that the ideal number of firms in a mobile market is no more than three. The allocation mechanism of radio frequencies may then provide oligopolistic rents as they represent an entry barrier (Gruber, 2006).

In Latin America, spectrum allocation has followed a command and control criteria. Table 7 taken from Hazlett & Muñoz (2006) illustrates the mechanisms used to provide licensees in different countries in Latin America.

Table 7: **Spectrum Licensing in Latin America**

	Is service license distinct from wireless license?	Is the wireless license associated with a service?	Does the service license permit new services?	Technology neutrality?	Spectrum comand and control?	Spectrum property rigths?	Positive administra-tive silence	Is license revoked if licensee provides unauthoriz ed service?
Argentina	yes	no	yes	yes	intermediate	no		no
Bolivia	yes	yes	no	no	yes	no		yes
Brazil	yes	yes	no	no	yes	no		yes
Chile	yes	no	no	no	yes	no	yes	yes
Colombia	yes	yes	no	no	yes	no	yes	yes
Costa Rica			no	no	yes	no		yes
Ecuador	yes	yes	no	no	yes	no		yes
El Salvador	yes	no	yes	yes	yes	no		no
Guatemala		no		yes	yes	yes	yes	
Honduras	yes	yes	no	no	yes	no		yes
Mexico	yes	yes	No	no	yes	no		yes
Nicaragua	yes	yes	yes	yes	intermediate	no	yes	yes
Panama	yes	yes	no	no	yes	no		yes
Paraguay	no	yes	no	no	yes	no		depends on the contract
Peru		yes	yes, but restricted ones	no	yes	no	no	depends on the contract
Uruguay	yes	yes	No	yes	yes	no		yes
Venezuela	yes	yes	No		yes	no	no	

Source: Hazlett and Muñoz (2006)

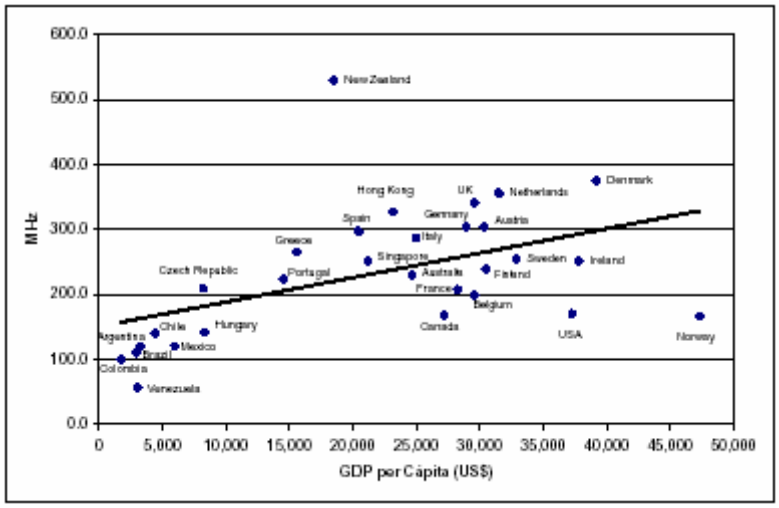
The dominant strategy to allocate rights of use for spectrum is by specific services which limit its use, that is, a firm must request a new license for each different service it wishes to provide. In Argentina and Nicaragua there is a more liberal regime but the quantity of spectrum allocated is very small. In Guatemala and El Salvador market mechanisms play a more significant role

and property rights in the use of frequencies are clearly defined and there are possibilities of increasing the assigned spectrum through an auction.

In most of these countries, licensees are awarded by line of business, that is, firms need a different license to provide a new service. Technological neutrality is explicitly included in the telecommunications law in Argentina, El Salvador, Nicaragua, Uruguay and Mexico, even though in is not always implemented. Property rights over the spectrum are authorized only in Guatemala, while in the other countries in this study it is considered property of the nation and can only be leased.

In Latin America most governments have allocated a relatively small amount of spectrum compared to countries such as the U.S or European countries. The average amount of assigned cellular spectrum in the region is 102 MHz, considerable lower than the average in the European Union of 266 MHz. Graph 11 shows how the assigned spectrum in the largest Latin American economies is quite lower than European countries

Graph 11: GDP per capita vs. MHz



Source: Hazlett and Muñoz (2006)

It is difficult to identify clear associations between spectrum allocation and penetration. One would expect to find a greater penetration in countries that allocate more spectrum and this does not appear to be the case. For example, according to the data provided in Table 7, Ecuador and Venezuela allocate

fewer spectrums than Peru but both countries have almost twice as much mobile penetration than Peru.

