SPECTRUM MANAGEMENT FOR A CONVERGING WORLD: CASE STUDY ON GUATEMALA

International Telecommunication Union

This case study has been prepared by Giancarlo Ibarguen <gis@ufm.edu.gt >, Rector, Universidad Francisco Marroquin, Guatemala, as part of a Workshop on Radio Spectrum Management for a Converging World produced under the ITU New Initiatives programme of the Office of the Secretary General (OSG) in cooperation with the Radiocommunication Bureau (BR). The workshop manager is Eric Lie <eric.lie@itu.int>, and the series is organized under the overall responsibility of Tim Kelly <tim.kelly@itu.int>, Head, ITU Strategy and Policy Unit (SPU). This case study has been edited and formatted by Joanna Goodrick <Joanna.goodrick@itu.int>. Other case studies on spectrum management in Australia and the United Kingdom can be found at: http://www.itu.int/osg/spu/ni/spectrum/.

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1 Abstract

Before the enactment of the 1996 General Telecommunications Law in Guatemala, the radio waves were owned and licensed by the State following the licensing of radio spectrum model of the Federal Communications Commission. The radio spectrum licence was a revocable authorization for the licensee to use a given frequency band in a given manner. The risks involved with the legal licensing scheme taxed the development of the wireless sector in Guatemala. The 1996 radio spectrum deregulation reform privatized, in essence, the Guatemalan radio spectrum. Owners of radio spectrum are allowed to lease, sell, subdivide or consolidate their titles. The results of the reform have been strongly positive, as can be shown by comparing the growth of the mobile sector in Guatemala with Latin America as a whole.

2 Introduction: A principled approach

> "The great and *chief end* therefore, of Men uniting into Commonwealths, and putting themselves under Government, is the *Preservation of their Property*."
>
> John Locke[1]
>
> "The basic clause of such a [model] constitution would have to state that in normal times… men could be restrained from doing what they wished, or coerced to do particular things, only in accordance with the recognized rules of just conduct designed to define and protect the individual domain of each; and that the accepted set of rules of this kind could be deliberately altered only by what we shall call the Legislative Assembly. This in general would have power only in so far as it proved its intention to be just by committing itself to universal rules intended to be applied in an unknown number of future instances and over the application of which to particular cases it had no further power."
>
> Friedrich A. Hayek[2]

The value of liberty, strong property rights and the Rule of Law was the guiding vision when radio spectrum was liberalized in Guatemalan in 1996. Economic efficiency played a role, though secondary, in making the case for market reform more solid. A different promotional approach may have been chosen, which could have made the task of the reformers much easier, had they known then about the ground breaking work by Ronald Coase who, 36 years earlier, wrote an article about the Federal Communication Commission (FCC) arguing that it was not clear why it was necessary for the government rather than the market process to allocate the use of the radio spectrum.[3] According to Coase, the "price mechanism" could accomplish the same end by first defining "property rights in frequencies" and then "dispos[ing] of the use of a frequency to the highest bidder."[4] Many economists have built upon Coase's seminal work in proposing a practical plan to reform the legal framework for management of the radio spectrum.[5]

In a 1943 opinion by Justice Felix Frankfurter, the Supreme Court concluded that "regulation was essential" to prevent disorder and waste because "[t]here is a fixed natural limitation upon the number of stations that can operate without interfering with one another."[6] In other words, Justice Frankfurter considered that regulation is needed because the radio spectrum is scarce otherwise there would not be any interference problems. But Coase argued that radio spectrum was scarce just like any other resource used in the economic system. "The real cause of the trouble," said Coase, "was that no property rights were created in these scarce frequencies." He added: "[I]f no property rights were created in land, so that everyone could use a tract of land, it is clear that there would be considerable confusion and that the price mechanism could not work because there would not be any property rights that could be acquired. If one person could use a piece of land for growing a crop, and then another could come along and build a house on the

land used for the crop, and then another could come along, tear down the house and use the space as a parking lot, it would no doubt be accurate to describe the resulting situation as chaos. But it would be wrong to blame this on private enterprise and the competitive system. A private-enterprise system cannot function properly unless property rights are created in resources, and when this is done someone wishing to use a resource has to pay the owner to obtain it. Chaos disappears: and so does the government except that a legal system to define property rights and to arbitrate disputes is, of course, necessary."[7] Furthermore, according to Coase, the prevention of interference is not sufficient cause for government regulation of the radio industry. The creation of property rights in the use of frequencies and the consequent radio spectrum market would also take care of the problems occasioned by radio interference just as the real estate market does with real property.[8]

Thus Coase offered the basis for a sound policy for the allocation of the radio spectrum based on the economics — or what we call "expediency" — of property rights. Yet the principled approach followed in Guatemala offered advantages over one based on expediency. For the promoters of the Guatemalan reform, the defence of property was non-negotiable and supposedly no arguments based on efficiency would change the course. Privatizing the spectrum was the right thing to do because property makes people responsible for their own actions in the realm of material goods. The reformers would find themselves in agreement with Tom Bethell who later wrote that "[t]he great blessing of private property… is that people can benefit from their own industry and insulate themselves from the negative effects of others' actions… The industrious will reap the benefits of their industry, the frugal the consequences of their frugality; the improvident and the profligate likewise. *Private property institutionalizes justice*."[9]

It was believed by some of the reformers that an owner, whether of land or a radio spectrum band, should be allowed by law (rightly understood) to do whatever he wishes with his legitimately held property as long as he does not violate the individual rights of others. If these principles were violated, the injustices should be rectified voluntarily through private arbitration and/or resolution, or involuntarily through the coercive force allowed for by the legal system.

Early on, the reform focused on applying a generality constraint on the radio spectrum regime and allocation procedures. In fact, the working principle behind the spectrum reform was the idea of general rules of just conduct, or *nomos* as Hayek preferred to call them.[10] The generality principle is familiar in application to the common law tradition.[11] However, it is unlike the civil law of Guatemala, which in many cases is the law of special groups or interests. The same story repeats itself throughout Latin America.[12] Against this background a reform based solely on efficiency grounds would have easily fallen into oblivion. There are many lessons to be drawn from the telecommunication spectrum reform in Guatemala. The one lesson that stands above all the others is the importance of applying policy and politics by principle, instead of being guided exclusively by special interests or expediency.

3 Guatemala facts and indicators

3.1 Geography

Guatemala is a small country located in Central America with a total area of 108,889 square kilometers. It borders Mexico in the North and Northwest, the Pacific Ocean in the South, El Salvador and Honduras in the West, and Belize and the Gulf of Honduras (Caribbean Sea) in the Northeast (see Figure 1). For comparison, Guatemala is somewhat larger than Iceland but slightly smaller than the State of Tennessee in the United States. Guatemala has numerous volcanoes and the topography is mostly mountainous, with a narrow coastal plain in the South and a plateau in the North. The climate is hot and humid in the lowlands; and cooler in the highlands.

Figure 1: Map of Guatemala

Source: CIA – The World Factbook.

3.2 Economy

Guatemala's US$23.3 billion GDP and 11.2 million citizens (data for 2002) make it the largest economy in Central America. Yet a weak rule of law, inefficient courts, ineffective public institutions, and heavy regulation of business substantially limit economic growth. According to the *Human Development Report 2003* published by the United Nations Development Program (UNDP) the GDP per capita annual growth rate for the Guatemalan economy from 1975 to 2001 was a meager 0.1 per cent. In fact, Guatemala has lost two decades in economic performance. GDP per capita (PPP) was lower in 2001 than in 1980 (US$4,400 vs. US$4,522, respectively). Guatemala ranks 119 in the 2003 Human Development Index (HDI) of the UNDP, placing it with the third lowest ranking for all of Latin America, ahead of only Nicaragua and Haiti.[13]

3.3 The telecommunication industry

The latest ITU data available for Guatemala is for the year 2001. Total telecommunication service revenue during the year amounted to slightly less than US$450 million, or 2.2 per cent of GDP. Total telephone subscribers added up to 1.9 million, or 16.2 per 100 inhabitants. With 537 million minutes, international incoming telephone traffic is 3.4 times larger than outgoing telephone traffic.[14] The dominant company in fixed lines is Telecomunicaciones de Guatemala, S.A. — Telgua — (owned and operated by Telmex). Competition is more intensive in the mobile sector with Comunicaciones Celulares, S.A. — Comcel — (owned by Milicom) with 36 per cent of the market in 2001 (measured in terms of number of subscriptions per operator to total subscriptions); Sercom (owned by Telgua), 42 per cent; Telefónica Centroamérica Guatemala, S.A. (owned by Telefónica), 16 per cent, and BellSouth Guatemala y Cía., S.C.A., 7 per cent.[15]

4 The telecommunication environment

4.1 Beginnings

Telephone communications began in the year 1881 with services between Guatemala City and the old colonial city of Antigua Guatemala. The services were extended to Quetzaltenango, the second largest city located in the western highlands, three years later. *Teléfonos de Guatemala*, a private telephone operator, was established in 1909 and taken over by the Government seven years later. *Teléfonos de Guatemala* started operations with 900 telephone units with a 24-hour service, a high quality service for the time, yet the company was taken over by the Government in 1926. The Government established the *Dirección General de Teléfonos* and the *Proyecto Telefónico* in 1927, the year that automatic telephones were introduced in Guatemala City with the help of the German company, the *Allgemeine Elektricitäts Gesellschaft* (AEG). One year earlier the foreign company Tropical Radio & Telephone Co. began offering international telephone services. This company was nationalized in 1966 under the name *Telecomunicaciones Internacionales*. Telephone tariff price regulations were introduced in 1938 under the direction of a newly-created government office called *Servicio de Radiocomunicaciones Nacionales*.

4.2 The old licensing regime

Article 121 of the Guatemalan Constitution of 1985 assigns the property of the radio waves to the State.[16] The framers of the Constitution persuaded themselves that the radio spectrum along with water masses (underground or above), ocean and river shores, air space, subsurface (including minerals), natural gas and oil, was inherently scarce and, thus, in their minds "strategic".[17] This idiosyncrasy provided the rationale for a complete nationalization of these resources. There was of course precedent in previous Constitutions that also had nationalized these valuable resources.

