

Telecommunications in  
Brazil

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Brazil is a large country in terms of both area (with 8.5 million square kilometers, it is slightly smaller than the United States) and population (over 160 million in 1995). Its telecommunications infrastructure is one of the most advanced among industrializing nations, although at the same time teledensity and accessibility is low. Brazil's telephone system deteriorated considerably during the 1980s and early '90s due to a prolonged economic crisis, and is only now recovering.

In the early 1980s, Brazil entered a democratic period following decades of authoritarian rule. The inauguration of the Collor administration in March 1990 promised to propel Brazil toward a neo-liberal political economy. Collor's removal from office by impeachment proceedings in 1992 was viewed by some as demonstrating the strength of national democratic institutions. Others saw it as

demonstrating the extent of political corruption and economic uncertainty.

In any case, the economic policies of the Collor administration represented a break from the past, and continued to influence policy during the current administration of President Fernando Henrique Cardoso. Pressured by federal budget deficits and high inflation, the Collor administration set out, as part of its economic liberalization campaign, to radically reform telecom institutions and markets. The relaxation of laws regarding private and foreign participation in Brazil's constitutionally mandated state monopoly in telecommunications was a cornerstone of the reform. Much of the reform was derailed, but President Fernando Henrique Cardoso revived the discussion of plans for telecommunications reform in 1995 and 1996. In January 1995, the Communications Ministry announced it was again preparing legislation to reorganize the phone companies and allow competition from private firms. Since then, the legal groundwork for liberalization and privatization have been laid, although as yet there has been little change in the monopoly position of the dominant public telecommunications service providers.

Nonetheless, privatization and legal reform promise to radically transforming Brazil's telecom landscape by the next millenium. A more open economy is certain to emerge, but it is difficult to anticipate how long the

transition will take and how open the markets will ultimately become. There is, however, little doubt that the emerging political economy will be quite different from the previous one based on import substitution.

## 1 Historical Background

Modern communications in Brazil dates to 1851 when the Ministry of Justice decided to replace the optical telegraph with an electric one. The first public telegraphic network was inaugurated in Rio de Janeiro, then the capital, a year later. By 1855, the network had 20,000 kilometers of lines and, a year later, the first long-distance line connected Rio to Porto Alegre, the southern-most state capital, a distance of over 1100 kilometers. In 1874, a submarine telegraphic cable was completed connecting Rio to Salvador, Recife, and Belém -- all ports along the coast to the north.

A maintenance workshop was created by the government telegraphic agency in April 1865, and by the 1880s efforts were being made to make replacement parts, but until 1917 there was no communications equipment production in Brazil. Father Landell de Moura performed experiments with

radiotelephone, reportedly several years before Marconi. In 1900 he obtained a Brazilian patent for a telephone with and without wires, and received three patents in the United States covering a wave broadcaster, wireless telephone, and wireless telegraph. For a brief discussion of the early equipment industry, including Moura's pioneering technical achievements, see Capellaro (1989).

In the 1920s ham radio operators began assembling the first Brazilian radio equipment based on international designs. In 1926-27, Radiobrás, controlled by RCA International (Paris) installed the first shortwave transmitter. During this period, the first 15 radio stations were built, mostly foreign and with imported equipment. This created incentives for the emergence of a local radio industry. In 1927 Radio Record was the first non-foreign radio station to use equipment built locally, although from imported parts.

The growth of the Brazilian economy in the first decades of the 20th century created a market for equipment which was addressed in the early 1930s by at least a dozen local manufacturers, including Standard Electric SA (SESA) and the Companhia Marconi Brasileira. SESA was controlled by ITT, which also controlled the International Standard Electric Corp (ISE), charged with technical support of the automatic switching exchanges of the ITT European group in Brazil. Other major foreign firms included Ericsson and Companhia Brasileira

de Eletricidade, controlled by Siemens, which in 1913 installed several radiotelegraphic stations at Army forts. In the late 1930s the Army began to manufacture its own field telephones, radiotelegraphic stations and small telephone switching stations. Small national private companies also manufactured communications equipment for several other government agencies.

Actual and potential disruptions of imports during World War II created conditions for the development of a local electronics equipment industry, including communications equipment. Military fears of supply interruptions led to the development of a few communication projects in cooperation with academic institutions and the upgrading of the development and manufacturing capabilities of military R&D and maintenance centers.

During the second Vargas government (1951-54), mounting incentives for import substitution were successful in attracting (or forcing) international firms to establish equipment assembly operations using imported kits.

## 1.1 Early Postwar Operating Companies

In the two decades following the end of World War II, the communications system expanded rapidly, in conjunction with the growth of the Brazilian economy. However, this expansion was constrained by the power of local and state authorities to grant communications services franchises. This led to an incredibly fragmented market, with over 800 national and foreign private concessionaires. Unrealistically low tariffs also contributed to reduced investment and sluggish growth of telegraph and telephone traffic. Thus, in 1957 Brazil's teledensity of 1.3 per 100 inhabitants was just over a third of the world average of 3.7. [We report on in this chapter. We should note here that the Brazilian data sets are contradictory and incomplete. The data presented represents the author's best judgement on which numbers to believe - even if admittedly the data is not entirely internally consistent.]

In 1960 there were around 1 million telephones for 70 million people. Two-thirds of the equipment and traffic were concentrated in the states of Rio de Janeiro and São Paulo, where most of the economic activity and population have been centered, and which thus accounted for the majority of the traffic. Foreign firms dominated the key markets, with Companhia Telefônica Brasileira (CTB),

controlled by a Canadian holding company, Brazilian Traction Light and Power, servicing around 70 percent of the 1.5 million telephones in the country, and handling 80 percent of the traffic in 1968.

The telegraph sector was dominated by Western Telegraph & Telephone. Cable & Wireless, based in the UK, was the other major company. After 1947 telegraph operations gradually came under state control, foreshadowing the state's greater involvement in the communications sector in the 1960s.

International telephone service was split among four firms Radional/ITT, SUDAM/Alcatel, Radiobrás, and Italcable. Their concessions expired between 1970 and 1973, when international service came to be monopolized by the state company Embratel.

