

Brasil Telecom: the briefing of a case on telecom regulation in emerging markets¹.

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Abstract

In 2005, the telecom regulator in Brazil asked incumbents to undertake the account separation and cost modeling. The goal was allowing the regulator to set prices based on an assessment of incumbents finance and physical data, especially the definition of cost-based prices at the wholesale market (interconnection, leased lines and unbundling prices) and the measurement of productivity to define X-factor applied to the retail tariffs in the price cap readjustment.

1. Introduction

In 2003, Brazilian government issued a decree introducing cost based regulation for the Brazilian telecommunications sector to establish interconnection fees and leased line prices (Decree nº 4.733/03). The intention was to facilitate the entry of new competitors into the Brazilian telecommunications market and to create a competitive environment for local telephony, thus maintaining price balance and quality in the final service rendered. Observing the decree, Brazilian telecommunications agency (Anatel) issued in 2005 the Regulation on the Separation and Allocation of Accounts, called *Resolution 396*, setting the rules to Brazilian incumbents develop a system of account separation and cost models able to define cost-based regulated prices.

This paper describes the process of costing and pricing in Brazilian market. Section 2 summarizes the evolution of regulation and competition in Brazilian telecommunications. Section 3 offers a look into the main economic issues tied to telecommunications regulation, focusing particularly on the following questions: (i) What does regulation stand for and why it is done? (ii) What is a suitable regulatory framework for the industry's current structural conditions, characterized by imperfect competition and subject to pressure from the rapid pace of technological advance; (iii) What tariff-regulating mechanisms are available in the literature and in the practical experience of regulators (with a special focus on price-cap and cost-based models). To conclude, Section 4 finalizes the paper showing that the option chosen in Brazil - price-cap for final services and cost-based

¹ This paper summarizes the book "*Brasil Telecom: a case on telecom regulation in emerging markets*", elaborated by nine professionals from Brasil Telecom and PricewaterhouseCoopers (including myself): Anderson Ramires, Dustin Posseti, João Alberto Santos, Jose Rogerio Vargens, Lilian Viana, Luiz Eduardo Viotti, Marcelo Henrique Padua, Rafael Guaragna Souza, Rodrigo Teixeira. This book was published in Portuguese in March 2008. Now, it is been traducing and will be published in English in September 2008 (Ramires et al, 2008).

for network usage - was preferable over all the alternatives due to the sector's structural conditions.

2. History

2.1. Telecom competition and concentration

The privatization of telecommunications and the implementation of the competitive model in place today are only recent trends, worldwide and in Brazil in particular. With the wave of liberalization that swept through the 1980s, the new trend spread to other countries. In Latin America, Chile and Argentina led the first privatizations of the 1980s and early 1990s. Brazil, following global trends and lessons learned from these countries, first conceived its new regulatory framework in 1997 and then privatized fixed telephony in 1998.

The Telebrás state monopoly gave way to four fixed telephony companies, a decision that, following the example of the United States, sought to stimulate competition in the sector. This is the story behind the establishment of three local fixed telephony incumbents—Brasil Telecom², Telemar (now Oi), and Telefônica—and one long-distance, national, and international incumbent—Embratel.

Brazilian regulator Anatel also opened up space for “mirror companies” to compete with the large incumbents in fixed telephony: Intelig, for long distance; GVT, which competed in the area of Brasil Telecom; and Vésper, to compete with Telefônica and Telemar.

Mobile telephony was divided into ten regions. State companies were privatized in 1996 and B-Band entered into a bidding process in 1996 in each of these regions in order to allow competition with the sector's ten incumbents.

Taking all the fixed telephony and mobile companies created through privatizations and new licenses as a whole, there were now 28 companies under operation. In addition, there were new bidding processes for mobile telephony for Bands C, D, and E, in 2000 and 2001, when more companies within this sector came onto the market.

The global trend in the telecommunications market at the time, however, was of consolidation. Many small companies had no means of surviving within in an environment where economies of scale and scope and synergies from vertical and horizontal integration were the crucial factors driving profitability and competitiveness.

