# Economic Benefits of the Digital Dividend for Latin America

# PREFACE

*The Digital Dividend is, without any doubt, a central component of the future development and scope of the Information Society around the world. It embodies a critical resource for the democratization of Internet broadband access. While this topic concerns governments with regards to the policies regulating telecommunications and broadcasting, civil society needs to participate as well in the debate on how to meet its communication needs and what the most appropriate use of national resources, such as the frequency spectrum, is.*

*The frequency spectrum that represents the Digital Dividend in Latin America is the result of technological progress of ICT (Information and Communication Technologies). It has significant propagation advantages that will allow expanding the present coverage of broadband services, reaching population that is not currently connected to the Internet, thereby reducing the "digital divide." However, to be able to use this portion of the spectrum to enlarge broadband coverage a change of paradigm is needed, that means basic change of the status quo of its current use. Given the criticality of such a change that will influence the future social and economic development of our countries, we believe in the need to gain access to the best possible tools in order to make public policy decisions that maximize the potential benefits to society.*

*This is why we have commissioned a study to Telecom Advisory Services, LLC to deepen the analysis of empirical data that will help us understand the quantitative and qualitative impact of alternative usage scenarios of the Dividend Digital in some key Latin American countries. While several studies of this nature have already been conducted, this is the first one focused on countries of our region, relying on a methodology adapted to our context and generating forecast and estimations based on all the information available at this time. This study represents an important challenge we have decided to tackle in order to contribute to the much needed debate about the future of information and Internet access in our region. We believe that it is critical not to shy away from making decisions on the matter of what the best use of the Digital Dividend is. Delaying or underutilizing the use of a productive resource such us the radio spectrum that can promote individual and social development should definitely not be a policy option.*

*September 22, 2011*

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# EXECUTIVE SUMMARY

The purpose of this study[1] is to provide decision makers in Latin American countries with a quantitative and qualitative estimation of the social and economic benefits of a prospective allocation of the "Digital Dividend" spectrum for the provision of mobile broadband services. The "Digital Dividend" is defined at the upper segment of the UHF band - "700 MHz" in the Latin American region - currently allocated to broadcasting services in most countries. As result of the transition of analog to digital television, this spectrum is being vacated, and could be reassigned to offer mobile broadband services in underserved areas. This would allow the provisioning of increased capacity to wireless services in order to meet the growth of data traffic, while increasing broadband coverage. This study is based on a detailed analysis of five countries in the Latin American region (Argentina, Brazil, Colombia, Mexico, and Peru), from which results for the rest of the continent are extrapolated[2].

## The Growth of Data Traffic in Latin America

Data traffic in Latin America is increasing significantly, partly driven by the introduction of mobile broadband services. This creates the need to gain access to more spectrum. Mobile telecommunications in the region have achieved massive adoption levels. Average penetration of wireless services in Latin America has reached 97.8% in 1Q01, which represents a level comparable to that of mature countries. Based on current penetration, the historical trend, and a conservative estimation of expected saturation levels, we estimate wireless telecommunications to reach an average penetration of 117% in 2015, and 130% in 2020[3].

In parallel with the diffusion of wireless telecommunications, operators in Latin America have been migrating their networks from second (2G) to third (3G) generation; some providers are already testing fourth generation networks[4]. In fact, in the course of 2012, the launch of 4G networks, based primarily on the LTE (Long Term Evolution) standard, will begin[5]. The migration to 3G technology represents a significant trend, since the devices that operate in standards such as HSPA (High Speed Packet Access) are better suited economically to offer a more efficient broadband access to the Internet than fixed broadband. As such, this technology represents an economic and technological response to market needs still constrained by the relatively high computer acquisition costs and the limits in fixed broadband deployment. The response to the need to gain access to the Internet, combined with a more efficient use of the frequency spectrum, will result in the migration of most subscribers in Latin America to 3G platforms in the course of the next ten years. According to our forecast of device substitution, by 2015 46.2% of Latin American subscribers will be using either 3G or 4G devices. In some countries, driven by the significant increase of subscribers relying first on HSPA, and later on LTE, a large part of the installed base will be either 3G or 4G. For example, we estimate that by 2020, 87% of the installed base of wireless devices in Argentina, 73% in Mexico and 76% in Brazil will be 3G or 4G devices.

The migration to 3G devices subsumes a second important trend: the adoption of smartphones. These devices are more developed functionally than feature phones in terms of both their user interface and screen formats. Therefore, since they are more suited to gain broadband access to the Internet than

1. This study was commissioned by a consortium formed by the GSM Association (GSMA), AHCIET (Asociación Iberoamericana de Centros de Investigación y Empresas de Telecomunicaciones), Telefónica, América Móvil, Telecom Italia, Qualcomm, and Intel.

2. The countries considered for extrapolating results include Bolivia, Chile, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Paraguay, Dominican Republic, Uruguay and Venezuela.

3. We estimate, conservatively that in 2015 wireless penetration will reach 150% in Argentina, 141% in Brazil, 100% in Colombia, 95% in Mexico, and 105% in Peru.