Before the enactment of the 1996 General Telecommunications Law, the radio waves were owned and licensed by the State following the licensing of radio spectrum model of the Federal Communications Commission (FCC). An office lost inside the bureaucracy, the State-owned telephone company[18] was managed remotely by a branch of the military. It zoned the radio spectrum assigning large blocks of bandwidth for particular uses following the pattern of the FCC's US Table of Frequency Allocations. This office would then slice each block into smaller portions and assign them to individual licensees. Foreign nationals were not allowed to apply for a licence. Everyone, from radio amateurs to TV channels, had to deal with this office. The licensing process was in general not transparent: in practical terms, the licences were basically — and legally — free, if you were lucky enough to win the current officers' favour.[19] However, with demand far exceeding supply, an illegal market for licences quickly arose, whereby bribes and an informal market of illegal licences matched demand with supply.[20]

The radio spectrum licence was a revocable authorization for the licensee to use a given frequency band in a given manner. The licence specified what could and could not be used for a particular service. This included the technologies to be used, the location of the transmission equipment, the type of antennas, among other requirements. The licence was non-transferable and typically expired after 2, 5, 10, 15, 20 and 25 years respectively. Since the licence was dependent upon the consent of the Government, it could also be revoked by the Government at any time.

The risks involved with the legal licensing scheme, and the uncertainty of the extralegal licensing arrangements, taxed the development of the wireless sector in Guatemala. The Government controlled entry and limited the licences arbitrarily. Companies invested resources to obtain special privileges through the political process and connections. These privileges translated into rents that benefited all parties involved in different proportions.[21] In fact, the licensing scheme created an ideal rent-seeking situation complete with legal and illegal routes, such as controlled

entry, immobilized bandwidth, privileged information, bribery and corruption.[22] The scope of this rent-seeking activity in Guatemala has not been measured, but the injury to the consumers was arguably much greater than the gain to the companies or persons who obtained the rents.[23]

4.3 Antecedents to the Reform of 1996

The national telephone company, *Empresa Guatemalteca de Telecomunicaciones* (GUATEL), was created in 1971 by the official merger of the *Dirección General de Teléfonos*, the *Proyecto Telefónico* and *Telecomunicaciones Internacionales*. The decree that created GUATEL in fact monopolized the telecommunication sector.[24] Article 5 grants GUATEL the exclusive right to provide telecommunication services "by means of the following systems: telephone, telegraph, radio and television broadcasting… *and all others of the same nature developed in the future*."[25] The Government, of course, allowed the development of incipient two-way and one-way radio communications services. The cable TV industry emerged intact from this law through an informal market and with support of the municipalities that received fees from the cable companies for the use of local streets and rights-of-way.[26]

The limited private alternatives (i.e. radio telephones, paging services, two-way radios) alleviated the most urgent communication needs. But they were expensive and limited in their availability. Hence, in a very effective manner, the legal monopoly of GUATEL impeded the development of the telecommunication market in Guatemala. In 25 years of operations GUATEL installed a total of 340,000 telephone lines reaching a telephone penetration of less than 3 per cent (of total population).[27] The unsatisfied demand for telephone lines was estimated at 1 million potential subscribers.[28] On balance, GUATEL proved to be a very inefficient company. In 1996, the average waiting time for the connection of a telephone line was close to three years compared to an already outrageous average of 1.1 years for Latin America.[29] For the same year, the GUATEL network managed only 56 telephone lines per employee compared to the average of 155 for all of Latin America.[30] And there was also the issue of cross subsidies. Expensive international calls (US$1.50 per minute) provided the revenue lacking from relatively inexpensive local calls (US$0.67 per month for 400 minutes).[31]

Such estimates do not account for the most expensive call, which is the one that cannot be placed because there is no line available. The opportunity cost of the State-owned company and regulatory apparatus eventually became untenable. The political pressures for radical reform gained strength with the help of the privatization wave rolling throughout Latin America, rapid technology changes and a new generation of politicians.[32]

5 Management of the radio spectrum

5.1 The logic of the 1996 radio spectrum reform

Why should the radio spectrum become a commodity? Richard Pipes, Professor of History at Harvard University, in his compelling and insightful book *Property and Freedom*, asked basically the same question with regard to land. "[I]n all primitive societies and most non-Western societies in general, land was not treated as a commodity and hence was not truly property, which, by definition, entails the right of disposal… The question then arises: when and why did land become a commodity? ... The most persuasive answer is economic. The transformation of land into tribal, family, or individual ownership seems to occur, first and foremost, in consequence of population pressures which call for a more rational method of exploitation…"[33]

The same logic can be applied to the radio spectrum. The privatization of land created a thriving and efficient market for urban and rural real estate. The transformation of the radio waves into private property rights that pass the "three D's test" (i.e. they must be defined, defensible, and

divisible) responds to increasing demand pressures for alternate uses. The divisibility of property rights in radio spectrum makes the telecommunication market more flexible, allowing the bandwidth parcels to be purchased and exploited by those who value them most highly. Here enter the familiar considerations favoring private property in productive assets: "it increases the social product by putting the means of production in the hands of those who can use them most efficiently (profitably); experimentation is encouraged, because with separate persons controlling resources, there is no one person or small group whom someone with a new idea must convince to try it out; private property enables people to decide on the pattern and types of risks they wish to bear, leading to specialized types of risk bearing; private property protects future persons by leading some to hold back resources from current consumption for future markets; it provides alternate sources of employment for unpopular persons who don't have to convince any one person or small group to hire them, and so on."[34]

The creation of property rights in radio spectrum implies de-zoning bandwidth. Thereupon, a market for radio waves naturally evolves from the assignment of property rights. The resulting price system allocates radio waves in the same manner that land prices allocate real estate. No central office is needed to zone bandwidth for specific technologies and services. Existing owners of rights to radio spectrum rights could sell, rent, subdivide or consolidate their spectrum rights. They could use different technologies at will and alter the use of their right subject only to their contractual agreements and the general rules of just conduct. And "those who clamor for "conscious direction" — and who cannot believe that anything which has evolved without design (and even without our understanding it) should solve problems which we should not be able to solve consciously — should remember this: the problem is precisely how to extend our utilization of resources beyond the span of the control of any one mind; and, therefore, how to dispense with the need of conscious control, how to provide inducements which will make the individuals do the desirable things without anyone having to tell them what to do."[35]

Similar arguments caught the attention early in 1995 of Mr. Alfredo Guzmán who was then a young congressman heading the Committee on Telecommunications of the Guatemalan Congress.[36] Mr. Guzmán, who in 1996 became the General Manager of GUATEL and later privatized the assets of the State monopoly, defended the spectrum privatization idea forcefully and effectively since the early stages of the telecommunication regulation reform of the same year. Needless to say, Mr. Guzmán, who proved to have uncommon political audacity for the task at hand, was instrumental for the inclusion of the spectrum deregulation scheme in the general telecommunication law enacted by the Guatemalan Congress in October 1996.[37]

5.2 Radio spectrum management after the telecommunication reform of 1996

The spectrum allocation system of Guatemala changed dramatically with the "*Ley General de Telecomunicaciones*" of 1996. Allocation of radio spectrum evolves from the bottom up. Private action comes first: any person or company, national or foreigner, may request any spectrum band not currently assigned to other users. When conflicts arise — caused by interference from signals of adjacent bands and/or intermodulation distortions — private parties are encouraged to mediate between themselves. If private mediation fails, specific rules are enforced by the telecommunication regulatory body.[38] Additionally, the injured party may sue for damages in existing courts.

From the perspective of the theory of economics of property rights, the most salient feature of the spectrum reform is the creation of usufruct titles in lieu of Constitutional restraint. In the Guatemalan Civil Code, the usufruct carries the right to use and enjoy the property of another to the extent that such use and enjoyment does not destroy or diminish its essential substance.[39] The 1996 law specifically states that the *Títulos de Usufructo de Frecuencias* (*TUF*) may be leased, sold, subdivided or consolidated for a limited period (fifteen years). In fact, the TUF may be even

used as equity exchanged for investment. The usufruct term can be extended for an additional 15 years by a simple request at no cost to the bearer, and so on.[40] The electromagnetic waves are infinitely reusable and are not "destroyed or diminished" after being used. Therefore, in all practical matters, the TUFs are the closest approximation to private property rights in radio spectrum that the Guatemalan law allows.[41] Regulation is limited to interfering emissions and reserved bands.

The physical TUF is a security paper certificate listing the six following basic variables on the front:

- frequency band;
- hours of operation;
- maximum power transmitted;
- maximum power emitted at the border of adjacent frequencies;
- geographic territory;
- duration of right (beginning and ending).

The back of the *TUF* is for endorsements which are required whenever the instrument is being negotiated for property transfer. The independent regulatory body established by the 1996 law, the *Superintendencia de Telecomunicaciones* (SIT) is responsible for the TUF registry. This computerized database is easily accessible to the public. Anyone may request a copy of the TUF inventory.