In fact, from 1998 until now, a process has been unfolding in which fusions and acquisitions have been enabling the sector's consolidation in Brazil, in line with global trends. Of the 28 initial companies, five large telecommunications conglomerates emerged, operating in various sectors of the domestic market and encompassing the groups controlled by Telefônica, Telmex, Oi, Brasil Telecom, and Telecom Italia. Coexisting on the market with these five groups were other small and independent competitors.

²Concession depends on geographic location. Brasil Telecom possesses two concessions in Region 2, which covers ten states in the South and Mid-West regions and three states in the North region, where Brasil Telecom owns PSTN, local, and long-distance concessions. Outside Region 2, Brasil Telecom is the licensee of PSTN. Additionally, it has authorization for long distance, international, and personal mobile service (SMP) and mobile telephony, and authorization for multimedia communication services (SCM), which enable data communication.

Coinciding with the industrial concentration of telecommunications, an interdependent process of gradual and asymmetrical growth in competition was taking place. This process was due not only to the regulatory model and the sector's globalization, but largely because of the technological advance occurring in the sector (Vargens; 2005; p. 136).

The regulatory framework established in Brazil in the 1990s created the institutional conditions that enabled competition to develop. This was what enabled the entry of multiple companies—through the privatization model adopted and with market entrances via new authorizations—, which began operating under asymmetrical rules which were favorable to the new players: these were granted greater freedom in operation while incumbent activities were slapped with temporary restrictions, causing the new players to migrate to new market sectors and geographical areas to fulfill universal service requirements³.

Globalization, in turn, enabled the entrance of foreign direct investment into the sector with the arrival of large international groups to Brazil. Finally, technological progress has been enabling the development of new markets, expansion in the productive chain of telecommunications, the operation of small operators in market niches, and the construction of own networks by the new participants under economically and technologically viable conditions.

An analysis by Fransman (2002; p. 48, 54-55 and 2004; p. 9) reveals an increase in competition in telecommunications industry worldwide since the 1990s due to a reduction in barriers to entry. This is what occurred in the long-distance segment in the 1990s with the commercial use of fiber optics, whose use made the sector more competitive by allowing any operator to build long-distance networks.

Another noteworthy change emerged as a result of the competitive process—slow and gradual but not less important—, which resulted in the adaptation of cable TV networks to telephony and Internet services, raising companies of the segment to the roles of principal competitors in local fixed telephony incumbents—which is already a reality in Brazil. This decade has also witnessed the possibility of developing and disseminating new customer access technology, as in the case of wireless Wi-Fi and Wi-MAX, among others, and fiber optics (Fiber to the Home), generating significant competitive results within the industry.

The reduction of barriers for entrance onto telecommunication markets and the resulting increase in competition have not been at all uniform. As a result, the evolution of competition in the sector has been asymmetrical and unequal in various respects: among the industry's segments, customer types, the products offered, and geographical regions.

The impact of asymmetry in competition has largely been felt in fixed telephony: competition has been stronger in the long-distance sector than in local services. This occurred because technological advances enabled the establishment of domestic networks based on fiber optic cables and satellite footprint, unlike local fixed telephony, where competitors faced greater difficulty in financing the construction of networks to compete with local fixed telephony incumbents. As a result, PSTN (Public Switched Telephone

³Universal service is the incumbent's obligation to reach the whole of the population. It will be discussed in the next section.

Network or STFC in Brazil) incumbents still held most of the fixed lines in service in Brazil despite the growing advancement of new companies on the market—notably those of pay-TV and mobile telephony, whose business models directly interfered with the volume of traffic generated by PSTN users.

Unlike in the fixed segment, asymmetrical competition did not prevail in mobile telephony. Due to its wireless nature, the connection of each customer to the mobile network involved marginal minimal costs upon establishing this network within a determined location. Furthermore, the various mobile networks were built in a short period of time, following the sector's development in Brazil within an already competitive environment. As a result, every Brazilian state now possesses three or four personal mobile service (PCS/MCS)⁴ companies.