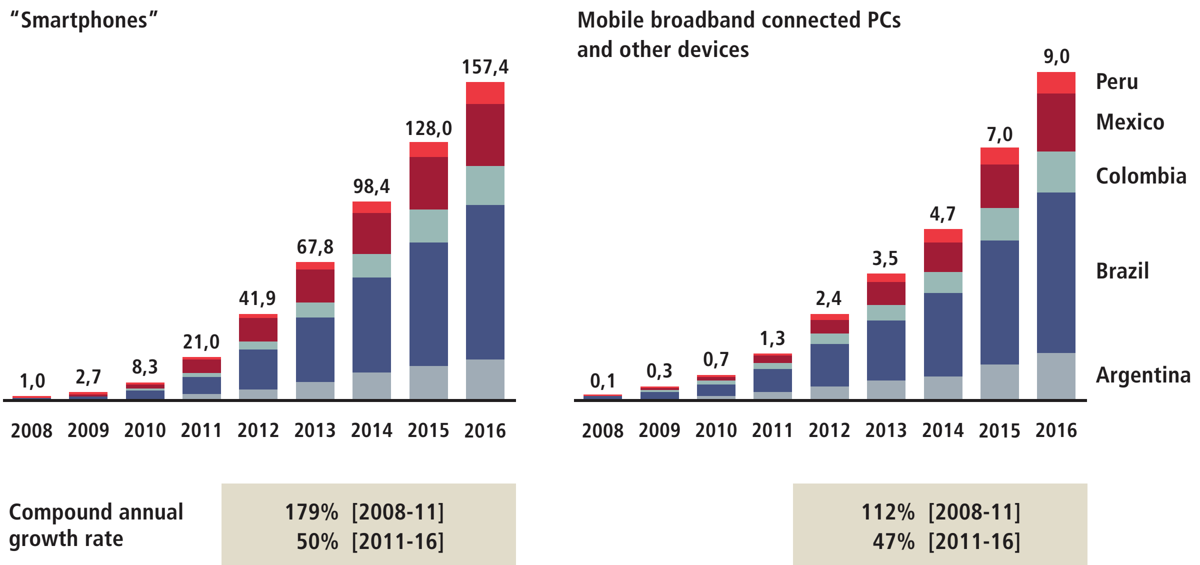
4. ITU Press Release, December 6th, 2010. "…..Following a detailed evaluation against stringent technical and operational criteria, ITU has determined that "LTE-Advanced" and "Wireless MAN-Advanced" should be accorded the official designation of IMT-Advanced. As the most advanced technologies currently defined for global wireless mobile broadband communications, IMT-Advanced is considered as "4G", although it is recognized that this term, while undefined, may also be applied to the forerunners of these technologies, LTE and WiMax, and to other evolved 3G technologies providing a substantial level of improvement in performance and capabilities with respect to the initial third generation systems now deployed…"

5. In the second half of 2011, UNE (Empresa Publica de Medellín) in Colombia will be deploying LTE services in three cities. In 2012, ENTEL Chile will launch LTE services, which will be followed by Movistar (Telefónica) in Chile and Argentina, as well as Claro (AMX) in Chile.

conventional phones, smartphone subscribers tend to be heavy broadband users. While the smartphone installed base in Argentina, Brazil, Colombia, Mexico, and Peru currently amounts to approximately 20.9 million (or 4.5% of the total base), we estimate that it will grow at a compound annual growth rate of 50%, reaching 157 million by 2016 (or 28% of the installed base of that year). It is estimated, however, that a significant share of the smartphone installed base will be substituted by tablets, although given the embryonic penetration of these devices in the region, it is difficult to estimate accurately this percentage[6].

In addition to the growing diffusion of smartphones, the increasing number of personal computers connected to the Internet through mobile broadband peripherals (USB, air-cards, and dongles) should be considered. During 2011, the total number of personal computers connected to mobile broadband will reach 1.3 million in the five countries studied in detail (which amounts to 1.5% of the installed base). However, these peripherals are growing at a rate of 47%, which will result in an installed base of 9 million units in 2016 (see figure A).

## FIGURE A. Installed base of devices generating heavy data traffic (in millions)




Source: TAS analysis

The trends mentioned above, combined with deployment of "machine to machine" connections (what is labeled the "Internet of things"), result in a sizable growth of data traffic that has to be transported through mobile networks. Thus, while monthly mobile data traffic in the five countries under study was 362 terabytes in 2008, it reached 11,906 terabytes in 2011, and is projected to reach 180,214 terabytes in 2016, which implies a compound annual growth rate of 117%[7]. This growth rate results in a growing demand for wireless network capacity. If nothing is done to meet this requirement by assigning additional frequency spectrum, the networks risk of becoming saturated, with the consequent service degradation and an increase in operating costs.

6. It is important to consider this future trend since in mature countries a tablet user generates an average monthly traffic of 405 Mbps, compared to 79 Mbps for smarthpone subscribers. It is also estimated that in the future, tablet-generated traffic will grow at 122% (Source: Cisco. Visual Networking Index; Global Mobile Data Traffic Forecast Update, 2010-2015).

7. This calculation is consistent with the estimates of Cisco, which projects a rate of mobile data growth in Latin America of 111% between 2010 and 2015 (See Cisco Visual Networking Index). Similarly, IDATE estimates in its report to the UMTS Forum that worldwide growth of mobile data traffic between 2010 and 2015 will be 94%.

## Frequency Spectrum Needs to Support the Growth in Mobile Data Traffic

In order to respond to the increasing needs for network capacity, the mobile telecommunications industry needs to gain access to additional frequency spectrum[8]. In this context, the World Radio Communications Conference 2007 (WRC-07) of the International Telecommunication Union (ITU) recommended the reallocation of the 698 – 806 MHz ("700 MHz") band for IMT (International Mobile Telecommunications) in Region 2 (Americas). The benefits of such a move are not only to provide a more efficient way to handle data traffic, but also, given the propagation characteristics of signals in the 700 MHz band, allocating this spectrum to mobile broadband will allow to deploy broadband service in rural areas of the continent, with the resulting positive social impact. In addition, the 700 MHz band will improve indoor signal reception in urban areas.

With the exception of a few countries in Latin America, the 700 MHz band is, typically, under-utilized. For example, in Argentina the band has very limited use. Until recently, broadcasting licenses had been provisionally assigned by the regulatory agency for use in encoded TV service. None of them were national in scope and all of them had limited development (approximately 30,000 clients). However, in July 2011, following a resolution by AFSCA[9], channels above 52 (in the 700 MHz band) were licensed to 15 universities in the Buenos Aires region. In Brazil, the band is relatively more utilized than in the rest of the region. The band above 746 MHz is used by low power repeaters and is reserved to be licensed to public television channels. In Colombia, the band is relatively occupied by six national, seven regional, and 48 local licenses. Mexico has 20 signals in this band (19 free broadcasting television channels and one paid), most of them in border towns[10]. Finally, in Peru, the band is marginally utilized. This situation allows for the spectrum to be reassigned in the short term without waiting for the complete migration to digital television.