The adjudication process contained in article 61 of the law is quite simple and has been implemented in practice as follows:

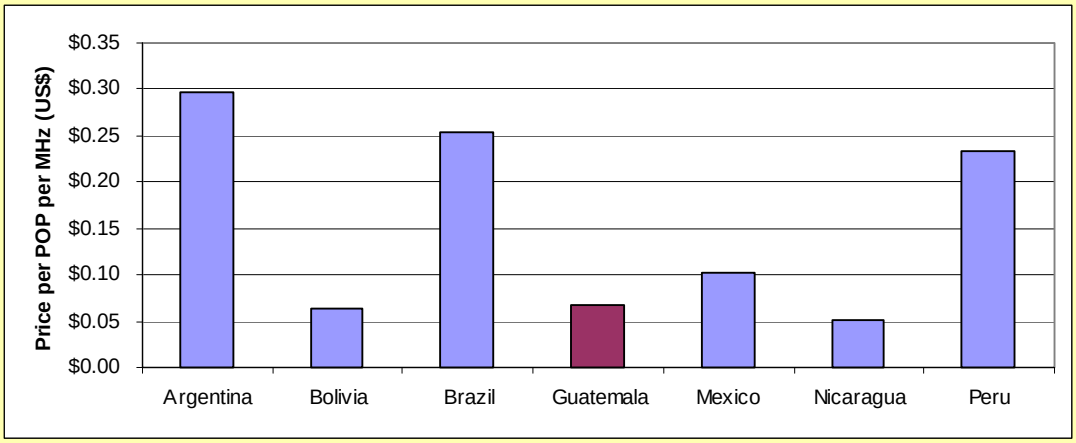
- An interested party surveys existing spectrum use in the spectrum registry of SIT.
- The party applies to SIT for the right to use a frequency band as specified in the application form.
- The application is evaluated by SIT which deems it accepted, incomplete, or rejected. SIT is required, by law, to answer in 3 days or less. Grounds for rejection include technical interference, request of reserved or radio amateur bands. Reserved bands are for government use only.[42]
- If the application is accepted, public notice is issued. Parties objecting the new use file formal complaints. Grounds for opposition are limited to technical interference.
- Complaints are quickly adjudicated via binding arbitration. The adjudication process cannot exceed 10 days.
- Other interested parties are allowed to file competing claims to requested spectrum rights.
- If no competing claims are filed, then the petitioner directly receives rights without auction *gratis*.
- If competing claims filed, then SIT must schedule an auction 35 days after the end of the opposition period.

5.3 Auctions

The results of the reform have been strongly positive as will be proved, at least in a preliminary way, in the following series of Figures. The property rights model instituted by the telecom

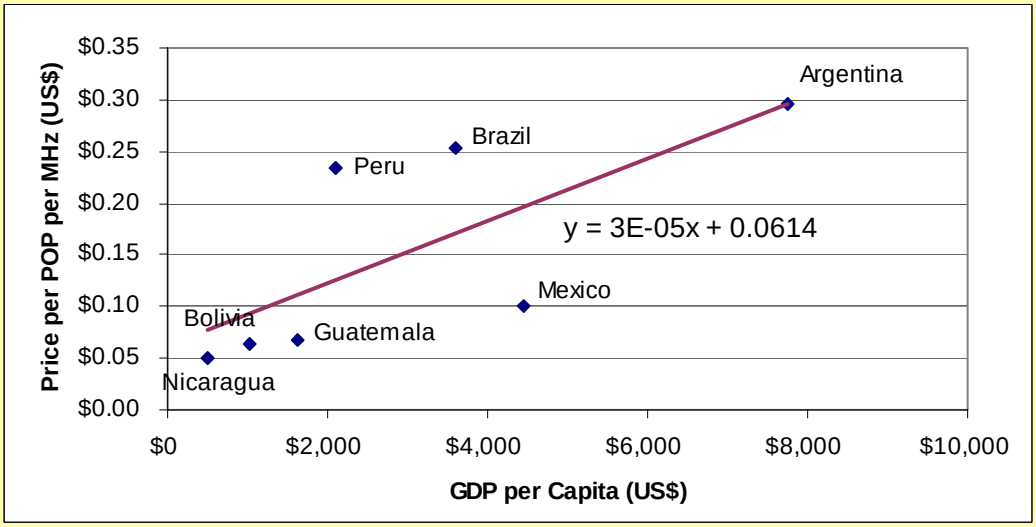
reform of 1996 resulted in very low values for the wireless titles — see Figure 2 (showing the low relative price of TUFs in the bands used for mobile telephony) and Figure 3 (indicating that low income does not appear to account for this). Country risk may account for the relative low price but evidence from the marketplace (e.g. the prices and the 7 per cent pay-out rate for FM radio titles) is not consistent with this explanation. The low prices probably reflect the competitive and liberal regime as well as the open access to basically all the tradable radio spectrum.

Figure 2 Licence Pricing for Mobile Phone Operators



Source: Pyramid Research.

Figure 3 Wireless licence prices vs. GDP per capita

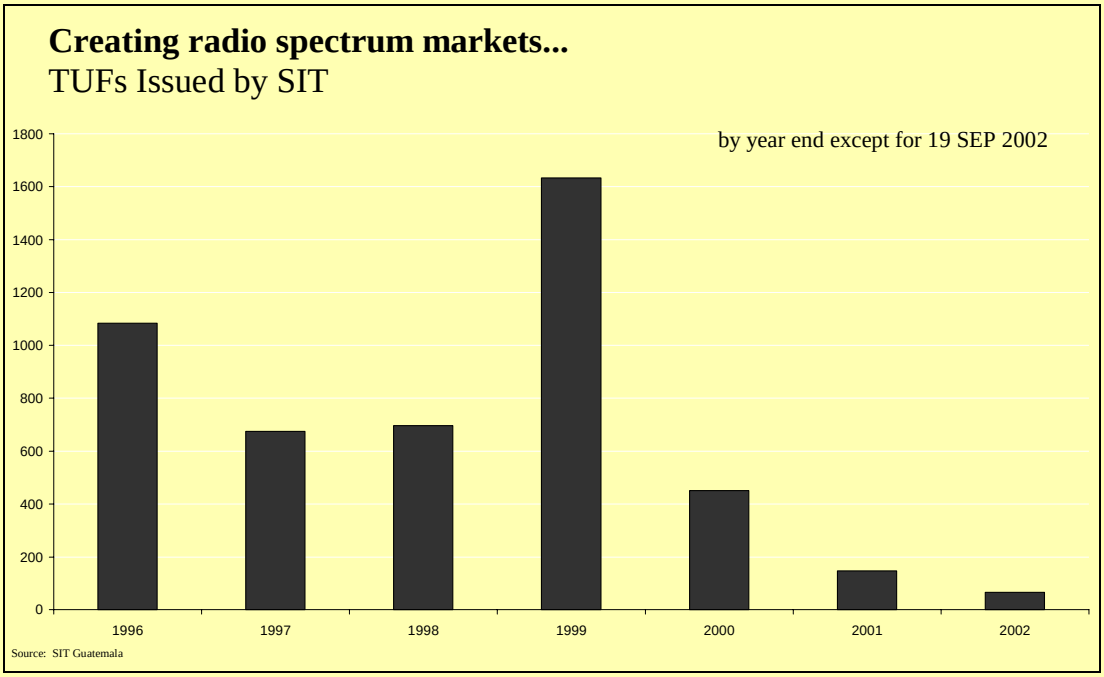


Source: Pyramid Research.

SIT has issued more than 5,000 TUFs since 1996[43] (see Figure 4). Since its inception, SIT has received more than 13,000 applications for usufruct titles. Of these, 4,300 generated expressions of interest, which resulted in more than 80 auctions. There are over 1,050 different owners of TUFs. The auctions have generated more than US$130 million in revenue (see Figure 5). Seventy per cent of the annual auction revenue up to a cap of US$3.7 per annum has been used to develop

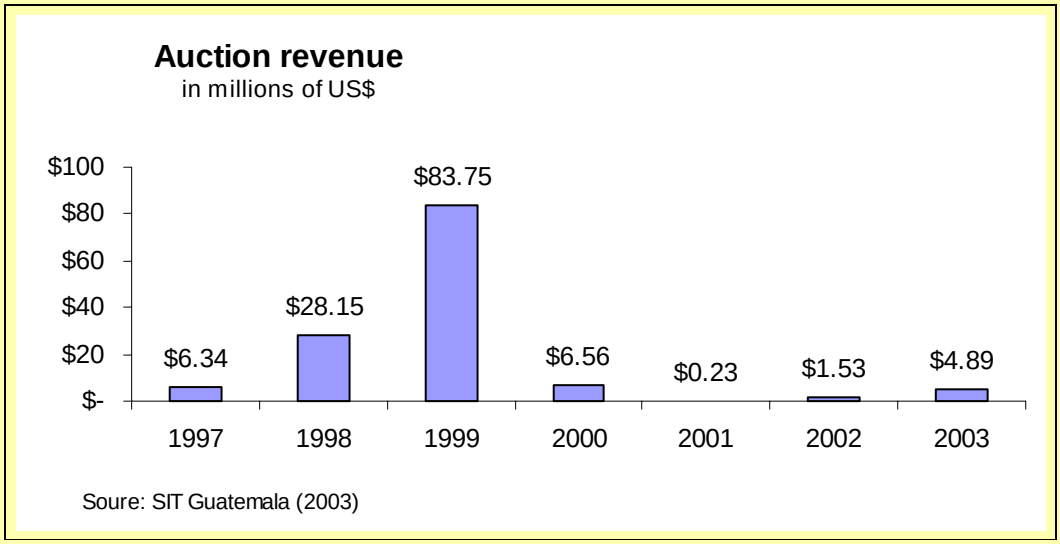
rural telephone services administered by FONDETEL, an office of the Ministry of Communications, Infrastructure and Housing. These funds have been used to develop community telephony services in the poorest rural areas of the country.