Another unusual characteristic of telecommunications is the unequal intensity of competition among regions, a phenomenon that is highly relevant in the Brazilian context. Economic inequality, not only between regions but also between areas of the same region, led new operators to establish networks only where a sufficient demand existed in order to make the service economically viable. As a result, competition in fixed telephony, mobile telephony, and broadband Internet is stronger in some urban areas—located mainly in city centers or well-to-do suburbs where demand is concentrated—and weaker in others, such as poor neighborhoods, smaller cities, and rural areas, where demand is more scattered.

Even compared to local fixed access, and considering the competition bottleneck in telecommunications, competition can develop more easily in large-customer segments—the business and corporate market—than in those with large-scale public characteristics, such as the residential market and small businesses. This asymmetry is the result of the nature of the industry and the economies of scale necessary to construct infrastructure for customer access. However, the feasibility of building or renting access to connect customers only exists when there is the capacity to generate revenues above the level necessary to cover costs.

Aside from being asymmetrical and unequal, competition has been evolving gradually, in different stages, depending on the country and region. Where an incumbent company dominates, competition evolves more slowly; it does, nevertheless, move forward due to new technology: VoIP, wireless technology, and cable TV, the latter in the sense that cable enables the TV provider to offer telephone and Internet services.

Regulatory agencies throughout the world have been adopting regulatory strategies to increase market competition. It is within this context that Resolution 396⁵ by Anatel came onto the scene, with a view to make the network (interconnection and leased lines or EILD in Brazil) available to all service providers through competitive prices, as will be covered in greater detail in the chapters to come.

2.2. Universalization of fixed telephony

⁴ PCS – Personal Communication Service/ MCS – Mobile Cellular System or SMP in Brazil

⁵BRASIL. National Telecommunications Agency. Resolution 396: Regulation on the Unbundling and Allocation of Accounts. Brasília, 2005. Available at: <<http://www.anatel.gov.br>>.

The first General Plan for Universalization Targets (PGMU), enacted by Decree 2,592 on May 15, 1998, established universal service requirements for PSTN incumbents within the scope of privatization, such that the onus for achieving goals was already taken into account in Telebrás auctions and new private companies could invest in service expansion as soon as they entered into operation.

The goals of this Plan, applicable to the 1998-2005 period, essentially consisted of a gradual expansion of individual fixed lines and public use terminals—known by specialists by the acronym TUP but more commonly called telephone booths—to small locations, covering all of Brazil, in addition to the installation of TUPs adapted to special-needs carriers.

With the renewal of PSTN concession agreements in 2006, a second PGMU came into force, previously approved by Decree 4,769 on July 27, 2003. The new PGMU established additional goals for service universalization in the 2006-2025 period, increasing requirements for PSTN incumbent universalization, especially in local service. Apart from maintaining practically the same requirements related to individual and collective (common and adapted) service, it ruled on the installation of Telecommunications Service Centers (PSTs) in urban and rural areas in all Brazilian municipalities, covering TUPs (Public Use Terminals), Public Access Terminals (TAP)—which enable Internet access—, and fax machines.

From privatization in 1998 to 1997, R\$174 billion have been invested by the private sector, of which R\$140 billion have gone toward expanding, universalizing, and improving the quality of telecommunications services, and R\$34 billion have gone toward the purchase of companies within the scope of privatization. Although more recent investments have not been as large, the industry has been making annual investments in the order of R\$11 billion, which places these among the country’s largest infrastructure investments⁶.

These investments have enabled the reduction of lines that Brazilian used to face in order to have access to a telephone (commonplace until one decade ago), as well as broadened fixed telephone networks—which used to be absent from many rural areas—throughout Brazilian territory. The scenario was transformed: restrained demand was replaced by a situation where telecommunications companies made efforts to connect consumers to their networks and offer greater diversity in services.

The numbers in Figure 2.1 demonstrate the great strides made in Brazil with the advancement of universalization through the introduction of the new regulatory framework, with significant improvements in sector indicators between 1997 and 2006, even under smaller growth rates for the economy. The individual fixed terminal plant doubled while the public terminal plant tripled and the Switched Fixed Telephony System (PSTN) was made available to more than 98% of Brazil’s population—all under the aegis of the PGMU.