The Radio Communications Rules of the International Telecommunication Union envision the primary allocation of the 700 MHz band in Region 2 to promote the development of broadband services. Accordingly, several countries in Latin America have already adapted their national frequency plans. Furthermore, some governments have already begun taking the first practical steps aimed at the reallocation of this band. For example, the Peruvian Executive has established a 12 month lapse to relocate broadcasting services operating in the 700 MHz band; a public consultation to that effect has already been completed[11]. Similarly, in Uruguay a presidential decree signed in June 2011 ordered the 700 MHz band to be vacated by any broadcasting signals in order to be utilized by international mobile telecommunications services, while the 638-698 MHz sub-band would be utilized to offer national digital television services. In Colombia, the Ministry of Information and Communication Technologies announced that the Digital Dividend in the 700 MHz band will be assigned in 2013 . Similarly, in Mexico, following the recommendations of the ITU, COFETEL (Comisión Federal de Telecomunicaciones), the regulatory agency, is intended to reassign the 700 MHz for[12] telecommunications services, having concluded the first public consultation to that effect in December 2010[13]. In Argentina, the Presidential Decree 1552/10 which creates the National Telecommunications Plan "Argentina Conectada", established, as a priority, "to plan the use of the Digital Dividend spectrum freed by the migration to digital television." In Brazil, ANATEL, the regulatory agency, is considering that the potential reallocation of the 700 MHz band will occur at the completion of the transition to digital television, to be achieved by 2016. Access to mobile broadband is a priority for the Brazilian government, as stated by the Executive Branch in the National Broadband Plan. This could ease the consideration of using a portion of the 700 MHz band before the completion of the digital transition. Finally, it is important to consider the work conducted by the Inter-American Commission of Telecommunications (CITEL), which has "established an ad-hoc group to study the Digital Dividend spectrum resulting from the transition to digital television and the opportunities to launch converging applications."[14]

In support of the decision-making process conducted in the region, this study evaluates two potential allocation options of the 700 MHz band that would create the larger economic and social benefit. Considering the availability of the 700 MHz band currently used for broadcasting services, the study estimates the social and economic benefits of two alternative scenarios: 1) assigning the 700 MHz band to mobile services for deployment of mobile broadband, or 2) using the band by broadcast television, maintaining the status quo.

8. The CITEL (Comisión Interamericana de Telecomunicaciones) estimates that Latin American mobile operators will require additional 712 MHz of spectrum in low demand areas and 1,161 MHz in high demand areas by 2020 CCPII/Rec.70 - XXII-02).

9. Autoridad Federal de Servicios de Comunicación Audiovisual (AFSCA), previously called Comisión Federal de Radiodifusión (COMFER).

10. Additionally, eight signals are planned but not in service as of now (Source: COFETEL, Dirección General de Radio y Televisión).

11. See Supreme Decree 015-2011-MTC, which modifies article 28 of the General Rule of the Telecommunications Law (http://www.osiptel.gob.pe/WebSiteAjax/WebFormGeneral/sector/VerLegislacionTeleco.aspx)

12. "Ministerio TIC abrirá proceso de asignación de espectro para servicios de 4G en el cuarto trimestre del 2011" June 16, 2011.

13. On September 2, 2010 the Decreto por el que "se establecen las acciones que deberán llevarse a cabo por la Administración Pública Federal para concretar la transición a la Televisión Digital Terrestre, was published, resulting in accelerating the original transition plan. The transition, which began in 2004, will have to cease the broadcasting on analog signals by December, 31, 2015. This decree is being questioned not only by interested companies but also by Congress.

14. Consultative Permanent Committee II: Radio communications including Broadcasting, Resolution CCP.II/RES. 70 (XVI-10), diciembre 2010.

The assessment of alternative scenarios proceeds along three dimensions: economic contribution to the Information and Communication Technologies (ICT) ecosystem, the public economic benefit, and the social impact. In the first dimension, we compared the additional economic benefit to be generated to the providers of the telecommunications industry (network equipment, construction industry, information systems, etc.) and the television industry (program production, construction industry, etc.). In addition, we considered the potential benefits to the public treasury as a result of the licensing of spectrum to private sector firms. Finally, the study estimated the savings to be generated if additional broadband coverage in unserved areas were to be achieved through the use of the 700 MHz band, which has a better signal propagation. Similarly, we estimated the additional broadband coverage to be reached with the 700 MHz spectrum that would otherwise not be achieved if using of higher bands[15]. Based on these analyses, the study calculates the producer surplus to be generated as a result of a change in the allocation of spectrum, assuming that a portion of it will be transferred to retail prices, thereby benefiting end users.

In the second module, the study evaluates the social and economic impact of each scenario in terms of its direct contribution to the Gross Domestic Product (GDP), as a result of the offer of additional goods and services enabled by the 700 MHz spectrum, as well as the spillover effects and positive externalities generated in other sectors of the economy. In addition, we calculated the creation of direct and indirect employment, the contribution to additional taxes and the creation of consumer surplus. In the third module the study evaluates the social benefits (for example, financial inclusion, e-health service delivery, and education) derived from each spectrum allocation scenario. The study results are reviewed in the following sections.

## Economic Impact of Allocating the 700 MHz Band to Mobile Broadband

In the first place, the results of the analysis focusing on the contribution to the ICT ecosystem show an important difference between scenarios in terms of value to be generated from the acquisition of goods and services. If the Digital Dividend were to be used to provide to mobile broadband, it would contribute between US $8.3[16] and US $10.82 billion in the five countries studied in detail ; for the rest of Latin America, the value would be between US $3.36 and US $3.99 billion. The range is driven by the portion of the spectrum to be licensed in case it were to be assigned to mobile broadband. If the typical licensed in the five countries studied in detail were of 60 MHz, the estima[17]ted proceeds would reach US $5.04 billion, while if 90 MHz were licensed, the amount would reach US $7.56 billion . For the rest of Latin America, the spectrum to be licensed could generate between US $1.26 and US $1.89 billion. This estimation was made using, as a starting point, the prices observed in licensing processes conducted until now in Europe and the United States, as well as the latest ones held in Latin America. It is important to mention, however, that these values can change substantially as a function of the licensing approach to be followed, the specific market conditions at the time of occurrence, and, especially, the licensing conditions, such as coverage, deployment timeline, minimum investment, and other obligations and restrictions. The rest of the value to be generated comprises investment in infrastructure acquisition, operational services, and commercial services (see figure B).