Figure 4[44]



Source: SIT Guatemala

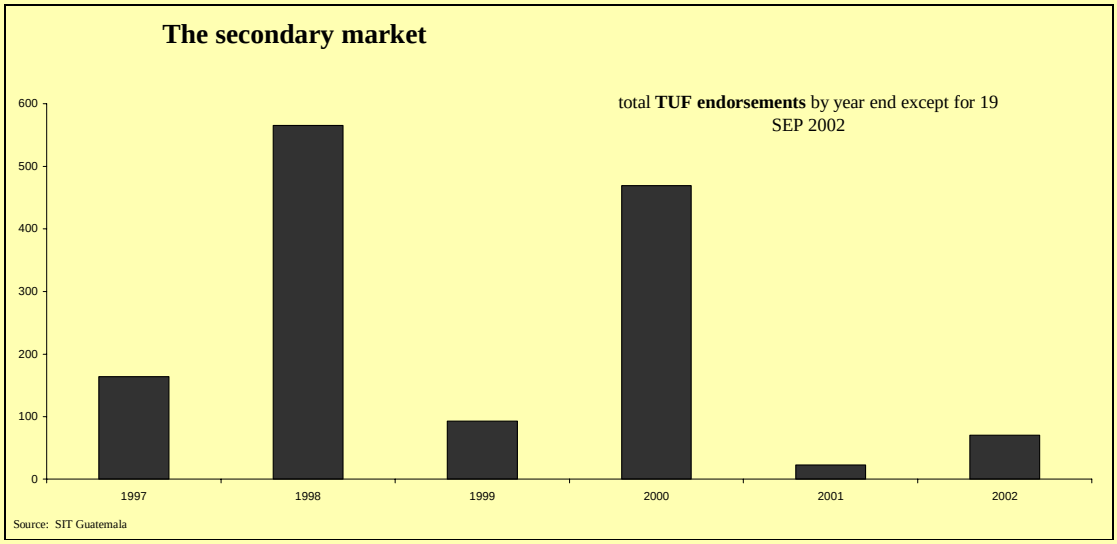
Figure 5



Source: SIT Guatemala.

The relative number of TUF endorsements provides a sign of an evolving secondary market. Of the total TUFs issued, about 26 per cent have been endorsed since 1996 (see Figure 6). This is only a partial indication of the secondary market because the rights may also be leased. Since this commercial activity is not reported to SIT, data is hard to find. Interestingly, the TUFs are also being used as collateral for loans.[45] The going market price for a FM radio TUF with coverage in the Guatemala City area goes from US$600,000 up to US$750,000; the same are leased at US$4,000, or so, per month.[46]

Figure 6



Source: SIT Guatemala.

5.4 Interference issues

We suspect that one of the reasons for the vitality of the TUF marketplace is that interference complaints did not increase in number nor complexity and most of the problems have been resolved efficiently by mutually agreed bilateral negotiations. TELGUA, the largest private spectrum owner, reportedly has had one instance of interference problems since 1996. The interference occurred with one of the telephone company microwave stations. The problem was quickly solved when company officers learned that TELGUA did not own the *TUF* for the microwave frequency being used by the company![47]

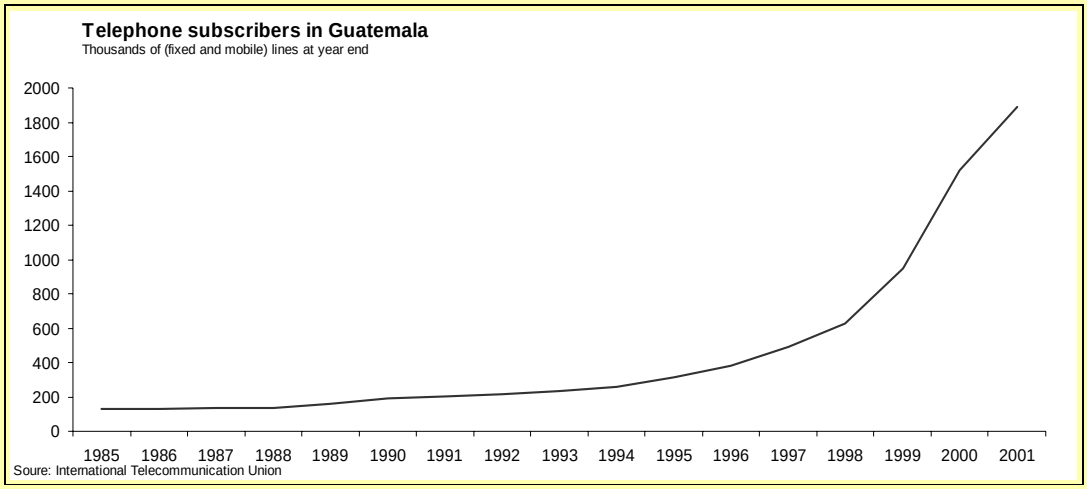
Interference problems appear to be concentrated in commercial AM and FM radio spectrum. To date, only 14 interferences cases have been disputed in the government courts. Enter again the logic of the law that creates incentives for private parties to solve their conflicts by mediation.[48] Operators monitor themselves and their neighbours using readily-available equipment such as the IC-PCR1000[49], a small unit that turns a computer into a worldwide communications receiver with modulation analysis capabilities. If an operator encounters interference signals, the issue is brought up to the *Cámara de Radio Difusión de Guatemala*, a private association of broadcasters, which has established its own private arbitration office. The *Cámara* itself has acquired sophisticated equipment to monitor the airwaves. The interference problems that remain unresolved are those caused by pirate radio stations (self named "community radios") that *SIT* and the Government have been unable, or unwilling, to close. The *Cámara* officials have

identified and located 341 illegal commercial radios operating in FM. These stations apparently have a religious orientation but they were reportedly used for political propaganda for the party that passed on political leadership in January 2004. This may explain the Government and SIT's inaction in persecuting the illegal radio operators. In the past, the licensing of commercial radios was subject to arbitrary dissolution by government officials. Radio operators were then subject to political pressures every election period. Today, the TUFs may have protected commercial radio operators from this political pressure.

6 Results after seven years

As may have been expected, the initial effects of the telecom reform are more visible in the telephone sector. From 1996 to 2001 the total number telephone of lines (fixed and mobile) increased at an annually compounded rate of 38 per cent. Under the command and control conditions of the State monopoly, the annually compounded rate from 1985 to 1995 was 9 per cent (see Figure 7).

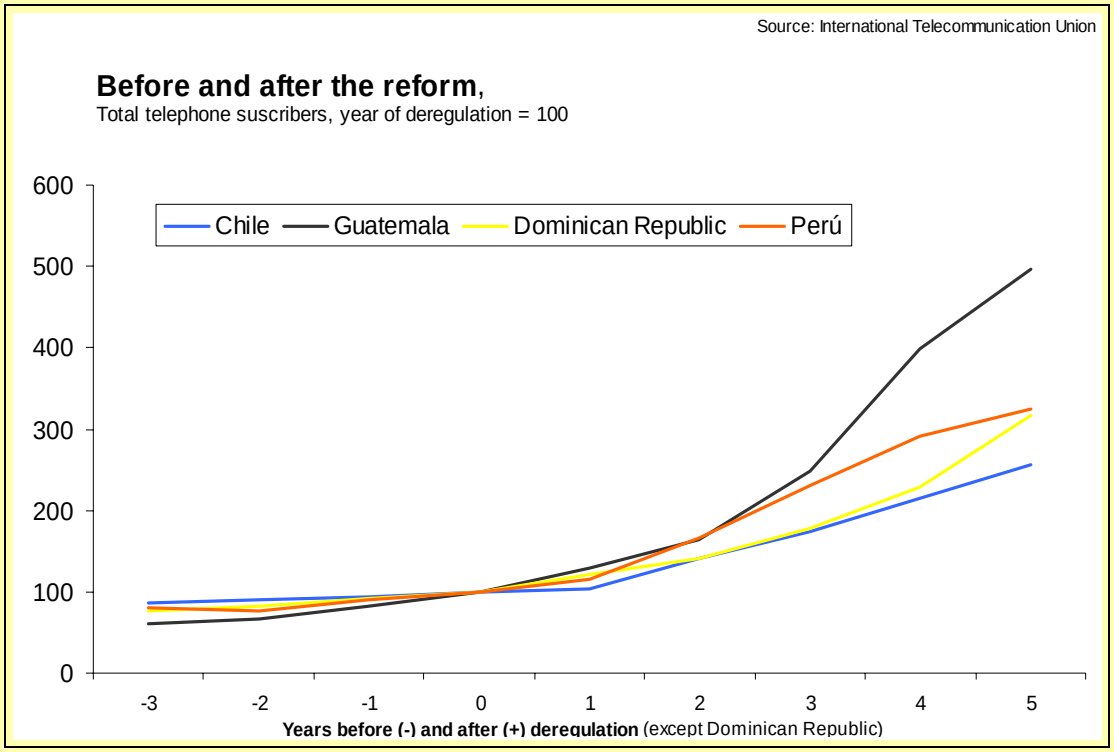
Figure 7



Source: ITU.

As a comparison, consider the growth of the total number of telephone subscribers in Chile, Peru, and Guatemala. If one uses as a baseline the year of the reforms (1988 for Chile, 1993 for Peru, 1996 for Guatemala), the growth rate in Guatemala far surpasses that for either country. Five years after the reform the annually compounded growth rate for Chile and Peru was 21 per cent and 27 per cent, respectively. Certainly a component of the difference may be explained by the fact that Guatemala started from a lower base. Data for the Dominican Republic, with an economy similar to that of Guatemala, shows a growth rate of 26 per cent during the same period of time considered for Guatemala (see Figure 8).