## 2 A New Order

In 1962 Law 4,117 (Brazil's Telecommunications Code) was decreed as the basis for the evolution of a new institutional regime and re-organization of the system. The Code granted the state a monopoly in the operation and regulation of telecom activities. It also created the National Telecommunications Council (CONTEL)



to develop a National Telecommunications Plan aimed at unifying and modernizing the system by reducing market fragmentation and rationalizing equipment supplies. Important provisions included setting more realistic tariffs and approval, in November 1963, of a National Telecommunications Fund (FNT) financed by a 20 percent surtax on local calls and 30 percent surtax on long distance calls.

The Brazilian Telecommunications Enterprise (Embratel) was approved at the same time, but perhaps because of the political instability generated by the 1964 military coup, Embratel was not actually established until September 1965. It is a mixed-economy enterprise whose shareholders initially were the federal government and large public enterprises, including the national oil company (Petrobrás).

Embratel's initial objectives, to be financed from the FNT, included implementing and operating domestic and international telecom trunk operations, developing linkages enabling the integration of the country's northern-most region (the Amazon) into the national system through a microwave trunk network, and regulating telecom services.

In 1967 the regulatory function was transferred to the recently created Ministry of Communications (Minicom). Minicom's mission was to solve the

significant problems that continued to limit the development of Brazilian telecommunications, such as the large number of concessionaires, outdated and incompatible equipment, and congested lines. These problems had continued to plague the system in spite of efforts made in the 1960s, including a doubling of the number of telephones.

As part of a Minicom-led rationalization effort, in 1968 the federal government acquired the largest foreign telephone concessionaire, Companhia Telefônica Brasileira (CTB) and gradually took control of most telecommunications operators in the country.

## 2.1 Telebrás

Telebrás was created in November 1972 to plan and manage the development of the national telecommunications system. As part of this, most of the federal government's ownership of Embratel, and hence the task of coordinating its activities, was transferred to Telebrás. To rationalize the supply of equipment, create scale economies for local production, and standardize networks for national integration, at the time it was established, Telebrás was given a monopsony in the purchase of telecom equipment, which it allocated to the pole companies.

Telebrás was also assigned the task of developing a national telecom R&D strategy, centered in the Centro De Pesquisas e Desenvolvimento (Center for Research and Development, CPqD) created in 1976, and in three training centers.

Established as a public enterprise, initially 80 percent owned by the federal government, by mid 1992 about half of its stock, which trades on the São Paulo exchange, was in public hands as a result of sales of shares to purchasers of telephone lines as a way of financing the system's expansion.

By 1973, through a series of purchases and mergers, Telebrás had drastically reduced the number of firms operating telephone networks to 37 major ones, about one and a half for each of Brazil's states. Telebrás often held a

majority interest in these consolidated firms. State governments had substantial control over management of the majority of operating telcos -- generally called pole companies. For convenience, this chapter will speak of Telebrás owning or controlling pole companies although limits on both, because of other owners and the management interest of the state governments, have made the pole companies more independent than, say, the pre-divestiture Bell operating companies were of AT&T.

In 1982 the number of pole companies affiliated with Telebrás was 36. The number of independent private service providers, about 1,000 in 1972, had been reduced to 150, with only 250,000 telephones. In 1992, Telebrás accounted for over 90 percent of total telephone lines through its control of 27 pole companies.

## 2.2 Financing Expansion

In the early 1970s, with the mission of expanding the country's telephone system, the newly established Ministry of Communications devised a scheme to make up for Telebrás' lack of investment funds. The final user was, and still is, required to

provide the cash for network expansion. Typically, to get a telephone, the prospective customer signs up with the local Telebrás affiliate and pays (in 1992) the equivalent of US\$4000, which could be financed. Within a year, the customer is to receive Telebrás stock equal in value to the payment. The local telco has up to two years after final payment to actually install the telephone line and give the customer a telephone set. This approach compares to that used in Japan, where subscribers were required to buy bonds in the government-owned phone company.

### 2.3 Embratel's New Role

In this new regime, Embratel was charged with the implementation and operation of the system, including the sale of a variety of trunk services in data, voice, and image communication for regional companies, television networks, naval communications, and so forth.

The growth rate of new capacity jumped from 3 percent per year in 1965 to 15 percent in 1969. By then, all major cities were connected through a microwave network and the Amazon region was linked to the rest of the country by a tropodiffusion (microwave) trunk system. The international calling system

was revamped in 1969 with the installation of an INTELSAT earth station in Rio. After 1974, Embratel partially replaced its shortwave radio telephone system with a line-of-sight system of microwave towers, and then with terrestrial satellite stations using a leased INTELSAT transponder. International communications were greatly improved when new submarine cables were installed to expand connections to Europe (in 1973 and 1983) and the United States (in 1980).

By the late 1980s, Embratel's major activities were operating the terrestrial microwave network linking Brazil's major cities and the domestic and international long distance satellite network, which consisted of two national satellites and 38 earth stations. There are also terrestrial links with Uruguay, Paraguay and Argentina. Since 1984 employment has been around 12,000.

#### 2.4 Promoting A Domestic Equipment Industry

Through its monopsony purchasing power, standardization rules, and with a long-term strategy for acquiring technological capability, Telebrás promoted development of domestic equipment manufacturing. Initially, its R&D activities centered on training personnel and defining promising research areas, implemented from 1972 with the selection of five university groups to conduct

research in areas relevant to future telecom systems. These mission-oriented contracts included pulse code modulation (PCM) and stored program control (SPC) technologies, as well as fiber optics and microelectronics. In early 1972 the Planning Ministry (Miniplan) had asked government agencies to propose sectoral R&D projects for what would become the first National Basic Plan of Scientific and Technological Development (I PBDCT). Telebrás took over these plans when it was created.

Ericsson had started local manufacturing in 1955 after the largest operating telco, CTB, although foreign owned, sought to promote domestic production with the assistance of a government executive group. The availability of cheap labor and the possibility of an almost captive market provided great incentive for the venture. Other major foreign firms followed, NEC (1968), Siemens (1970), and Philips (1974).