Beyond the contribution to the ICT ecosystem, the cost-benefit of allocating spectrum to mobile broadband is apparent in other areas. First, the utilization of the 700 MHz band allows the increase of speed of deployment of broadband services. If this band were not available for mobile broadband services, the deployment of 4G technology would have to be achieved using higher spectrum bands (1,900MHz, 1,700/2,100 MHz, 1,900/2,100 MHz, 2,500 MHz), which will require a larger number of radio base stations. Conversely, a smaller number of sites would also result in lower operations and maintenance expenses. Finally, a smaller number of sites would reduce the level of potential conflict due to the location of towers and antennas.

As a corollary, the use of the 700 MHz for mobile broadband allows a larger coverage of the territory. In fact, signal propagation in 700 MHz allows for a 10 [18]kilometer radius (or higher), compared to 5 kms in other bands . Therefore, the fundamental value of the reallocation of the 700 MHz spectrum is embodied in the possibility of significantly increasing profitably in the deployment of mobile broadband, promoting a more suitable technology to foster adoption. The coverage of mobile broadband, which today reaches 75% in Argentina and Brazil, 52% in Colombia and 65% in Peru, could increase significantly, helping to close the digital divide (see figure C).

15. Obviously, the extension of service coverage would also be possible with higher bands; however, due to lower signal propagation, this would require an increase in the number of radio base stations, which would render the investment uneconomical.

16. This amount is estimated as a one-time payment. Other payments would have to be made annually for spectrum usage.

17. This sum does not include regular payments for the use of spectrum such as Frequency Levies (Argentina), payment of duties (Mexico), and municipal taxes.

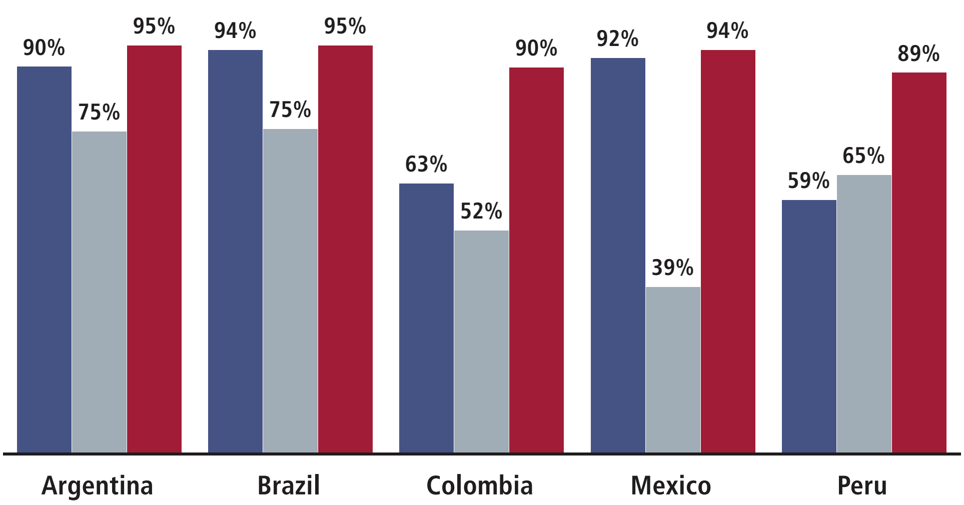
18. Source: FCC, "The broadband availability gap", OBI Technical Paper No.1, April 2010.

## FIGURE B. Impact on the production chain of the mobile industry (in million US $)

| | Spectrum acquisition | Acquisition of production goods | Acquisition of operational services | Acquisition of commercial services |
|---|---|---|---|---|
| | • In vestment for the acquisition of spectrum in either auction or contest | • Sites<br>• Access equipment<br>• Backbone<br>• Systems (OSS)<br>• Civil engineering | • Mantenance and repairs<br>• Distribution<br>• Logistics<br>• Other services | • Applications<br>• Advertising<br>• Commercial systems integration (CRM, billing, etc.) |
| **Argentina** | 474 - 711 | 445 | 11 | 13 |
| **Brazil** | 2,676 - 4,014 | 1,440 | 53 | 61 |
| **Colombia** | 366 - 548 | 313 | 16 | 19 |
| **Mexico** | 1,330 - 1,995 | 453 | 24 | 29 |
| **Peru** | 196 - 293 | 366 | 5 | 6 |
| **Rest of Latam** | 1,259 - 1,888 | 1,867 | 194 | 44 |
| **Total** | **6,301 - 9,449** | **4,884** | **303** | **172** |

Source: TAS analysis

## FIGURE C. Additional mobile broadband coverage achievable with the 700 MHz band




Fixed broadband coverage
Current mobile broadband coverage [3G]
Estimated mobile broadband coverage with 700 MHz band

Source: TAS analysis

Thus, mobile broadband coverage with the use of the 700 MHz band would reach an estimated total of 92.7% of the population of Latin America, increasing the reach of networks by 31.5 percentage points. With an average broadband penetration of 6.8% in the continent, the additional mobile broadband coverage would result in a significant increase in broadband adoption, which is a fundamental public policy objective of the majority of governments in the region.

Additionally, the use of the 700 MHz band for mobile services will allow covering approximately 20.1 million people (or 4.8% of the population) in Latin America living today in isolated areas, which today do not have access to mobile telephony[19]. This would be achieved with savings of more than US $3.7 billion[20] in the deployment of new networks, of which US $2.28 billion (or US $3.69 billion in nominal value over 8 years) represent less investment and US $1.42 billion comprise lower operations costs. For the rest of the region beyond the five countries studied in detail, savings in capital investment and operations would reach US $1.74 billion. This is the Digital Dividend value form the perspective of infrastructure deployment.

