



## Spectrum allocation in Latin America: An economic analysis

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### ABSTRACT

As elsewhere, wireless markets play a crucial role in Latin American economic growth. Mobile telephone networks increasingly provide the communications infrastructure that has largely been lacking throughout the region. Yet, governments have generally made only modest allocations of bandwidth available to Latin American wireless operators, either absolutely (in terms of spectrum each country could allocate at modest opportunity cost) or relative to countries in North America, Asia and the European Union. Using an empirical model estimated on mobile phone data for international markets, we show that very large social benefits are available to countries that make more spectrum available for mobile phone markets. We conduct simulations using our calibrated model to provide lower bounds for country-by-country gains from larger allocations. We also discuss the impact of alternative regulatory regimes on the feasibility to achieve those social gains.

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### 1. Introduction

Wireless services are growing rapidly. In Latin America, as in other developing markets, mobile phone networks are supplying valuable social overhead capital (SOC), stimulating economic growth. Waverman et al. (2005, p. 18), studying African economies, find that “[d]ifferences in the penetration and diffusion of mobile telephony certainly appear to explain some of the differences in growth rates between developing countries... there are also increasing returns to the endowment of telecoms capital (as measured by the telecoms penetration rate)... Our analysis suggests the need for regulatory policies that favour competition and encourage the speediest rollout of mobile telephony.” This conclusion builds on the widespread view that tele-

communications networks are key components of SOC (Hardy, 1980; Leff, 1984; Norton, 1992; Greenstein and Spiller, 1996), and recent studies showing that wireless technologies are strong drivers of developing country growth.<sup>1</sup>

Yet, spectrum policies in Latin America are, on the whole, extremely conservative. This appraisal reflects both the structure of regulation, and the quantitative outcome. On average, by 2003 Latin American countries allocated only about 100 MHz to mobile phone carriers’ licenses, compared with a mean of about 266 MHz in the European Union.<sup>2</sup> Some of the differential is attributable to demand differences, but controlling for those factors we still find a statistically significant restriction on valuable bandwidth imposed across both sets of markets. Given substantial

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<sup>1</sup> See for example: Dasgupta et al. (2001), Waverman et al. (2005), UN (2004) and Annan (2005).

<sup>2</sup> For the sources, see Table 1 below for Latin America and Appendix 1 for the European Union.

amounts of unutilized bandwidth, the opportunity costs of more generous cellular allocations are typically quite modest.

Two Latin American countries, Guatemala and El Salvador, liberalized their spectrum regimes via far-reaching legislative measures enacted in 1996 and 1997, respectively. Wireless markets in both countries appear relatively robust, exhibiting high degrees of competitiveness, as measured by industry concentration and retail prices. Other Latin American countries, while not undertaking such ambitious reforms, have initiated policies that distinguish their wireless markets. These include Argentina, Chile, Nicaragua and Paraguay. The experience of these nations may inform policy makers as to what might be achieved, and offers data for public choice scholars wishing to explain the divergence in regulatory regimes – a pursuit we do not undertake herein.

The primary task of this paper is to evaluate the Latin American spectrum policies now in place, an analysis we divide into four parts (Sections 2–5). First, in Section 2, we provide a diagnostic analysis revealing the primary spectrum under-allocation problem confronting Latin American mobile services markets. We also define alternative regulatory regimes, providing a taxonomy for reform measures that alter bandwidth allocations by traditional administrative actions versus policy liberalization granting wireless rights-holders greater scope for accessing and utilizing airwaves. In Section 3 we then present a model that tracks the relationship between spectrum policies and retail mobile market results (prices and outputs), empirically calibrating the model using a panel consisting of 28 countries for the period 1Q1999–2Q2003. These estimates are then, in Section 4, used in simulations that forecast the social value of enhanced spectrum allocations for mobile phone service in six of the largest Latin American nations. We find that, in response to an increase of 20 MHz, the average change in consumer surplus in our sample is approximately US\$50 per capita. This magnitude is over 10 times the average marginal revenue in regional countries employing wireless license auctions (on a per capita per MHz basis), suggesting that the social gains are of very substantial magnitude, and accrue overwhelmingly to consumers' surplus rather than to mobile operator profits.

In Section 5 we consider the prospects for achieving such welfare gains under alternative regulatory structures. The gains described above could be realized via policies instituted by fiat under the administrative allocation systems now in place. Alternatively, statutory reforms may eliminate regulatory discretion, forcing a regime shift. We also explain that the important link between a liberalization of licensee property rights (granting greater degrees of freedom in utilizing allocated bandwidth) and the expansion of spectrum allocations (increasing the bandwidth allocated for use by mobile operators). We then offer a brief conclusion.

## 2. Wireless markets in Latin America: a diagnosis

Spectrum allocation policies in Latin America are usefully evaluated with respect to the market for mobile

phone services.<sup>3</sup> First, this application constitutes the dominant spectrum-based service in terms of service revenues. Second, the next most economically important industry, radio and television broadcasting, is intensely political and is subject to its own idiosyncratic analysis.<sup>4</sup> Third, mobile telephony plays a vital role in economic development, providing basic telecommunications infrastructure for most residents and businesses. And fourth, this industry is broadly studied by investors, yielding data and opening the way for empirical estimates of the social value of policy reforms.<sup>5</sup>

The average amount of spectrum allocated to cellular service in Latin American countries (equally weighted) is 102 MHz (see Table 1), well below the average in the European Union of 266 MHz. We consider two possible reasons for this gap.

- (1) *A market hypothesis:* In Latin America the demand for mobile services does not justify a higher allocation. The lower amount of spectrum would optimize resource use were marginal frequencies more productively deployed elsewhere.
- (2) *A regulatory hypothesis:* Regulatory authorities in the region have inefficiently constrained spectrum access, over-conserving bandwidth. This would suggest non-market failure.

Fig. 1 illustrates the situation for a sampling of countries included in quarterly mobile phone market data published by Merrill Lynch (2003).<sup>6</sup> This global dataset includes six Latin American countries: Argentina, Chile, Brazil, Mexico, Venezuela and Colombia. As can be seen, all six countries allocate substantially less spectrum to mobile telephony than what is predicted by their per capita national income.<sup>7</sup> This L.A. sub-sample features the largest economies in the region, and we note that most of the remaining countries have even more parsimonious spectrum allotments.

The quantity of spectrum allocated to wireless phone service is presumably a function of other factors in addition to GDP per capita, and countries throughout Latin America should be included in the analysis if we are attempting to provide a regional perspective. For this broader statistical inquiry, we generate a new database, adding all non-Caribbean Latin American countries not appearing in Merrill Lynch (2003). Data for the additional

<sup>3</sup> This paper uses the terms “wireless telephone,” “mobile telephone,” and “cellular” interchangeably.

<sup>4</sup> The politics of broadcast regulation have figured prominently in explaining the spectrum allocation regime in the US and other countries, but the emerging dominance of cellular in the 1980s and 1990s fundamentally shifted this paradigm. See Hazlett (1998) and Hazlett (2001).

<sup>5</sup> For example, Hazlett et al. (2006) study the transition to digital TV in Europe. Using estimates from the mobile phone market, they provide a lower bound for the social value of TV band spectrum.

<sup>6</sup> The Merrill Lynch database consists of a quarterly panel with 46 countries, first quarter 1999 through the second quarter 2003. A subsample of 29 countries was used given that these were markets for which spectrum allocation data were available.

<sup>7</sup> We use a simple linear model in this diagnostic because we are focusing on the relationship between spectrum allocations for mobile telephony (in MHz) and per capita income.

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