Shortly after it was created, Telebrás ordered about 1 million lines, divided among Ericsson, SESA and Plessey. Ericsson was rewarded for having started local manufacturing well before the others. It received the award for modernizing the São Paulo system, the largest market.

In the mid 1970s, with an eye on technological changes in the telecom equipment market and with the objective of protecting its R&D investments,

Minicom reserved, through a series of regulations, half of the market for Stored Program Controlled exchanges (SPC) for the TDM/PCM technology being developed by CPqD. The remaining half was allotted to analog technology, which could be imported or manufactured by the foreign firms that had recently been required to take on Brazilian partners for their local operations. Until a domestic technology was developed, however, the market was to be divided among the 'localized' firms led by Ericsson and Standard Electric (ITT), which together accounted for 70 percent of installed telephone lines in 1979.

Import restrictions on computers and other high technology products, a vestige of the import-substitution industrialization strategy of an earlier era, began to fade in the 1990's, although remnants remain. The more competitive local market has accelerated the introduction of new networking products, to the benefit of diverse sectors of the Brazilian economy.

### 3 Telecommunications under II PND

In 1974 when the Geisel administration came to power, a very ambitious telecom strategy was defined within the broader Second National Development Plan (II



PND). One of the goals was to increase by almost 200 percent the number of telephones in use by the end of the decade.

At that time, the institutional structure of regional operating companies controlled by Telebrás was consolidated. This gave Telebrás greater leverage to launch a more aggressive import substitution policy, drafted in 1975, which aimed to reserve the market to national producers of equipment.

In the task of formulating industrial policy for the sector, Minicom was aided by the Executive Group for the Devices and Materials Industries (Geicom), an interministerial think tank charged with industrial studies for the development of a domestic communications equipment industry. Geicom's task was to coordinate and promote domesticizing production through studies and contacts with manufacturers and suppliers. At first Geicom sought to identify and organize the demand for inputs and components, and then it sought to influence other government institutions to provide incentives for the development of a network of national suppliers.

Under its five-year investment plan, begun in 1975, Telebrás was charged with providing authorization for all imports and public procurement orders for telecom equipment and with promoting the domestic industry. However, under pressure from foreign firms already established in the country, a compromise was

found in the 'localization' of foreign firms through their association with Brazilian financial groups: Siemens-Equitel, Ericsson-Matel, ITT (Sesa)-Unipec; and NEC-Brasilinvest.

Under Minicom's executive order 622 of June 1978, in order to qualify for bidding on Telebrás projects foreign firms had to cede 51 percent voting control to national groups and develop effective technology transfer mechanisms for their partners. The local partners were given preferred shares with the requisite voting power, but contributed only 17 percent of the actual capital.<sup>23</sup> Despite earlier import-substitution efforts, until this step, practically all high-tech and large equipment was imported. But from 1978, local production began to take off.

In the end, the association between Ericsson and Matel, controlled by the industrial holding company Monteiro Aranha, was the only one that effectively achieved the transfer of digital technology. This partly explains its selection for the manufacture of the digital exchange AXE in 1979 (the first of which was installed in 1982) and its enduring close relationship with Telesp, the pole company in São Paulo, which comprises about 40 percent of total Brazilian telephone traffic. Ericsson provided over 58 percent of the 1.2 million lines contracted by the National Telecom Plan.

Siemens, whose Brazilian operations mostly involved assembling

crossbar-type exchanges, was not selected as a manufacturer of electronic exchanges in the 1978 competition. However, it was selected in 1981 when it associated with the Brazilian industrial group Hering. SESA, with Plessey technology, was selected along with Ericsson in the 1979 National Telecommunications System bidding for digital exchange equipment. ITT sold SESA to a Brazilian investment firm, Brasilinvest, in 1981 as part of an overall divestiture strategy and in the face of more new Brazilian rules. Rights to crossbar, but not electronic digital technology, were included in the sale. Also in 1981, Brasilinvest took control of NEC do Brasil. SESA was later renamed Telbra and then Standard Eletrônica.

Minicom's policy succeeded in the 1970s in expanding the network significantly, particularly in the last half of the decade. The number of lines in service more than doubled from 1973 to 1977, and had more than tripled by 1980, when it reached 4.7 million. During the five years 1976-80, over 500,000 lines a year were being placed in service.

Just a few years after the beginning of its R&D program in the early 1970s, Telebrás began transferring technology to local firms, which also became involved in the development phase of several projects. For example, in 1975 a firm was contracted to develop a satellite parabolic antenna and a few years later another was selected to develop a push-button telephone set.

Throughout the 1970s Telebrás had gradually reduced dependence on international suppliers in a context of rapidly growing demand, the emergence of new services, and a technological discontinuity in production (from electromechanical to digital). By the end of the period, the Brazilian telecom system had attained a level of service sophistication and quality without par among developing countries.

'Localized' foreign firms in association with Brazilian partners accounted for over two-thirds of sales in Brazil's telecom market in 1981. They were followed by several smaller local companies which produced peripheral equipment and small exchanges, often with technology developed by Telebrás' R&D center, CPqD. In 1982 domestic communications equipment production reached US\$776 million. Imports were about US\$100 million, just one-third their all-time high in 1975. Aided by Geicom's gradual nationalization and import-substitution policy, by the mid 1980s 'localized' foreign manufacturers could

count on a network of some 1,200 domestic suppliers of parts, components and materials.

By the end of the 1980s, the market share of equipment developed by CPqD, representing about 40 percent of total purchase of domestic equipment by the SNT, was \$200 million, at competitive prices. For example, about 20 percent of the telephone lines contracted out by Telebrás in 1987 were based on the CPqD-developed Trópico system. By the end of 1991, there were at least four Trópico-RA digital exchanges in operation, manufactured by STC (Sharp group), Standard Eletrônica, Elebra (Alcatel) and PHT (Promon). In microelectronics, a dialing circuit to be used in the Brazilian standard telephone set was developed for a potential market of one million chips a year.

Incentives to domestic companies led several large industrial, media, and financial groups to enter the telecom market during the early and mid 1980s. Among these were the Globo media conglomerate, which owns Brazil's largest television network, in association with NEC do Brasil, and Bradesco, Brazil's largest private bank. Several other groups also sought to profit from the growth opportunities in the market, so that by 1990 a large number of national telecom firms were part of diversified conglomerates or holding companies.