Figure 8

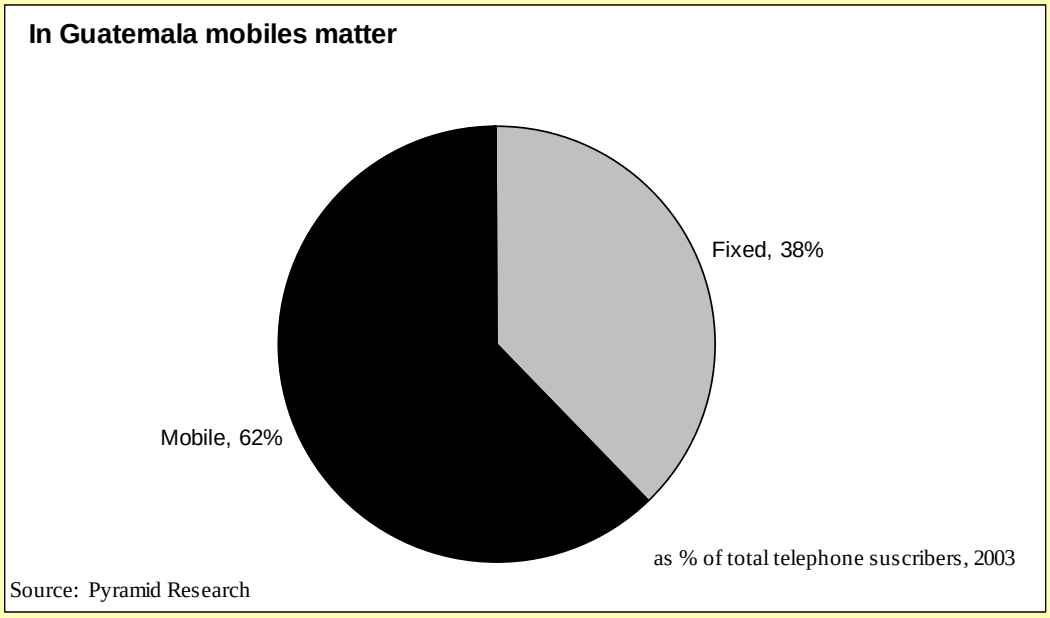


Source: ITU.

Mobile phone subscribers rose from 64,197 at year-end 1997 to an estimated 1,562,000 at year end 2003. Annualized compounded growth for the mobile sector during this period is 57 per cent.[50] These growth rates will diminish in future years if only for the law of large numbers. However the absolute and relative gains will continue to be unprecedented.[51]

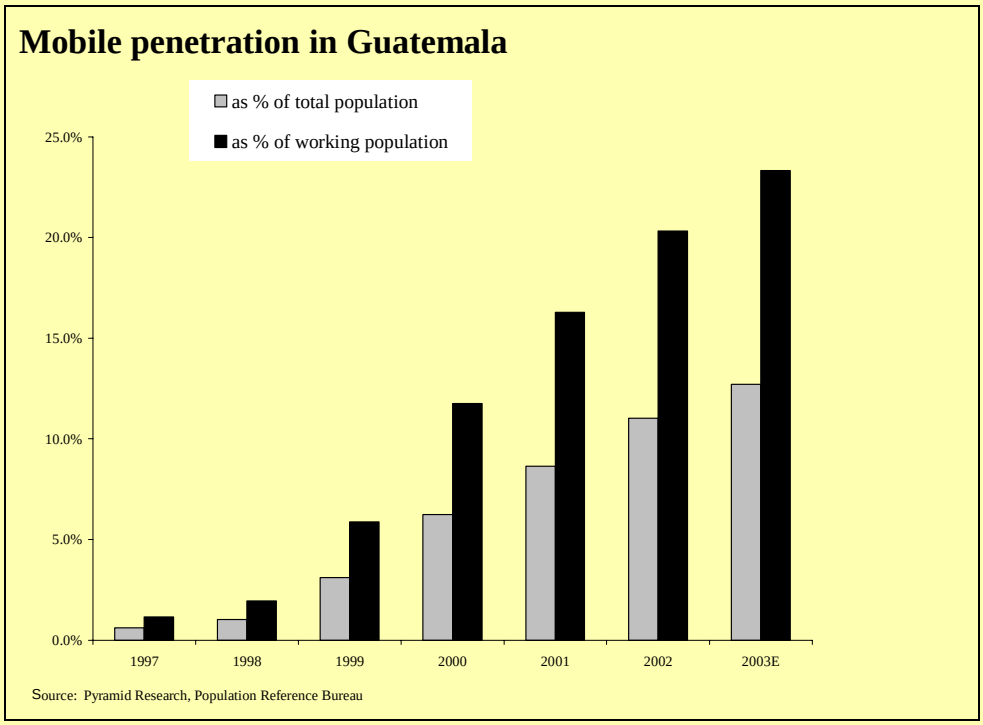
Mobile phone penetration is today higher than that of fixed lines. Fixed lines penetration has increased from 4.1 per cent at year-end 1997 to an estimated 7.7 per cent at year end 2003 at an annual compounded growth rate of 11 per cent. On the other hand, mobile subscriptions have grown from 0.6 per cent of total population (year end 1997) to an estimated 12.7 per cent (year end 2003) at an outstanding annually compounded growth rate of 66 per cent. Mobile phones account for 62 per cent of the total number of telephone subscribers in Guatemala (see Figure 9).

Figure 9



Source: Pyramid Research.

Figure 10

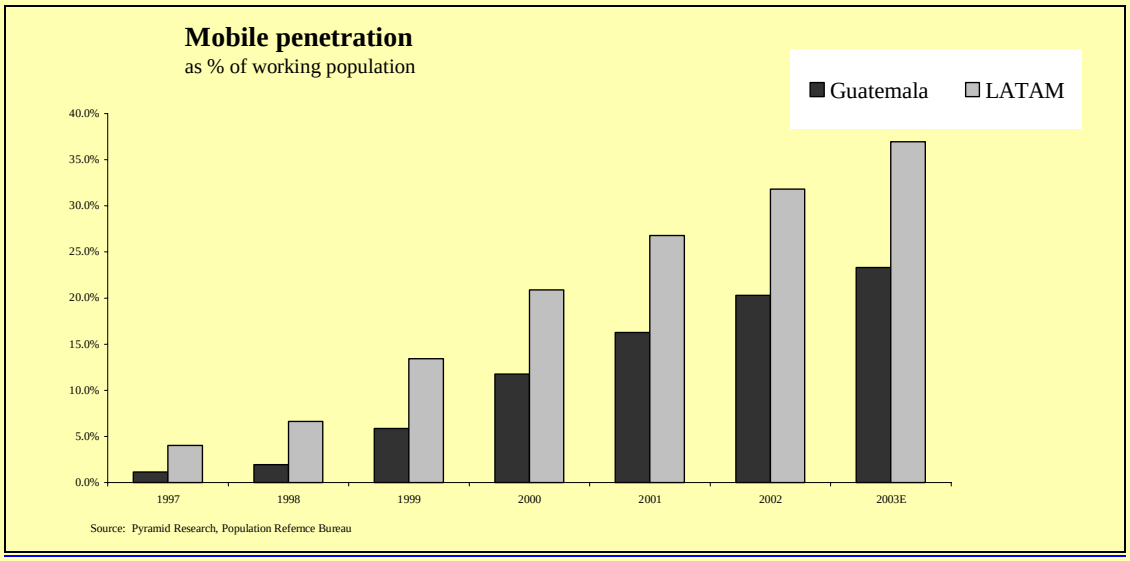


Source: Pyramid Research.

Guatemala is a very young country in terms of the average age of the population, with forty-two per cent of its population 15 years of age or younger. Thus, a more accurate statistic is the measurement of mobile penetration in relation to working population. This ratio has increased from 1.2 per cent (year end 1997) to an estimated 23.3 per cent (year end 2003).[53] Figure 10 depicts the mobile penetration as a percentage of total population and as a percentage of working population.

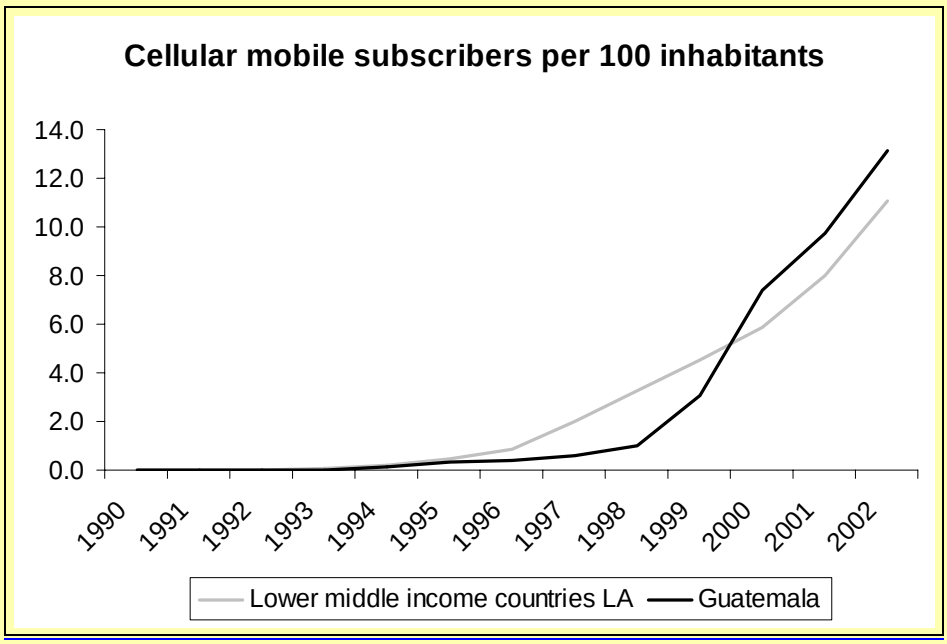
Taking into consideration the Guatemala's GDP per capita in 2002 was 38 per cent that of the average for Latin America, the performance of the Guatemalan telecommunication market during the years 1997-2003 is fairly impressive. International outgoing traffic has grown substantially more in Guatemala during the years after the telecom reform. Figure 11 compares Guatemalan mobile penetration with that of Latin America. Note that the mobile sector in Guatemala has grown 1.5 faster than the Latin American average (i.e. Guatemalan mobile penetration has grown at an annually compounded rate of 65 per cent compared to 45 per cent for Latin America). Given that Guatemala started from a lower base the difference in growth rates could be misleading. Yet, if one compares the performance of the Guatemalan mobile market with other Latin American countries classified as lower middle-income group by the World Bank, a comparative advantage persists (see Figure 12). From the year of the reform (1996), until 2002, the growth rate of mobile subscribers per 100 inhabitants was 77 per cent for Guatemala compared with 53 per cent for these lower middle-income countries. In the international arena, outgoing traffic has grown substantially more in Guatemala during the years after the telecom reform (see Figure 13).