Alternatively, if the spectrum remained licensed to broadcasting services for the transmission of television signals, it would contribute US $2.69 billion in the five countries under study and US $823 million in the rest of the region (see figure D). It is important to mention that this estimate does not include contributions for spectrum licensing, given that it remains difficult to establish a firm value due to the limited experience in licensing of this type[21].

As the estimates indicate, one of the largest contributions to the broadcasting ecosystem is the acquisition of programming services to generate content to be distributed through the new local signals to be launched in case the spectrum remained licensed to the television industry. It is important to emphasize that this amount can vary substantially depending on the type of content that is being transmitted. For example, the development of original content with state-of-the-art production resources results in high costs, while basic programming (such as newscast, acquisition of syndicated programming like documentaries, soap operas, films, or other content available internationally) would result in significantly lower costs. In the study, we have considered acquisition of basic programming costs, amounting to monthly US $1 million per signal.

## FIGURE D. Impact on the production chain of the broadcasting industry (in million US $)

| | Spectrum acquisition | Acquisition of production goods | Acquisition of operational services | Acquisition of commercial services |
|---|---|---|---|---|
| | • Investment for the acquisition of spectrum at auction or contest | • Sites<br>• Transmission equipment<br>• Repeters<br>• Civil engineering | • Maintenance and repair<br>• Distribution<br>• Energy | • Programming (acquisition and production)<br>• Billing |
| **Argentina** | 0 | 93 | 13 | 180 |
| **Brazil** | • There is little experience in broadcasting spectrum auctioning<br>• Value is dependent on mode of assignment | 833 | 120 | 540 |
| **Colombia** | | 63 | 9 | 126 |
| **Mexico** | | 135 | 20 | 270 |
| **Peru** | | 90 | 13 | 180 |
| **Rest of Latam** | | 334 | 48 | 414 |
| **Total** | 0 | 1,548 | 223 | 1,737 |

Source: TAS analysis

19. The additional coverage would be approximately 1% in Argentina, 4% in Brazil, 6.4% in Colombia, 7% in Mexico, and 4.5% in Peru. These values refer to the deployment of all standard types. As mentioned above, in order to reach massive mobile broadband coverage, the coverage targets are higher given that these figures include 2G technology.
20. Amount calculated as the Net Present Value discounted at 10%, between 2012 and 2020.
21. A potential scenario could be that, given the prior assignments, the licenses would be assigned without charge. Only the recurring charges for spectrum use would apply in this case (although for comparative purposes with the prior scenario, these were not included).

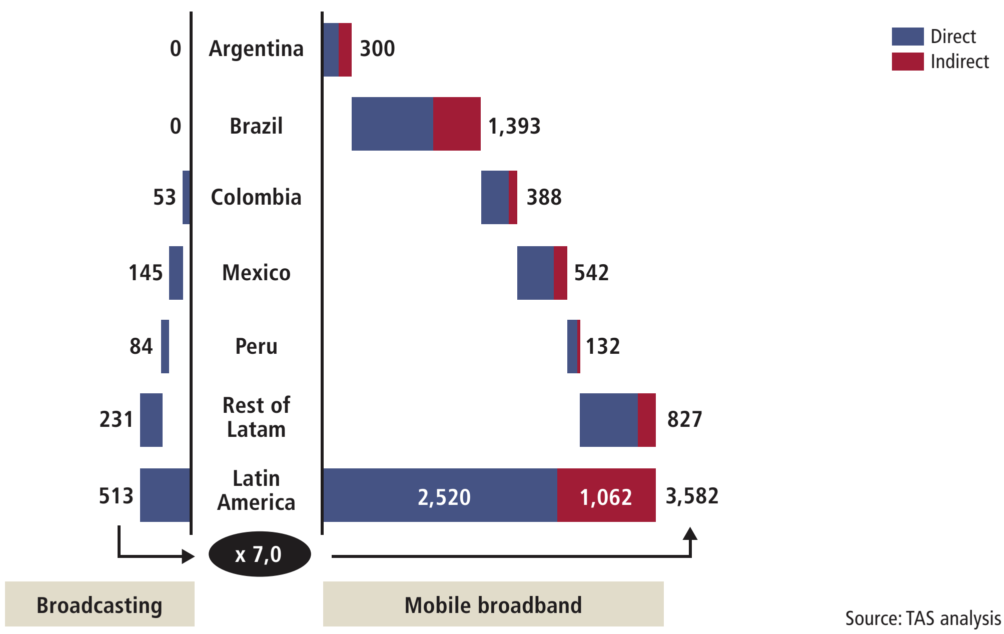
When it comes to evaluating the economic and social impact, the results again favor the allocation of spectrum to mobile broadband. First, the utilization of the 700 MHz band to offer mobile broadband services contributes directly and indirectly to the GDP seven times more than broadcasting. In the case of the direct contribution, the study estimates the amount generated by offering additional products and services to be introduced as a result of gaining access to the 700 MHz band. This amount comprises additional mobile broadband adoption resulting from a reduction of prices of 10% (a transfer of a portion of the savings mentioned above), assuming a demand elasticity of 0.6 (in areas already covered). In addition, it considers new subscribers to be gained in new areas to be covered as a result of gaining access to the 700 MHz band. In the case of television, the additional revenues are based on the sale of advertising by the new signals to be broadcast under channel 51 as well as the subscription paid for premium signals[22]. It is important to mention, however, that given that in most cases the spectrum in the broadcasting case would be used by public television, the contribution in terms of subscription would in some countries be nil.

In the case of the indirect contribution of mobile broadband to the GDP, the study estimates the externalities (or spillover effects on other sectors of the economy); conservatively, we have considered only the economic impact derived from additional mobile broadband connections resulting from the use of the 700 MHz band. This is estimated to reach US $1.06 billion in Latin America. Figure E compares the cumulative results for both allocation scenarios.

As shown in figure E, using the 700 MHz band to provide mobile broadband services would contribute seven times more to the GDP than broadcasting.