All this has contributed to a declining degree of concentration (measured

as the share of the market held by both the 4 largest and the 10 largest firms). Moreover, small firms have been gaining important niches. At the same time, the 10 largest local producers (those at least 70 percent owned by Brazilians) have gained share. It should be noted that the 4 largest firms are all affiliates of foreign companies (Ericsson, NEC, Siemens, and ZTT).

#### 4.1 The Heyday of Telecom R&D

Virtually all basic telecom R&D in Brazil is conducted by or in association with Telebrás, mostly at its R&D center, CPqD, which opened in Campinas (São Paulo) in 1979. In 1992, CPqD employed 1300 people, 70 percent of whom worked for Telebrás or university-based foundations involved in joint projects, and 30 percent for domestic firms involved in joint development projects with CPqD.

In the early 1990s the Telebrás System was investing 2.5 percent or more of its net operating revenues in R&D. Since 1985 the CPqD has by law received 2 percent of revenues, and the rest is distributed among the R&D centers of the pole companies. Under a 1988 ministerial order, at least 5 percent of Telebrás' annual R&D budget has to be spent at university research institutes or on small- and medium- enterprise-initiated projects.

In 1990 CPqD's budget was US\$60 million, distributed between 53 different projects for new equipment production in cooperation with 22 firms and 13 academic research teams. Projects include the development of a smart telephone (Intelitel) for the ISDN network under development; a large telex text exchange (Cetex) (equivalent foreign products cost three times as much); a multifrequency data communications system via satellite based on Time Division Multiple Access (TDMA) technology (Samsat); and optoelectronic devices for fiber optics communications. Over 100 local firms take part in CPqD's Product Technology Program, which gives them preferential access to technical reports, qualified components lists, and updated packaging norms.

CPqD had generated over 350 patents by 1993, and contributed to about 400 smaller projects at the pole companies. Many of these developments were transferred to domestic firms, helping them take a 50 percent share of the local telecom equipment market in the early 1990s. CPqD developed 79 products in its laboratories and transferred them to 66 local firms, generating about US\$1 billion in revenue for them. Despite this local preference, Brazil's telecom equipment market was relatively open to imports compared to those of such developed nations as Japan, France, Italy.

Telebrás' flagship project is the Trópico family of digital exchanges

employing stored program control (SPC) technology. In 1990 tenders, Trópico equipment outsold the equivalent Ericsson system 4 to 1. Moreover, Trópico brought down the average price per line from US\$670 for a digital exchange (Ericsson's AXE with 4000 lines) to US\$450. Between 1976 and 1990 US\$37 million was invested in the development of the Trópico-RA central digital exchange and total development costs for the entire family of exchanges was on the order of US\$237 million, including training personnel at the University of São Paulo. The Brazilian development cost was less than half that of the cheapest other digital exchange, the AXE, developed in the 1980s by Ericsson.

## 5 The Crisis of the 1980s

The crisis that hit Brazilian telecommunications in the 1980s had its roots in the mid 1970s. Maintaining successful development of domestic firms and research capacity required continuous effort to keep up with the rapid technological change characteristic of information technologies.

In 1975 the FNT, the pool of money collected as surtaxes on telecom services, which had financed a sizable share of investment in the sector between



1965 and 1975, was removed from the direct control of the Minicom. As a result, public procurement, which until then had accounted for 80 percent of foreign firms' revenues, was drastically reduced. The FNT was finally abolished in 1982.

Still, over the seven years 1974-80 the number of telephone lines increased over 18 percent a year, and local production capacity reached 1.1 million lines in 1980.

However, after reaching a demand of of 1 million equivalent-lines as measured by the number requests for telephone services in 1975, the public network's expansion was slowed by a succession of economic problems, including the second oil crisis, the debt crisis, and finally a galloping and persistent inflationary spiral through the 1980s. These problems were reflected in the fall in demand to 700,000 equivalent lines in 1976, followed by a further slide to only 450,000 for the next decade, less than half the level of 1980. In 1986 and 1987, demand experienced a slight recovery to 635,000 and 987,000 equivalent lines, but the following year it fell again to 630,000.

The number of new lines installed reached a peak in 1978, and there has not been a sustained telecom investment program since. Around then, the Telebrás system began to decline due to repeated government raids on its cash and revenue to help offset the mounting state deficit. Although in the early 1990s

investment levels have equaled those of the mid 1970s, the market had continued to expand. It is estimated that in 1990 there was a US\$2.4 billion gap in the Telebrás system budget, representing the funds necessary to install the 1.2 million lines sold but not yet delivered. System growth in the 1980s was uneven and telecom investment as a share of GDP, just over 1 percent in 1976 and 0.73 percent in 1978, was in a 0.4 to 0.5 percent range during most of the decade.

### 5.1 Telebrás in the 1980s

After the consolidation of the 1970s, Telebrás fell prey to the politics of the early 1980s, which increased the power of state governments and the federal Congress. Little by little, the professional management and technical staff of Telebrás, already threatened by imposed short-term financial management, became victims of widespread clientelism, with high levels of inefficiency and mounting bureaucratization (traditional public service agencies). This pressure intensified after 1985, when the Sarney government replaced top level professional management with political appointees, part of a larger game of political maneuvering.

The stagnation and decline of Telebrás in the 1980s was part of a larger

deterioration of the government and its policy framework, reflecting the difficulties of fashioning a functional democratic system, with effective checks and balances, out of what had been a military-authoritarian system. (Stepan (1989) provides a review and analysis of Brazilian political history.)

Telebrás became unable to keep pace with demand and the quality of its services declined. This was exacerbated by the ongoing economic crisis and by the persistent lag of rates behind inflation -- during the 1980s tariffs declined 80 percent adjusted for inflation.

## 5.2 Price Distortions

The requirement that a new customer make a lump sum payment to fund network expansion is a critical part of the distortion in telecom service pricing in Brazil.

In the early days, it was considered innovative, as Telebrás could count on an urban and increasingly affluent population to provide cash for expansion.