Figure 11



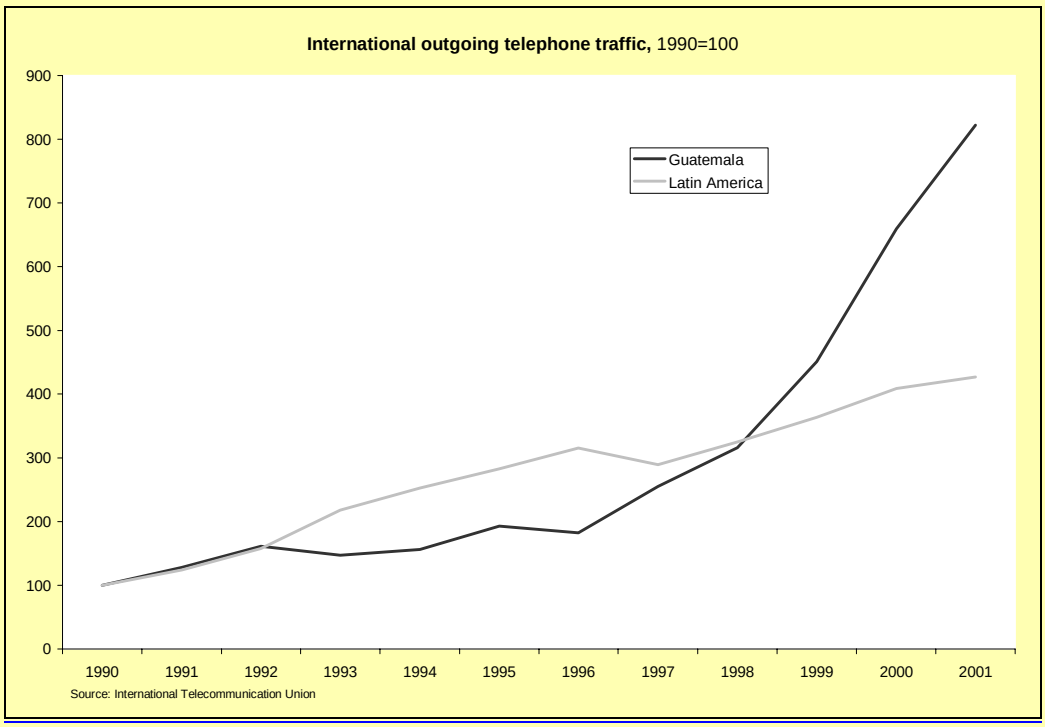
Note: LATAM = Latin America.
Source: Pyramid Research.

Figure 12



Note: Lower middle-income countries include Belize, Bolivia, Colombia, Ecuador, El Salvador, Guyana, Honduras, Paraguay, and Peru.
Source: ITU World Telecommunication Indicators 2003, SIT (Guatemala).

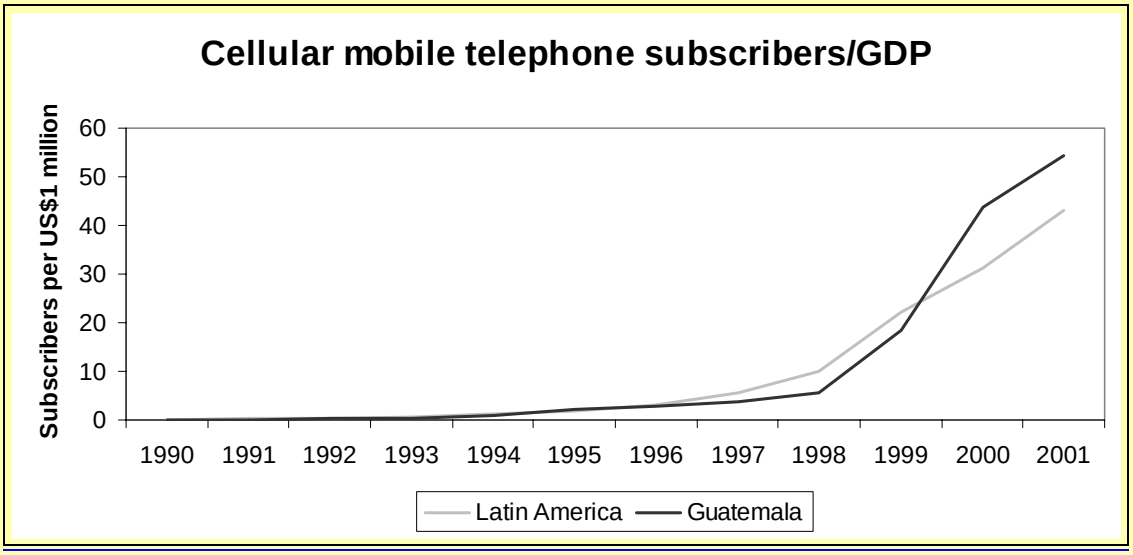
Figure 13



Source: ITU.

But per capita figures may not be the correct way to measure the gap in telecommunication statistics between Guatemala and other Latin American countries. From an economic perspective per-income stock may be more informative about the differences in the availability of telecommunication services. A time series comparison of the number of cellular mobile telephone subscribers and television receivers per dollar of GDP may provide a more revealing measure of the gap between countries. For example, in measuring the number of cellular mobile telephone subscribers per million dollars of GDP, Guatemala scored behind Latin America until 1999, when it managed to catch up and has gained a substantial advantage in more recent years (see Figure 14). An interesting and parallel story evolves when comparing the more mature market of television receivers (per million dollars of GDP). Guatemala lost ground throughout the same decade until 1996 when the gap was dramatically reversed (see Figure 15). However, one should take into account that different countries may expend different shares of GDP to telecommunications. Moreover, the same country may change the share for reasons other than mere progress in the development of telecommunications.

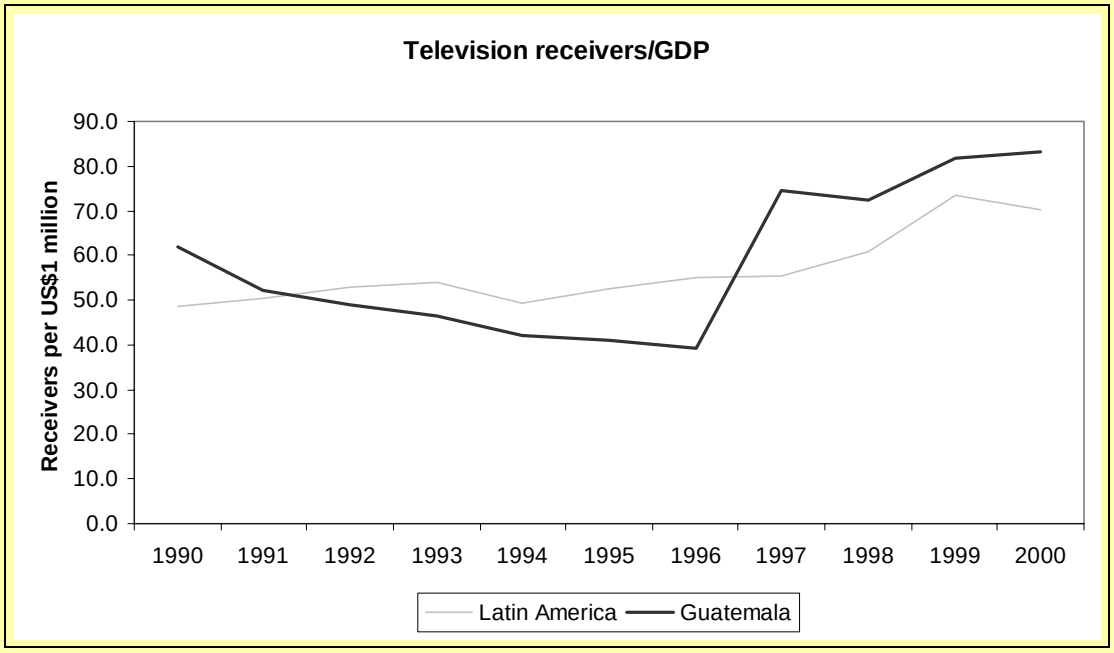
Figure 14



Source: International Telecommunication Union and World Development Indicators (World Bank).

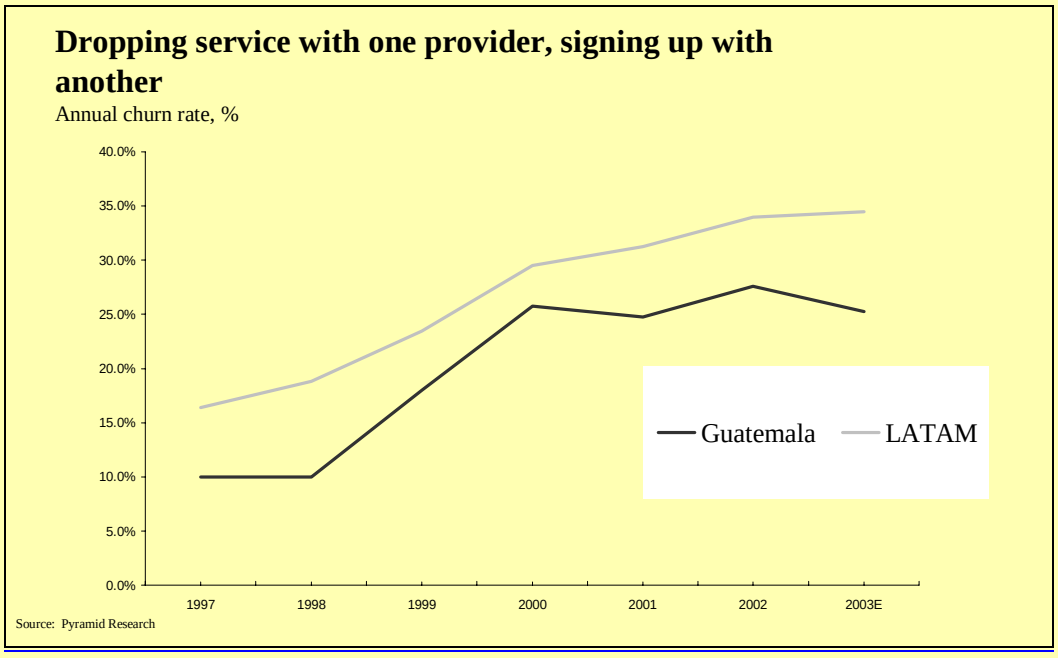
The figures thus presented could be somewhat misleading if growth has come at the cost of the quality of service. Nevertheless, annual churn rate (representing the number of disconnected mobile accounts during a calendar year as a percentage of total mobile accounts) is today lower in Guatemala than the rest of the region (see Figure 16). This may be a good sign of quality of service. Additionally, Guatemalans pay much less on average than fellow Latin Americans (see Figure 17) while at the same time spending more time on the telephone (see Figure 18).