Secondly, by assigning the 700 MHz band to the development of mobile broadband, the industry could contribute significantly more than broadcasting to job creation. In the case of direct employment (which includes the employees of the telecommunications service providers, as well as those selling services to the carriers) to be created by each industry, broadcasting tends to generate a higher number of jobs: 3,870 compared to 3,000 for the mobile telecommunications industry. This is because in the case of broadcasting, the key variable driving new employment is the number of digital television signals to be deployed, which multiplies by a constant the number of employees required by signal (between 60 and 70 depending on the country). In the mobile telecommunications industry, the key variable in direct job creation is the number of additional subscribers resulting from a larger coverage of the territory and the decline in prices. In this case, given the important economies of scale of the mobile telecommunications industry and the fact that the service providers in most countries in the region are operating at optimal levels, the marginal increase of employees as a result of additional mobile subscribers is small.

## FIGURE E. Additional revenues and contribution to GDP growth (in million US $)



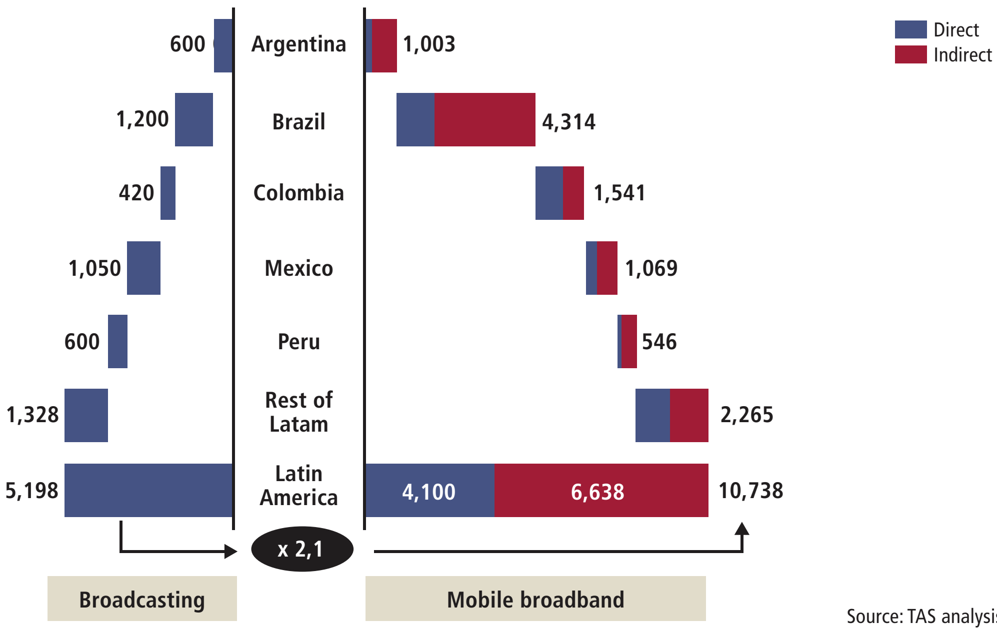

Source: TAS analysis

22. In some countries (such as Argentina and Brazil), this estimate can be considered aggressive because the State and non-profit organizations could be the main investors in public broadcasting signals; thus, these services would not be subscription-based and may not be able to fetch advertising revenues.

The important difference in terms of job creation between both scenarios occurs in terms of their impact on other industries. Given the externalities already documented for the broadband industry[23], the adoption of new mobile broadband connections will have a multiplier effect in job creation in other sectors of the economy[24]. On the other hand, beyond the impact of additional advertising of the new broadcasting signals (a factor which is limited by the total size of the advertising market), the television industry does not generate significant indirect jobs[25]. The impact of alternative scenarios is presented in the figure F.

Thirdly, the utilization of the 700 MHz spectrum for mobile broadband contributes to the collection of taxes in the five countries under study US $2.14 billion more than broadcasting; for the rest of the region the difference would amount to US $460 million. In the case of broadcasting, we considered direct taxes (VAT or equivalent) accumulated over eight years resulting from additional sales in advertising and subscription generated by new digital television signals. In the case of mobile services, we have considered direct taxes (VAT or equivalent) on cumulative sales generated over eight years due to the growth in mobile broadband penetration and the increase in coverage. The comparative amounts are presented in figure G.

## FIGURE F. Comparative contribution to job creation

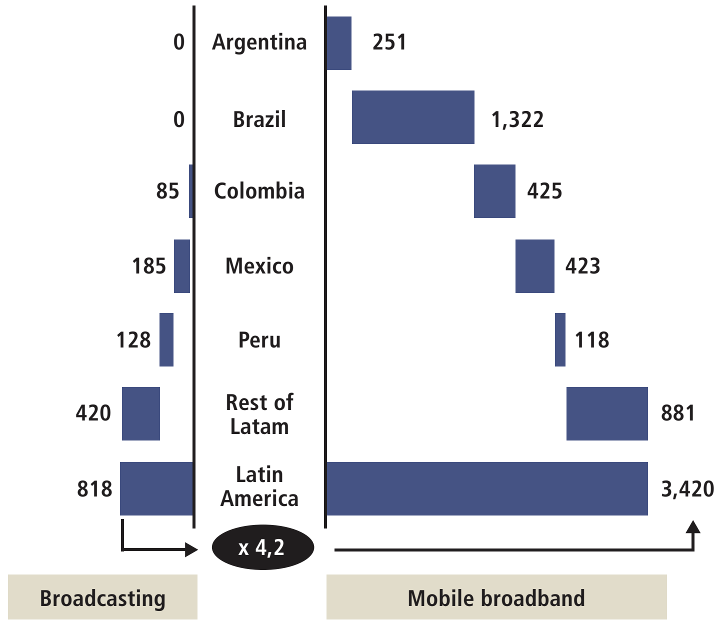



Source: TAS analysis

Finally, by using the 700 MHz band to provide to mobile broadband services, important benefits can be generated in terms of consumer surplus. This is measured in terms of the difference between willingness to pay (as a measure of user benefit) and the price paid for a good or service. In the case of broadcasting, while the introduction of additional signals can create benefits linked to the delivery of public services and better information to citizens[26], they are difficult to quantify. Furthermore, these effects would also be present in the case of mobile broadband since the service would allow the population to gain access to the same radio and television signals through the internet, in addition to access to social networks, blogs, etc. Furthermore, it is important to mention that, while difficult to quantify, the use of spectrum for broadcasting generates a second order effect that can result in more advertising vehicles (e.g. additional television signals) with the consequent potential producer and consumer surplus[27]. From the mobile broadband perspective, the transfer of larger savings in capital investment to retail prices of mobile broadband services results in a consumer surplus derived from a reduction of prices of 10%, directly benefiting consumers[28]. When measuring this benefit in terms of the cumulative decrease in tariffs over the total user base during