However, low-income users generally were unable to gain access because of their lack of capital. The inflationary environment of the 1980s limited the ability of even the middle class to pay, reducing the rate of subscriber growth.

Prices for most services have remained extremely low by international

standards. Although charges for international calls have been high relative to other nations (in early 1992 it cost about 4 times as much per minute to call from Brazil to the United States as from the United States to Brazil), tariffs for local calls and basic subscription are underpriced and heavily subsidized. As a result, the number of lines desired by customers but not yet installed continued to increase, jumping from 6 million in 1987 to 9 million in 1988.

Rates have been repressed as part of price control programs to reduce inflation. For example, in 1984 the average price of Embratel service, adjusted for inflation, was 42 percent lower than in 1981. For Telebrás, tariffs dropped 45 percent in real terms between 1985 and 1991. These declines were not due to improved efficiency and lower operating costs, but rather to political constraints. As a result, investment capacity declined precipitously. When the brief recovery of the mid 1980s increased Embratel's traffic by 30 percent, the system quickly became congested. Embratel revenues from long distance and international calls are usually transferred to pole companies at the rate of 90 percent for the former and 120 percent for the latter.

The majority of the VHF television band has already been allocated to the existing national networks (Globo, Manchete, SBT, Bandeirantes and public educational channels). In the UHF band there are still about 90 channels available which will be distributed through a lottery.

Because of very high levels of illiteracy and semi-illiteracy, television and radio have much larger audiences than newspapers and magazines. TV reaches more than 35 million sets, with more than 100 million viewers or 75% of the population, and radio extends even further. TV advertising volume is among the top five in the world, with the State accounting for 40% of it (Perrone 1992).

Brazil's unique telenovelas (soap operas) are exported to over 100 countries, demonstrating the technical and commercial quality of this product (see Duarte, Straubhaar and Stephens 1992). US programs may be more appealing to the middle class and elite, but telenovelas serve the cultural and entertainment needs of the majority with their variety of themes, ranging from romantic affairs to historical dramas.

The diffusion of TV and radio among low-income groups, as well as to the most remote areas of the country, gives these media significant political importance. For the majority, the possibility of being informed is limited to them. Their potential to serve as political weapons is well known, and is alleged to be

responsible for radically transforming power structures, as in Eastern Europe. Quite conscious of this, the Brazilian elite has been attempting to use them to maintain the status quo.

Radio stations generally have only a regional political impact. The granting of radio concessions is frequently the subject of intense disputes amongst local authorities and political leaders, and are managed by political factions through a bargaining process and coalition building.

The television market is dominated by the Globo network the fourth largest television network in the world, with interests in TV, newspaper, printing, electronics, and cellular franchises, e.g., in Rio and São Paulo. Its TV arm has the most advanced technology, enabling its stations to reach even the most remote parts of the country with a strong signal, and the most sophisticated programs, including prime-time telenovelas as well as news programs, variety, and comedy shows. These help give it a 60 to 80 percent audience share and 70 percent of total advertising revenue (Straubhaar 1991). The group's original success can be traced to efficient management, which combined professionalism, decentralized decision making, technology transfer from US networks, and a market strategy that enabled it to reach all audience segments. Stable control by the Marinho family has enabled Globo to plan for the long term.

Globo has substantial political influence because of its economic strength. Indeed, it is reputed to have influenced election outcomes and even social movements. Even when there was a mass movement calling for presidential elections in 1984, with enormous numbers of citizens taking to the streets, Globo news coverage -- the sole source of information for many millions of Brazilians -- ignored the demonstrations. Globo paved the way for Collor's 1990 election as president by portraying him as a young, energetic governor who was aggressively confronting the traditional political elite and corruption.

More recently, Globo entered into alliances with Grupo Televisa of Mexico and Denver-based TCI, as well as with AT&T and Bradesco, Brazil's largest private bank, to enter the direct-to home satellite TV business and to bid in the coming privatization of the Brazilian telephone system, respectively.

## 7 The Emerging Telecom Regime

Brazil plans to have 25 million lines installed by the year 2000, 75 percent of which are to be digital. In the period 1992-95, Telebrás plans to invest US\$3.5 billion and install 4.2 million new lines, for a total of 13.5 million. However, in light of the 6 to 9 million line backlog, critics say the number of installed lines

will have to reach 20 million just to eliminate the backlog. In 1991, 310,000 lines were installed and by the end of that year.

During the second half of the 1980s the quality of telephone service declined considerably. Failed local calls, already above average by international standards in 1980, increased to 25 percent of all calls in 1990. Crossed lines -- jokingly referred to as free conference calling -- and wrong numbers also continued to increase. At the end of 1990, 30 of 100 calls between Rio and São Paulo did not complete. Overall, the direct dialed long distance call completion rate fell from 49 percent in 1986 to 41 percent in 1990, and the chance of even getting a dial tone fell from 95 percent to 88 percent.

In 1990, installation of a line in Brazil cost US\$4570 against an international average of US\$2500, partly due to the higher prices of telecom equipment in Brazil (Hobday 1990, p 184-85). The cartelized manufacturers of telephone exchanges argue that the cost per line is high because they are forced to buy locally a number of inputs and components, such as copper.

The Collor administration used such evidence to call for a revolutionary liberalization of the sector, which would include a complete opening of the market to foreign companies, breaking-up of the state monopoly, and privatizing Telebrás and Embratel. Supporters of a nationalist view replied that the existing



institutions were quite capable of meeting the market, technological and industrial challenges until their investment capacity was undermined by the tandem of spiraling inflation and tariff adjustment lag. They claim that had it not been for the nationalist policy, geographic coverage would not be as widespread as it is, a domestic equipment and service industry would not have emerged, and the technological capability for domestic production would not have grown over the past two decades.

#### 7.1 Opening Procurement

Liberalization and deregulation have affected public procurement of telecom equipment. In June 1990 the market reserve for large switching systems was terminated. Since the early 1980s this market had been divided between NEC do Brasil, Equitel, and Ericsson. They benefited from a reserve of over 2 million lines. However, in 1991 AT&T was awarded an US\$85 million contract by Embratel to install a new submarine cable between Brazil and the United States, with a digital switch located in Rio.