Figure 15



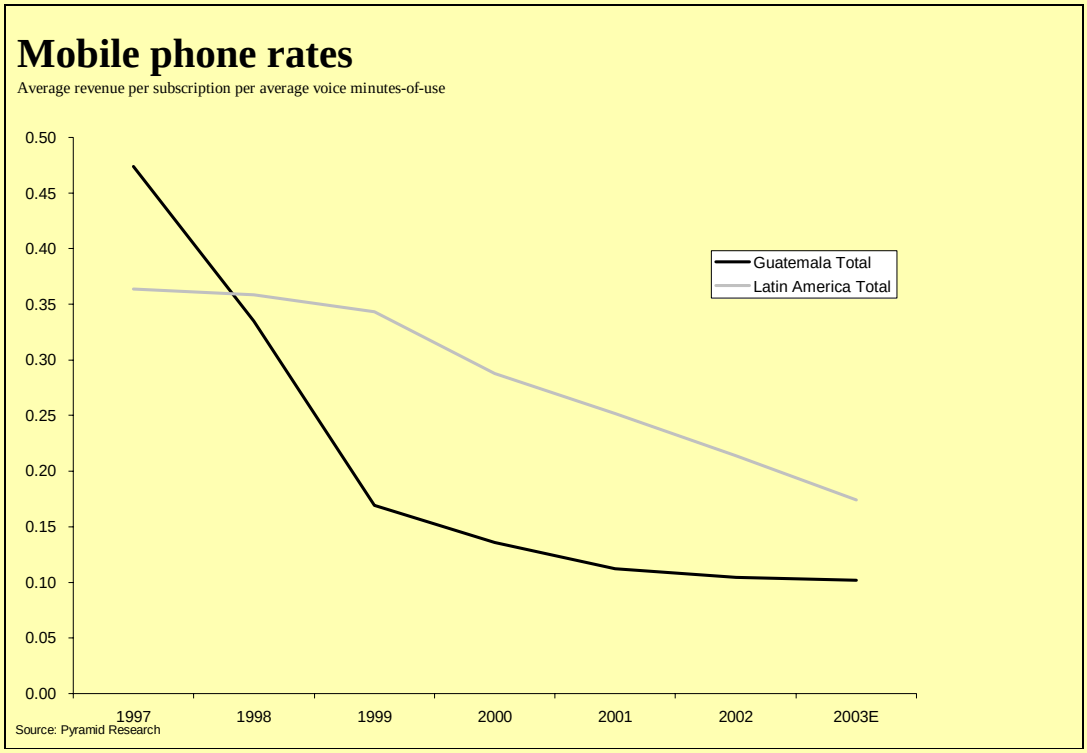
Source: International Telecommunication Union and World Development Indicators (World Bank).

Figure 16



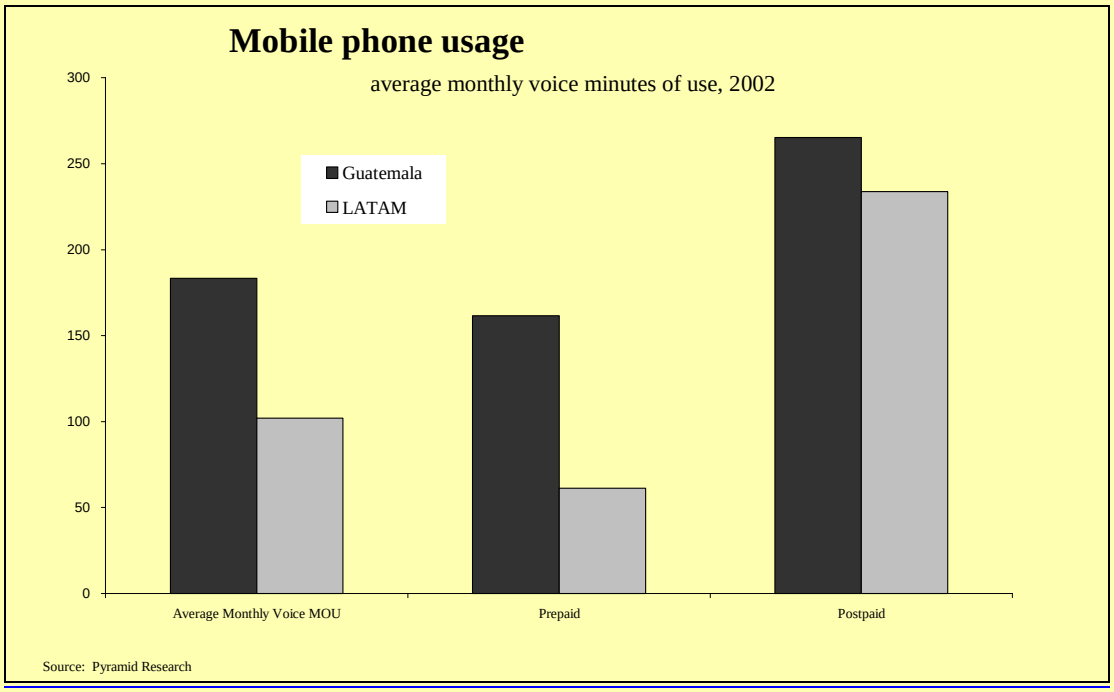
Source: Pyramid Research.

Figure 17



Source: Pyramid Research.

Figure 18



Source: Pyramid Research.

7 Conclusions[54]

The numbers speak for themselves. Even the most ardent detractors of the liberalization brought about by the market reforms of 1996 have had to recognize the benefits. When visiting far-flung rural towns, or the large *basurero* of zone 7 in Guatemala City,[55] it is common to find peasants and garbage collectors using a mobile phone.

Before Guatemala essentially privatized the spectrum in 1996, radio spectrum management was inefficient and ineffective, and overwrought by the regulatory straight jacket. If "private property is inextricably linked with civilization,"[56] then we may add that property rights spontaneously "civilized" (but also "energized") the radio spectrum. The reform allowed a poor country to make good use of a precious resource that was being wasted. A centralized licensing spectrum allocation system is a collectivist scheme that deprives persons of the freedom to organize wireless entrepreneurial initiatives creatively and efficiently. As Peter Huber says "[t]he telecosm is too large, too heterogeneous, too turbulent, too creatively chaotic to be governed wholesale, from the top down."[57]

Many wealthy countries in the West may waste resources with no apparent impact on their economies. But lack of property rights in radio spectrum limits one of the most important resources in the information age. In the past, the most significant resource was land and, for the West at least, every parcel was represented in a property title. "Thanks to this representational process", argues Hernando de Soto, "assets [in the West] can lead an invisible, parallel life alongside their material existence… The single most important source of funds for new businesses in the United States is a mortgage on the entrepreneur's house… These assets can also provide … a foundation for the creation of securities (like mortgage-backed bonds) that can then

be rediscounted and sold in secondary markets. By this process the West injects life into assets and makes them generate capital."[58]

According to calculations by De Soto and his team of analysts, the extra-legal possession of real estate in the hands of the poor of the Third World and former communist nations is valued at US$9.3 trillion or more (1997). Yet this capital is dead because the land owned by the poor cannot be "used to produce, secure, or guarantee greater value in the expanded market."[59] Now, exactly the same situation is happening in those rich countries of the West that have locked-out of their capital market networks this new "real estate": the radio spectrum.[60] How much dead capital is out there?

If a principled approach will not induce a radical radio spectrum reform in the wealthy countries of the West, maybe expediency will.