23. See, in particular, Katz, R. The impact of broadband on the economy: research to date and policy issues. International Telecommunication Union, 2010.
24. This is measured according to an econometric model developed based on a data panel for the Chilean economy, which indicates that for each 10% increase in additional broadband penetration, the employment rate increases by 0.018% (see Katz, R. "La contribución de la banda ancha al desarrollo económico", in Jordan, V., Galperin, H. y Peres, W. Acelerando la revolución digital: banda ancha para América Latina y el Caribe. CEPAL, 2010).
25. On the other hand, as mentioned above, all increases in employment in production and advertising are included in the direct effects.
26. For example, quality of life, social inclusion, well-informed citizenry, and social belonging (see section 7.7. in the study).
27. It is important to mention however, that the potential increase in advertising vehicles is limited by the total spending of advertising which would have to be split among multiple media, which also includes the Internet.
28. An additional portion of benefits results from applying the pre-paid model to mobile broadband, which plays a key role in stimulating adoption.

## FIGURE G. Comparative tax collection (2012-20) (in million US $)

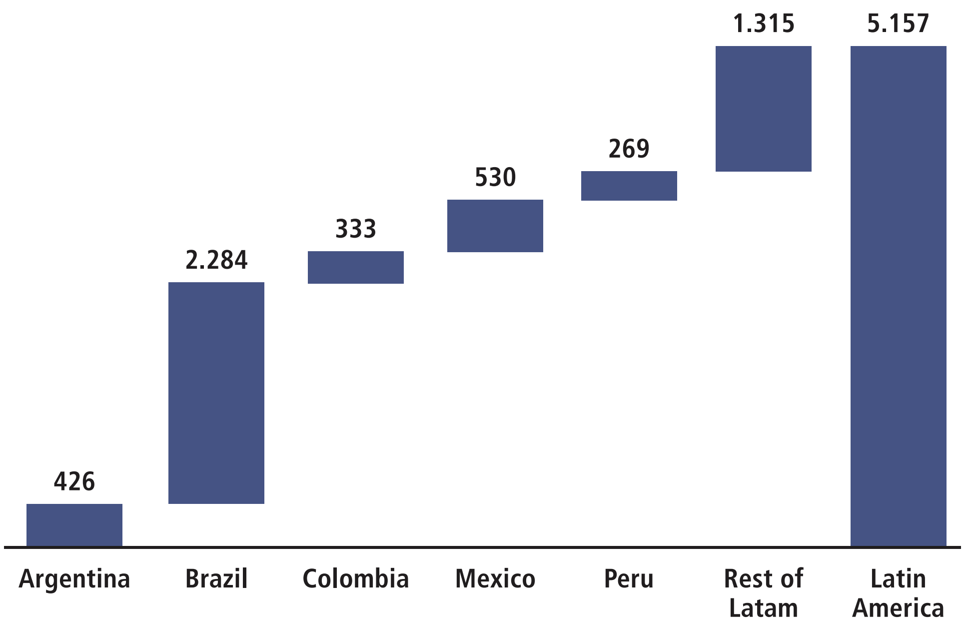



Note: This contribution includes only taxes on revenues, excluding additional levies such as any radioeletric frequency tax for spectrum usage, usage rights, municipal taxes, and other taxes.

Source: TAS analysis

eight years, we can estim ate a total surplus of US $3.84 billion for the five countries studied in detail and US $1.32 billion for the rest of the countries in Latin America (see figure H).

## FIGURE H. Contribution resulting from consumer surplus generated by mobile broadband (in million US $)




Source: TAS analysis

This consumer surplus contributes in turn to GDP growth insofar that it can lead to more consumption[29]. For example, in the case of Mexico, the National Census of Household Income and Spending (ENIGH), conducted by the National Institute of Statistics, Geography and Informatics, indicates that in 2008 average household spending was broken down according to the following items (see figure I).

## FIGURE I. Mexico: Larger items of current household spending by quarter (2008)

| Item | Percent of spending |
|---|---|
| Food and beverage | 25,2% |
| Clothing | 3,9% |
| Housing, energy, and fuel | 7,5% |
| Household articles | 4,5% |
| Health care | 2,3% |
| Transportation | 13,8% |
| Education and entertainment | 10,2% |
| Personal care | 7,5% |
| **Telecommunications** | 1,1% |

Source: Gobierno de México. Instituto Nacional de Estadística, Geografía e Informática

Considering the above breakdown, it is reasonable to conclude that a portion of the consumer surplus estimated for Mexico (US $530 million) could yield an increase in consumption of ítems such as household articles, education, entertainment and personal care[30].

### Social Impact of Allocating the 700 MHz Spectrum to Mobile Broadband

Beyond the quantifiable economic benefits, the allocation of the 700 MHz band to mobile broadband in Latin America will have a positive social contribution in several areas. For example, the expansion of wireless broadband to unserved zones will allow the population without current coverage to gain access to more educational resources, improved health services, and financial services. At the same time, wireless broadband to be introduced in rural areas will enable the efficient provision of public services at a greater speed of access, improving the interrelationship between civil society and governments. Based on the comparison of both scenarios, mobile broadband represents a more efficient platform for the provision of services that improve the welfare of citizens (see figure J).