The Collor administration implemented decisions to import optical fibers and to allow foreign firms to manufacture in the country, threatening the future of

domestic producers of fiber, which use technology developed by Telebrás' CPqD. Until 1988 Brazil had only one manufacturer of fiber cable, ABC Xtal. However, because of strong demand, Telebrás had authorized imports from Philips during 1988-89. The market was opened in 1990 when fiber optics was removed from the defunct Special Secretariat of Informatics (SEI) list of products to be protected by a market reserve until October 1992.

Another noteworthy development is the emergence of regional cooperative projects, particularly the Mercosul agreement to create a Southern Cone Common Market among Brazil, Argentina and Uruguay. The Mercosul agreement was ratified by the Brazilian Congress in 1991. There has been substantially increased trade, particularly between Brazil and Argentina, the two largest economies of South America, which heretofore had quite low levels of interaction. As part of the agreement, the three countries have agreed to build a US\$92 million fiber optic submarine cable to link them by 1994.

## 7.2 Aborted Reform

The Collor administration, inaugurated in 1990 with a liberalizing ideology, set out to effect profound changes in Brazil's political economy. Pressure for change came from the challenges of dwindling investment capital, the state's fiscal crisis, rising repressed demand, and declining quality of services generally, as well as the administration's recognition of telecommunications as a key infrastructure which must be enhanced for the government's economic strategy to succeed. The administration advanced its strategy for the sector in its March 1991 National Deregulation Program.

Any proposal for change in the existing structure must confront the state monopoly over basic telecom services. This is decreed by the Brazilian Telecommunications Code of 1962 and by the 1988 Constitution, which has been in the process of revision in 1995.

One of the linchpins of Collor's liberalizing strategy towards telecommunications was Decree 99.179 of March 1990, which allowed private capital to provide information services, private telecom exchanges in residential and business buildings, community telephone programs, and cellular mobile phone services. The same month, the administration abolished the Ministry of

Communications (Minicom) and created the National Communications Secretariat (SNC) under the Ministry of Infrastructure. (SNL was reestablished/renamed Minicom after the collapse of the Collor regime in 1992.) Then, in mid 1990, the government issued, as part of the so-called Collor Plan I, a provisional measure (Medida Provisória 151) stating objectives of:

- 1 Regionalizing management of the Telebrás system, with the creation of 7 (versus the current 28 regional pole companies) regional operating companies, resembling the Baby Bell institutional model.
- 2 Opening telecom services markets -- including long distance service, cellular mobile phones, paging, cable television, telecom infrastructure development, and private data services -- to private domestic and foreign companies.

The basic services monopoly was preserved, and state companies were allowed to compete in the value-added services market.

Opponents argued that the measure contravened the state monopoly over telecommunications embodied in the 1962 National Telecommunications Code and 1988 constitution. The Collor administration chose to interpret these legal

provisions liberally. In its view, there is no link between the concession of a right to operate a telecom service and the ownership of equipment or network used. Thus equipment and networks can be installed, leased, franchised, or operated by the private sector. The government expected the liberalization measures to attract upwards of US\$1 billion dollars in new foreign investment for the sector.

Despite strong opposition from the center-left political bloc in Congress, the measure was approved, although with the suggested creation of two regional companies in the Northeast instead of one and preservation of the status quo regarding Embratel. However, because the management and operation of local operating companies is a clientelist bonanza for local politicians, implementation never took place.

### 7.3 The Possibility of Privatization

In the first two years of the Collor administration (1990-91), sensitive sectors such as oil (Petrobrás) and telecommunications (Telebrás) were excluded from the privatization program. They were considered sacred cows not to be touched, lest opposition from nationalists derail the entire liberalization agenda. By early 1992, however, a new public attitude appeared to emerge, and the debate over

privatization of telecommunications began in some earnest, although political instability slowed it down and gave it muted tones.

Because Brazil's 1988 constitution does not allow for outright privatization of public utilities such as Telebrás and Embratel, a constitutional amendment is required.

There is also the problem of how to value a company like Telebrás, which practically controls Brazil's national and international telecommunications. In 1989, strapped for investment capital, Telebrás sold US\$450 million in debentures convertible into stock equivalent to 75 percent of the capital of the company. In mid 1992 estimates were made that privatization could fetch US\$10 billion in international stock markets, but the market value of its stock was only US\$600 million. At the time, Telebrás had fixed capital estimated to be worth upwards of US\$8 billion.

The agency in charge of privatization, the National Bank for Economic and Social Development (BNDES), pushed for a revaluation of Telebrás' capital, not including its debt, with the objective of making it more attractive to foreign investors.

Some critics have suggested a mechanism for the government to recoup part of the US\$5.5 billion "loss" resulting from the 1989 debentures sale. They

propose privatizing the pole companies without revaluing their capital base, so that the difference between the historic value and the sale price would be taxed, bringing into the government coffers a considerable sum of money.

#### 7.4 The Regional Companies

At the local level, emerging entrepreneurial companies and state governments are already taking advantage of opportunities created by the regime changes. The regional (pole) companies, particularly the larger ones in the southeastern region (Telesp, Telerj, Telemig, Telepar) have sought a role in determining policy. Traditionally, the pole companies have provided private residential and business lines. Since 1988, they have also installed point-to-point networks within their geographic areas.

In the emerging institutional regime, the regional operating companies are likely to acquire considerable managerial and budgetary freedom from the holding company. Already in 1989, the declining investment capacity of Embratel and the deregulation trend had wrested away Embratel's monopoly over telex maintenance service and modem supply, which were taken over by private companies.

Telepar, the operating company in Paraná state, just south of São Paulo, is investing its own funds to set up new transmission lines, promote data communications services, and otherwise renovate the system. Some of this will be done in partnership with the private sector, as a way of bringing in needed investment funds. The large state operating companies are also busy setting up



their own packet switching and data communications local networks.

Telesp, the São Paulo state pole company, has fought for radical changes in the policy giving Embratel a monopoly on data services. Telesp argues that under the current system Embratel keeps a disproportionate share of operational revenues. It wishes Embratel to become a mere wholesale service provider, or carrier's carrier, to local telcos, which would market services directly to customers within their areas. To this end, it has signed an agreement with Sprint to design a data communications project for its service area.