Endnotes

1 Locke, edited by Peter Laslett (1988), p. 350.
[2] Hayek (1976), p. 109.
[3] Coase (1974), 69-107. Coase´s original paper was published by the 2 Journal of Law and Economics in 1959.
[4] Ibid., p. 95.
[5] See, for example, De Vany et. al. (1969).
[6] National Broadcasting Co. Inc. v. United States, 319 U.S. 190, 213 (1943). Quoted in Coase (1974), p. 80.
[7] Coase (1974), op. cit. pp. 81-82.
[8] The origin of Coase's Theorem can be found in this paper. Referring back to interferences, Coase said "[t]he institution of private property plus the pricing system would resolve these conflicts. The operator whose signals were interfered with, if he had the right to stop such interference, would be willing to forego this right if he were paid more than the amount by which the value of his service was decreased by this interference or the costs which he would have to incur to offset it. The other operator would be willing to pay, in order to be allowed to interfere, an amount up to the costs of suppressing the interference or the decrease in the value of the service he could provide if unable to use his transmitter in a way which resulted in interference." Coase (1974), p. 95.
[9] Bethell (1999), p. 162.
[10] Hayek (1973), 94-123.
[11] Hogue (1985), 186-190.
[12] Roberts & Araujo (1997), 135-159. For a history of the legal morass in Argentina, an accurate image for the rest of Latin America, see Bustamante (1988).
[13] UNDP (2003).
[14] ITU World Telecommunication Indicators 2003.
[15] Pyramid Research 3Q 2003.
[16] The actual wording of the Constitution says "[s]on bienes del Estado: … h) Las frecuencias radioeléctricas." The literal translation for the term is "radio-electric frequencies".
[17] The basic difference between the subsurface oil in Texas and Guatemala is that the latter is being exploited in response to the property rights held by its owner, and the former is left underground as a consequence of red tape, a politicized bureaucracy and the regulation straight-jacket.
[18] The "*Dirección General de Radiodifusión y Televisión Nacional*." A distant cousin of this office is still in operation today with the same name but limited power over commercial radios and TV. The office currently manages the State radio station T.G.W. and provides a register for radio announcers, coordinates the radio and T.V. networks for official and simultaneous *communiqués* of the government, and oversees media content.
[19] In order to obtain the licence the interested party had to pay an insignificant tax stamp (usually less than US$40) and also to pay for a moderately priced bond as guarantee.
[20] An internal government memo in author's archives proves the case in point. The memo was addressed to the Minister of Communications, Transportation and Public Works dated January 24, 1991 and signed by a military officer in charge of the "*Asesoría de Frecuencias y Asuntos Internacionales de Radio*" office of the Ministry.
[21] Luis René Pellecer (personal communication, November 5, 2001), General Manager of the national telephone company (1971-1975), said in a recent interview by the author that the typical application for licence took from 5 to 10 years. Opposition to new applicants by existing competitors was rampant and effective. In the early 1980s, Mr. Pellecer applied for a FM radio licence. After a 5 year delay Mr. Pellecer inquired about his request, and was informed that his application file had been eaten by rats together with other documents held in a far away office of TGW near a prison. Fortunately, he had a complete photocopy of his file handy. Today he is a successful commercial radio entrepreneur.
[22] For more on rent-seeking see Tullock (1989).
[23] Jorge Garrido (personal communication, September 28, 2001), Technical Manager of the Superintendence of Telecommunications (SIT) of Guatemala, said that "[d]uring many years, Guatemala had quite a subjective and capricious way of assigning frequencies. People in high places or the civil employee of the office in charge were responsible for allocating frequencies."

[24] Decreto 14-71, Congreso de la República de Guatemala, dated April 14th, 1971.
[25] Italics by author. For a critical view of the state of affairs before 1996 see Ibarguen (1992), p. 21.
[26] The nascent and competitive cable TV industry in Guatemala very early on surpassed GUATEL in number of subscribers. In fact, the Guatemalan cable TV industry is a vivid case demonstrating the superiority of unregulated cable over regulated. The case supports the conclusion reached by Hazlett & Spitzer (1997), 205-217.
[27] Data provided to author by Telgua, S.A. (personal communication, June, 2001).
[28] Infraestructura para el tercer milenio (1999).
[29] World Bank, "World Development Indicators 1998".
[30] Ibid.
[31] *Infraestructura para el tercer milenio*, (1999).
[32] It is not farfetched to say that the privatization of GUATEL could have happened 4 years earlier had it not been for the failed May 1993 autogolpe (self-imposed coup d'état) of President Jorge Serrano Elías who sought to follow the steps of President Alberto Fujimori of Perú. See McCleary (1999). The GUATEL privatization initiative can be traced back to Manuel F. Ayau, founding president of the think-tank Centro de Estudios Económicos y Sociales (CEES), who in the early 1960's was appointed to head the privatization task force organized by President Ydigoras. The privatization effort failed but Mr. Ayau continued writing about, and promoting, the privatization agenda for GUATEL.
[33] Pipes (2000), p. 89. For an empirical cross-country analysis of the relationship between economic growth rate and the rule of law and secure private property rights, see Barro (1997), 26-29.
[34] Nozick (1974), p. 177. For a wide-ranging book on the misunderstanding of private property and its rediscovery by economic theory see Bethell (1999) cited in note 7 above. In the chapter titled "Why Isn't the Whole World Developed?", p. 201, Bethell quotes Mancur Olson who wrote in an unpublished paper of 1991: "A thriving market economy requires, among other things, institutions that provide secure individual rights – rights that insure that individuals, and the firms they create, can best advance their interests by being as productive as possible and engaging in mutually beneficial trade. The incentives to save, to invest, and to produce depend particularly upon individual rights to marketable assets – on property rights."
[35] Hayek (1945), p. 15.
[36] For more on the spirit of the deregulation reform see Emord (1991), Gilder (1996), 155-170, Keyworth II, Eisenach, Lenard & Colton (1995), Mueller (1991).
[37] The original proposal to privatize the radio spectrum espoused by Mr. Guzmán eventually became, after some important modifications, Title IV of the Ley General de Telecomunicaciones (Decree Law 94-96). The proposal was translated into legal jargon with the judicious and clever advice of lawyers Eduardo Mayora A. (personal communication, October 27, 2001) and Alvaro Castellanos. Carmen Urízar, Research Analyst and Economic Director at CIEN, played a key role in structuring and promoting the law bill. In 1996 Prof. Thomas W. Hazlett of the American Enterprise Institute and Prof. Pablo Spiller of UC Berkeley were retained as experts by the government of Guatemala to advise on telecommunication reform legislation. See Hazlett (2001).
[38] Profesor Thomas W. Hazlett has correctly pointed out that regulatory agencies are susceptible to capture (see Hazlett op. cit.). Ideally the enforcement of the new law should have remained exclusively in the hands of the existing courts. Alternatively, the law could have contemplated exclusively private alternatives (e.g. arbitration, mediation, private courts) for conflict resolution. See Benson (1990).
[39] *República de Guatemala. Código Civil, Libro II, De los Bienes, de la Propiedad y demás Derechos Reales, Título III, Usufructo, uso y habitación.*
[40] This scheme to extend the life of the TUF, while practical, carries some risks (e.g. a future change in the law).
[41] The TUF is not a licence, it is a right. A licence gives the licensee a specific permission to do so and so. A right simply defines the owners borders.
[42] The law stipulates that the Government may at any moment request SIT to transform reserved bands into regulated bands.
[43] A caveat is on order concerning the information provided by SIT. The information provided by SIT is subject to change. In the past, the information has not been processed and integrated in an orderly fashion. This will merit a revision of the figures provided here.

[44] The peak observed for 1999 suggests that the aggressiveness of the Superintendent may influence the issuance of TUF's. The government of President Alvaro Arzú (1996-1999) had the political incentive to limit radio spectrum supply to hike up the price for the State telephone company (TELGUA), which was finally privatized in 1998 after a failed attempt ten months earlier. The first (failed) auction was held on December 16, 1997. Only one offer was received from TELMEX for $529 million for 95 per cent of shares (5 per cent was reserved for the workers of TELGUA). The company was sold in a second auction held 1 October 1998. Luca, SA, formed by a group of local and foreign entrepreneurs, bought the State company for $720 million. Ironically Luca, is now owned by TELMEX. In 1999 a new Superintendent entered SIT, José Toledo, who understood the spirit of the law and unleashed the radio spectrum much more aggressively than during the previous three years. In a personal communication with the author, Mr. Toledo indicated that he received considerable pressure to stop the auctions from key figures of the ruling party; however President Arzú supported his actions. Also see Ibarguen (1998), 149-162.
[45] The SIT inventory of frequencies has annotated in its registrar the endorsements in favor of Citibank N.A. (Guatemalan Branch) for the TUF's which belong to Telefónica (one of the mobile telephone operators). Also, José Toledo (personal communication, October 3, 2001), former Superintendent of SIT (1999-2000), said during an interview by the author that he knows of at least two instances where local banks have given loans with TUF's used as collateral.
[46] Idem.
[47] Eduardo Mayora A. (personal communication, October 27, 2001)
attorney-at-law and legal advisor to TELGUA, S.A.
[48] One important incentive is the limited discretionary power of the regulatory agency. While private companies frequently complain about SIT's impotence, the very positive effect is that capture risks are reduced (albeit not eliminated) and private parties are "forced" to work out their problems by themselves.
[49] Manufactured by ICOM Inc. from Japan.
[50] Data from Pyramid Research and author estimates (2003).
[51] In 1999 TELEFONICA introduced free incoming calls before signing up the impending Calling Party Pays (CPP) agreement with TELGUA. Unsurprisingly TELGUA opted out of the CPP negotiations with all operators. Guatemala is one of the few markets with free incoming calls and no CPP contracts.
[52] Data from Pyramid Research, Population Reference Bureau and author estimates (2003).
[53] Data from Pyramid Research, Population Reference Bureau and author estimates (2003).
[54] Certainly the radio spectrum allocation reform of Guatemala was far from perfect. Along the way we have learned important lessons from the reform's flaws: (a) The enforcement of the new law should have remained exclusively in the hands of the existing courts in order to evade capture and unnecessary discretionary power of the regulatory agency; (b) The number of grandfathered frequency bands by the State telephone company, besides being prime real estate, was excessive; (c) The duration of the usufruct title should have been the maximum allowed by the Guatemalan Civil Code, i.e. 50 years (d) While the Guatemalan Constitution provides for market price compensation for the expropriation of property rights, the reform bill should have included an expropriation clause, possibly following the proviso included in the Chilean pension reform 20 years ago. Therein the government must pay the holder of the retirement account being expropriated the present value of future cash flows expected. See Piñera (1996).
[55] The municipal dump managed by private garbage collectors.
[56] See Mises (1998), p. 264.
[57] See Huber (1997), p. 206.
[58] See de Soto (2000), p. 6.
[59] Ibid, p.48.
[60] Think of the possibilities of changing the status quo: "By making assets fungible, by attaching owners to assets… and ownership to enforcement, and by making information on the history of assets and owners easily accessible, formal property systems converted the citizens of the West into a network of individually identifiable and accountable business agents. The formal property process created a whole infrastructure of connecting devices that, like a railway switchyard, allowed assets (trains) to run safely between people (stations)… Property's real breakthrough is that it radically improved the flow of communications about assets and their potential. It also enhanced the status of their owners, who became economic agents able to transform assets within a broader network." de Soto, ibid, 58-59.

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