However, it is possible to identify some trends. The greater liberalization in the allocation of the spectrum and a more flexible use are probably an explanation for less market concentration in Guatemala, El Salvador Chile, Brazil and Argentina. But less market concentration does not necessarily lead to more penetration. In countries such as Mexico, Ecuador and Colombia, where there is more market concentration, mobile penetration has increased significantly.

Table 8: **Penetration, spectrum allocation and market concentration**

Country	Penetration	Spectrum	HHI	Subscribers (Thousands)	Subs/MHz (Thousands)
Argentina	57.27	120*	3232	25000	208.33
Brazil	46.25	110*	2388	92000	836.36
Chile	67.79	170.0	3801	12000	70.59
El Salvador	35.05	137.87*	2965	2500	18.25
Ecuador	47.22	80*	5267	8000	100.00
Guatemala	25.02	140*	3600	5000	35.71
Mexico	44.34	155.0	6148	51000	329.03
Peru	19.96	130.3	4891	7000	53.72
Venezuela	46.71	101.8	3767	16000	157.17

Source: Telecom CIDE based on regulators´ web pages, companies´ web pages and Hazlett and Muñoz (2006)

6. Future lines of research

This document offered an exploratory view of the market structure in the mobile market in Latin America. Given the importance of mobile services as a mean of access to low income groups, the objective in this paper was to identify the impact that the consolidation of two firms in the region has had on mobile penetration as a piece of background research which will inform the Regional Dialogue on the Information Society (DIRSI) larger project on the mobile sector in Latin America. Following this line of inquiry this paper investigated the links between variables associated to market concentration and known to influence mobile penetration such as pricing and spectrum allocation.

The findings were mixed. The first finding is that market concentration differs significantly across the countries. Even though both Telefónica and América Móvil have consolidated their position in Latin America and are today the only

significant players at the regional level, the number of firms in each market vary in each country[7]. However, as measured by the IHH, it is possible to observe an increasing concentration in most countries.

At this exploratory phase, the implications of this concentration are not clear. This study did not find an association between more spectrum allocation and neither concentration nor penetration. There are opposing cases such as Brazil and Mexico that have quite different levels of concentration and almost the same penetration.

What is clear from this exploratory analysis is that pricing strategies had a very significant impact over penetration. CCP and prepaid mechanisms led to a significant increase in mobile access to important segments of the population. We observe that the introduction of both pricing strategies in Latin American countries led to the increase in penetration even in the absence of spectrum auctions. This study also identified the decrease in ARPUS during recent years. This trend points to the possible existence of an oligopolistic competition between the firms that are fighting for regional positioning rather than colluding. It also may be an indication of a business strategy that, after saturating the top end of the market, is now targeting the bottom of the pyramid where ARPUS may be lower. In this respect, the Regulatel Telecommunications Gaps Model recently published a document that measures the relative costs and potential revenues associated with bringing service access to unserved populations, and thereby determine the relative economic attractiveness, or constraints, to investment in expanding services into those areas.

There are a number of knowledge gaps further research needs to consider. The preliminary findings in this study did not find an association between market concentration and mobile growth. This study suggests that pricing strategies have been the most significant determinant of growth. These results must be strengthening by further investigation into the possible impacts of market

[7] The other relevant player, TIM, is in the process of selling its assets in Latin America.

concentration. Other variables that may be influenced by market concentration or influence it and that were not analysed in this document are:

- Prices and affordability, interconnection, roaming charges.
- Elasticity of demand, household expenditure survey data.
- Cost structure.
- Asymmetric access to information, knowledge of customer bases.
- Ability to dominate regulators (there is no regional level regulatory entity, e.g. corresponding to the EU level).

On the other hand, the specific market concentration that the region is experiencing, that is, a duopolistic competition with regional operators may provide opportunities to business models that address the bottom of the pyramid segment of the market. With ARPUs diminishing in the mobile regional market we need to investigate new business strategies. It is important to evaluate through interviews with corporate actors alternative market models, as well as new strategies for increasing ARPU and/or new forms of revenue. With technological change and new next generation network opportunities, market actors may move towards new revenue models.

Moreover, these new business models may provide opportunities to address the bottom of the pyramid users. Research into these opportunities must include the identification of common projects in the region. At the regional level there are clear "universal" issues in terms of communication needs that may require solutions that are not available at a low enough price or in scale. While each national project may have a small market, if one aggregates the demand, from all the regional projects the business opportunity may be interesting. Common projects may provide scale. At a more applicable research level DIRSI may identify corporate partners that can provide low cost solutions to these projects. This line of research should also identify "best practice" solutions to delivering these solutions to the bottom of the pyramid.

This knowledge gaps in terms of empirical research on mobile services is large. The gap is even more significant on the demand side. We know very little on the consumption patterns of mobile users. To address these gaps large - scale field

studies are a significant source of empirical data but experimental research may be useful in identifying determinants variables and testing competing hypotheses.

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