Furthermore, it should be emphasized that a large part of the social impact of broadcasting has already been achieved through the launch of digital television signals.

29. See, in particular, Greenstein, S. and McDevitt, R. The broadband bonus: accounting for broadband internet's impact on US GDP, NBER Working papers 14758.
30. Prior research indicates that spending in food and housing tend not to increase as a result of savings in other ítems. See Martinez, A. Consumption Pattern Development across Mega-Cities: An Analysis of Sao Paulo and Shanghai. The Lauder Institute. University of Pennsylvania, April 2009.

## FIGURE J. Comparative social impact of spectrum alternative allocation scenarios

| Impact area | Examples | Broadcasting | Mobile broadband |
|---|---|---|---|
| Education | Connectivity to educational resources<br>Distance learning | ◐ | ◕ |
| Health | Tele-diagnostics<br>Health professional communications<br>Preventive health care information | ◐ | ◕ |
| Financial inclusion | Access to micro-payments platforms<br>Education for micro-finance access | ○ | ◕ |
| Acces to public services | Acces to e-Government programs | ○ | ◕ |
| Information inclusion | Access to government information<br>Programs linking citizens and government | ◕ | ◕ |

Source: TAS analysis

● High impact ○ No impact

## Conclusion

To sum up, the study concludes that the allocation of the 700 MHz spectrum to mobile broadband in Latin America will generate more economic and social value than if it were to continue being assigned to broadcasting (see figure K).

## FIGURE K. Comparative economic benefits according to the utilization of the 700 MHz band (in million US $, except for employment)

| | Broadcasting | Mobile broadband | |
|---|---|---|---|
| Contribution to the ICT ecosystem (spectrum, network, other assets) | $3,508 | $14,808 | x 4.1 |
| Additional revenues and contribution to GDP growth | $513 | $3,582 | x 7.0 |
| Direct and indirect employment creation | 5.198 | 10.738 | x 2.1 |
| Taxes (collected on additional sales) | $818 | $3,420 | x 4.2 |
| Consumer surplus | $0 (*) | $5,157 | |

(*) Second-order effect which translates into more advertising space with the consequent potencial impact on producer and consumer surplus.

Source: TAS analysis

These results are consistent with those generated by research in other regions of the world (see figure L).

## FIGURE L. Relative benefit if spectrum is used for mobile broadband services

| | Latin America | Asia (*) | European Union (**) |
|---|---|---|---|
| Contribution to the ICT ecosystem (spectrum, network, other assets) | x 4.2 | N.A. | x 2.9 (without spectrum licensing ) |
| Additional revenues and contribution to GDP growth | x 7.0 | x 9.3 | x 4.8 |
| Direct and indirect employment creation | x 2.1 | x 22 | x 1.3 |
| Taxes (collected on additional sales) | x 4.2 | x 3.8 | N.A. |
| Consumer surplus | $5.2 B | N.A. | € 70 B |

(*) Boston Consulting Group "Socio-economic impact of allocating 700 MHz band to mobile in Asia Pacific." October.
(**) SCF Associates "The Mobile Provide Economic Impacts of Alternative Uses of the Digital Dividend." September 2007.

Note: Value generated by mobile broadband divided by value generated by broadcasting.

Source: TAS analysis

Thus, the results of the study indicate the benefits to be generated as a result of using the 700 MHz band to provide mobile broadband services in the five countries studied in detail:

- An increase in broadband coverage resulting from increased availability of mobile broadband, a fundamental variable to ensure economic growth in Latin America;
- More optimal deployment and operation of new networks, resulting in a reduction of capital investment of US $3.7 billion compared to deployment of infrastructure in higher frequency bands, while achieving better coverage[31];
- Contribution to the ICT ecosystem (acquisition of spectrum , equipment, and services) in excess of US $8.13 billion compared to the contribution generated by broadcasting[32];
- Direct (additional revenues to the industry) and indirect contribution (positive externalities) to GDP that exceeds US $2.47 billion to the contribution generated by broadcasting[33];
- Creation of more than 4,600 direct and indirect additional jobs than those created by broadcasting[34];
- Additional taxes in excess of US $2.14 billion;
- A consumer surplus greater than US $3.84 billion.

By extrapolating the results of the five countries studied in detail to the rest of Latin America, the benefits are, as expected, or a greater magnitude:

31. Nominal value of US $6.16 billion (investment: US $3.69 billion, and operating expenses: US $2.47 billion) calculated as the Net Present Value discounted at 10% over eight years.
32. Initial non-recurring expenses.
33. Annual direct contribution and cumulative indirect contribution over eight years.
34. Annual direct employment and indirect job/years accumulated over eight years.

- A significant increase in mobile broadband coverage with a more efficient technology, resulting in savings in capital investment and network operations of US $5.44 billion when compared to deploying similar networks in higher bands;

- Contribution to the ICT ecosystem (acquisition of spectrum licenses, equipment, and services) in excess of US $11.3 billion to the contribution generated by broadcasting;

- Direct (additional revenues of the industry) and indirect (positive externalities) contribution to GDP in excess of US $3.07 billion to that generated by the broadcasting industry;

- Creation of 5,540 direct and indirect more jobs than those generated in broadcasting;

- Tax contribution of US $2.60 billion more than in broadcasting;

- Consumer surplus in excess of US $5.16 billion;

- An increase of 31.5% of mobile broadband coverage, leading to a total estimated coverage of 92.7% of the population of Latin America. This will lead to significantly increase broadband adoption and deliver services at higher speeds, which represent a public policy objective of most governments in the region.

In summary, the reassignment of the 700 MHz band to mobile services, by allowing the enhanced deployment of mobile broadband and increasing coverage, entails significant economic and social effects, while responding to market needs. Policy makers in Latin America should consider these effects and follow the example of countries like Colombia, Peru, Uruguay, and Mexico, as well as that of other mature countries that are making spectrum reallocation decisions leading to their realization.

The full study can be downloaded from the sites:

**GSMA LA**
www.gsmala.org

**AHCIET**
www.ahciet.net