The city of São Paulo considered legal action to recover control of the management of telephone service from Telesp.

## 7.5 Embratel

Embratel, which operates the basic long distance and international networks, has been preparing to face competitive challenges. However, its investment budget to upgrade and expand the network (US\$650 million in 1991) has been limited by government pressure to reduce the public deficit.

The economic crisis and the emergence of new services (fax, low-speed data communications, public data packet network) threatened Embratel's profitable telex services. In 1989, with 135,000 terminals, Brazil had the world's third largest telex network. As of 1990, telex was responsible for 23 percent of Embratel's total revenues. That year telex traffic growth was just 4.7 percent against an average of 13 percent for the previous five years. Still, the price per minute of telex transmission is about 14 times smaller than the equivalent cost of a telephone line for a fax transmission. Telex traffic began to fall more recently.

In order to respond to technological and market trends, and to prepare for competition in the value-added services segment of the market, Embratel increased its investment in the development of an intelligent network and related services. In the early 1990s, Embratel invested US\$1.2 billion to modernize its long distance network in an attempt to triple the number of long distance lines by 1993. In 1990, on total revenues of US\$1.4 billion, Embratel spent \$900 million for five main services: packet data transmission, private data communication, telex, electronic mail networks, and VSAT. The company plans to install a fiber optic cable between Brazil and the United States by July 1994, and a long distance fiber optic network linking Rio and São Paulo by the end of 1992.

In satellite markets, Brasilsat B1 is scheduled to be launched in May 1994

and Brasilsat B2 seven months later. The \$300 million satellites will expand transmission capacity to meet the rising demand created by the growth of new information services and fax traffic, by increasing the number of satellite transmission channels from 48 to 104.

Embratel has also been restructuring. The company pictures itself as a trunk service provider, leasing lines to more specialized firms in areas as diverse as financial information systems, mobile communications, transportation companies, and cable television. At the same time, Embratel plans to compete in those areas in which it has accumulated experience over the past decade, such as data communications, where it will compete with the pole companies. Its competitive advantage lies in its national network, an important point for large customers with widespread geographic markets (banks, retailing, transportation).

## 7.6 Telebrás

Telebrás had almost 100,000 employees in 1990. During the 1980s it undertook administrative reforms to increase productivity. Between 1985 and 1990 the company reported the number of employees per thousand installed phones fell from 14.2 to 10.0.

In 1990, Telebrás began experimenting with alternative financing sources for the installation of new lines. It now allows regional affiliates to contract out construction of public telephone networks to private groups, including municipal and state administrations. An example of this was provision of 8500 lines in two condominium complexes in the São Paulo area. The deficit of 1.1 million lines sold but not delivered was already reduced to 300,000 lines.

Telebrás has also been expanding its links with the private sector, such as its efforts to promote private investment in the Community Telephone Program (Procom), seeing it as a way to reduce the 6.5 million telephone lines of repressed demand. Under this scheme, the company would be able to expand the network while reserving free cash flow for value-added services and modernization. Private firms would install regional trunk lines, sell the lines to subscribers, and collect user payments through monthly installments from Telebrás subsidiaries.

## R&D in the 1990s

Telebrás' research arm, CPqD, pressured by a shift in industrial policy toward competitive integration into international markets and in order to align itself with the prevailing strategy of similar R&D centers elsewhere, underwent a sharp reorientation in the early 1990s. This included shedding the remnants of import substitution that had informed its strategy for the previous 15 years. The major philosophical change is moving away from tailoring the telecom system's specifications to the products of CPqD's applied research projects. Since 1991 CPqD objectives are:

- 1 Target technological development to the needs of the national public network, such as technical specifications, network architecture definition, etc.
- 2 Be more selective in the development of new products.
- 3 Provide wider and more direct technological support to industry.
- 4 Develop software jointly with operating telcos and other members of the national public network for the automation of operational, planning and evolution of networks.

CPqD now concentrates on development of basic technologies in optoelectronics and microelectronics, technical assistance services to private equipment manufacturers, and involvement in the development of automation routines. Product development projects have become much more selective (Graciosa 1991) and industrial partnerships have become tighter, with participating firms now paying a larger share of R&D costs. An administrative reform had reduced the CPqD's direct staff to 530 employees by 1992.

## 8 Wireless Systems

A key market that has been in the forefront of the privatization debate is the mobile cellular phone market. Planning began in the early 1980s. However, by 1991 only Rio and Brasilia had service, with 10,000 and 2,500 lines, respectively. Since then, cellular telephony has expanded rapidly throughout most major cities in Brazil and has become a popular substitute to the expensive and limited terrestrial systems such as Personal Communications Services which are also being deployed. Curitiba, capital of Paraná, will be the third city in the country to have public mobile telephone service. In the first phase, 10,000 users are

expected to use the service, with an investment of US\$18.3 million. The second phase, to be completed in 1995, involves US\$63.8 million for 50,000 sets. By the end of the decade, 220,000 users are expected in Paraná.

Political and bureaucratic delays prevented Telebrás' forecast of 91,000 cellular subscribers by 1992 from being realized. Nevertheless, the market has attracted a great deal of business attention, domestically and abroad in the 1990's it became one of the largest in the world. Telebrás estimates a potential by 1995 of 1 million sets. Development is expected to require US\$1.5 billion, US\$500 million of which would be for network equipment. Profits of \$1 billion have also been projected.

Following the model adopted in many other countries, there will be two firms in each market. Band A is allocated to local pole companies and band B is assigned to the private sector. For the latter, Telebrás makes a technical pre-selection, and the local pole company makes the final decision based on financial criteria. For example, in the October 1989 pre-selection for the Brasilia market, three companies qualified, and Elebra Telecom, using Northern Telecom technology, was selected. The bidding rules stipulate that the winner in one state cannot have more than a 10 percent share in a consortium in another state. The rules also emphasize a low service price as the most important criterion.

Critics have pointed out that Telebrás, which in other areas has carefully selected technology in accordance with international standards set by either CCIT or CCIR, has approved outdated and incompatible technologies for several regional systems.

Foreign firm participation is limited to 49 percent, although supply and installation of the system can be contracted out. To this end, joint ventures have been established between foreign technology providers and Brazilian service providers, including some of Brazil's largest industrial and financial groups.

The prize market is São Paulo. Such market size attracted competition for the license from the heavyweights of Brazilian business, from finance to construction. Curiously, although in Rio and Brasilia, the local pole company started service before the private concessionaire, Telebrás attempted to prevent Telesp from directly competing, raising protests from local political forces. The Sao Paulo mobile cellular market reached 250,000 subscribers by the end of 1994, growing from 0 in 1993. This rapid growth illustrates the extent of unmet demand for telephone service, a result of the regulatory and structural weakness of the Brazilian telecommunications system prior to the reforms begun in 1995.

Local and foreign equipment and service suppliers are likely to profit from the market. For example, in 1991, NEC participated in a US\$64 million contract



to install Rio de Janeiro's cellular system. The system has a capacity of 10,000 subscribers and is operated by Telerj, Rio's state pole company. The contract was awarded to a joint-venture between NEC and Brazilian conglomerate Globo Group, which extended a supplier's credit to Telerj for installation.

## 9 Political and Economic Imperatives

The terms of the debate on the institutional transformation of telecommunications in Brazil, and in Latin America in general, have been mistakenly cast in terms of privatization, or, in more general terms, as liberalization. One cannot talk about privatization -- selling the controlling share in a government-owned entity -- without also talking about deregulation -- loosening government control of a market. However, deregulation can occur without privatization

Latin American countries can transform their telecommunications with the benefit of industrial countries' experiences with deregulation and privatization.

There is quite a body of literature on this, including Crandall and Flamm (1989), Derthick and Quick (1985), Duch (1991), Hills (1986), Kay, Mayer and Thompson (1986), Morgan and Weber (1986), Nguyen (1986), Noll (1989), and

Snow (1986).

Despite all the talk of deregulation, full privatization and elimination of barriers to entry has thus far occurred only in New Zealand. All European countries so far have preserved a mixed market institutional model, while countries like Mexico, Chile, Venezuela, and Canada still limit foreign ownership of telecom carriers. (Rubsamen (1989) is a good review of the issues involved.)

The good performance -- given the economic and political constraints of the last decade -- of Telebrás and Embratel is worth noting. It should also be stressed that Telebrás has accumulated significant technological capability and has contributed to the creation of a domestic equipment industry. This notwithstanding, the financial and technological needs of the sector require an infusion of new funds and new management strategies.

In 1989 Telebrás was charging the final user US\$2000 for a line it had spent US\$4000 to install. That year, this resulted in US\$300 million in costs not immediately recovered from users.

By 1992 productivity gains through rationalization and personnel reduction had reduced costs and the reduction in import tariffs, together with liberalization of public procurement, should bring costs down further through the mid 1990s. It is, however, questionable whether the system's persistent deficits

can be dealt with from the cost side, as some have argued, without harming the expansion of basic service and overall service quality. The critical problem remains the tariff structure. To start on any path toward reform, a tariff increase in 1992 of at least 30 percent above inflation would have been needed to align revenues with costs. However, in August 1992 the Ministry of Economy authorized an average increase of only 16.54 percent. Thus, tariffs continue to lag behind inflation, limiting the investment capacity of the public network.

If by 2000, when the population is expected to reach 180 million, Brazil aims to have a telephone density close to that of the newly industrializing economies (Spain, Taiwan, South Korea), today around 30 per 100 citizens, versus Brazil's 6, some 41 million new phones are needed (more than four times the number currently installed). This would take an investment on the order of US\$127 billion, or US\$15.0 billion a year during the period 1993-2000 at a cost of US\$4000 per phone, the average for 1989-92. If cost reduction efforts succeed in bringing this down to the international average of \$2,000, the necessary investment would be halved. But even US\$7.5 billion is well over twice the average for 1990-92 of about \$3.3 billion. The tariff lag and financial transfers out of Telebrás revenues in the 1980s and '90s reduced funds available to the system by an estimated US\$10 billion.

About 80 percent of residential users pay a tariff of less than US\$1 per month, but a jump in basic tariffs risks depressing potential demand. On the other hand, increases in charges for long distance, international, and value-added services -- already relatively expensive in Brazil -- which could provide a cross-subsidy to basic service, risks driving business customers away from the public network as competition emerges in these areas. In view of this situation, it is unlikely that privatization and a reduction in barriers to entry will solve the gap in investment.

One might argue that adjustment of basic service rates to account more adequately for inflation is, in the long-term, unavoidable. Development of a 'lifeline' service for the many millions of very low income households is possible, and has been done successfully by the admittedly more advanced US telecom sector. But what rate level is within the means of the 32 million Brazilians with incomes of less than US\$30 a month? Long distance and international tariffs could be reduced, but still include a modest premium to provide some subsidy. Such tariff adjustment would help Brazil compete for foreign investment by reducing the disincentives created by the current tariff imbalance, and limitations on network and service expansion.

Tariff adjustment plus liberalization and (partial?) privatization may still

not be enough for Brazil to overcome the obstacles created by extreme income inequality. Nevertheless, a balanced program to encourage foreign direct investment, extend basic service to additional households, and promote national technological capabilities and industrial expansion in new markets for information and communication products and services, may be the only strategy capable of addressing the myriad problems -- and numerous opportunities -- for Brazilian telecom policy on the eve of the 21st century.

## Conclusion

Following a long history of leadership in telecommunications among developing countries, Brazil lagged in the 1980's and 1990's. The Collor administration promised to initiate a privatization program in 1990, only to find the program blocked and the President impeached. This understandably slowed the pace of reform in this vital economic sector. The Cardoso administration of the 1990's reaffirmed in 1996 its intention to proceed with privatization and liberalization. Privatization in other economic sectors such as oil and mining are proceeding, and it appears to be only a matter of time before the national telecommunications system is reformed. Already, competitive broadcasting

cellular telephone, satellite and cable television, internet service, and equipment markets are demonstrating the potential benefits to Brazilian society of more aggressively striving to Brazil's relative position in the electronic markets of global information economy.

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Chapter XVI

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