Figure 2.1 – Evolution of Telecommunications Services in Brazil.

in millions	1997	2003	2006
Fixed line telephones	18.0	39.2	38.5

⁶ In July 2008, the exchange rate was about US\$1,00 to R\$1,60.

Mobile telephones	4.6	46.4	99.9
Pay telephones	0.5	1.4	1.2
Broadband connections	0	1.2	5.6
Internet users	2.1	16.8	32.8

Source: www.anatel.gov.br and www.telecom.com.br.

In the case of mobile telephony and the Internet segment, expansion took place in the most attractive markets and was based on prepaid plans, giving lower-income groups access to mobile phones. Internet access was initially spread throughout Brazil via dial-up access over the PSTN network, enabling access from any location through the fixed telephony network already in place. Broadband access also saw significant growth starting in 2003, mainly being offered by local fixed telephony incumbents through DSL technology on copper line networks and by cable television incumbents through coaxial networks.

Despite the progress achieved through privatization, significant obstacles still needed to be overcome, particularly in the Internet segment. In 2006, there were only three broadband Internet subscribers operating in Brazil for every one hundred inhabitants—a very low rate when compared to the more than 20 subscribers per 100 in developed countries. Several factors have stood in the way of expanding Internet access in Brazil, particularly insufficient income for the acquisition of computers, connection costs, and a lack of knowledge and experience with the use of the products and services being offered. Various government initiatives are currently in place to help overcome these barriers.

2.3. Decree 4733 and Resolution 396

As a result of policies aimed at universal access and initiatives that were put in place by incumbents as a result, the telecommunications fixed network became ample and extensive throughout all of Brazil. Until the beginning of the current decade, however, competition had not evolved sufficiently, given that the process of consolidating competition in telecommunications is by nature a long, gradual, and asymmetric one, as explored in Section 2.2.

The regulatory discussion, upon review of the rules foreseen in the renewal of PSTN agreements, emphasized the necessity of deepening the level of universalization and new measures that could in fact ensure a breakthrough in local network access bottlenecks and the consequent development of competition in the sector.

Within this context, Decree 4,733 as of June 10, 2003 was published, reaffirming the basic principles of the regulatory framework instituted in the previous decade and introducing new guidelines aimed at adjusting telecommunications policies to the need for increasing both access to services and inter-company competition.

A core idea introduced by Decree 4,733 was that local fixed telephony incumbent networks should be made available to all telecommunications service providers such that supply expansion could continue on a more competitive basis. The Decree thus consisted of guidelines that sought to guarantee providers deprived of infrastructure to share the incumbent networks—through interconnection—, the leasing of lines through industrial exploration of dedicated lines (leased lines), the resale of services and network unbundling and norms for remuneration in the use of the networks.

According to the determinations of the Decree, and motivated by the same, Anatel developed the Regulation on the Separation and Allocation of Accounts (RSAC), the subject of Resolution 396 (which in this book will be simply referred to as Resolution 396).

In order to meet the Decree's guidelines, the regulating framework needed tools capable of encompassing the economic relationship between the incumbents and other companies with respect to network use. The RSAC was thus conceived to incorporate the accounting separation between PSTN service modes; the hypothetical unbundling of network elements of other costs and services, in such a way that the first could be determined in isolation; and the definition of criteria and models for the allocation and determination of costs under hypothetical efficiency conditions. The regulation's final objective was to use an internationally-recognized cost model to calculate the wholesale costs of service.

The RSAC was created based on European experience and under the supervision of foreign consultants. When the RSAC's draft was submitted to public consultation by Anatel in July of 2004 (Consultation 544/2004), warnings emerged that the implementation process would be expensive and slow, in addition to questions about the cost-benefit relationship of this process based on the belief that it could be possible to put together a simpler model capable of producing similar results.

However, with insufficient time for incumbents to dedicate to an alternative model—the period between the announcement of public consultation and the end of contributions submitted by interested parties was only two months—, some contributions envisaging the upgrading of the model submitted to Anatel were received by the agency. Nevertheless, the draft of Consultation 544 turned into the Regulation on the Separation and Allocation of Accounts through the publication of Resolution 396 on March 31, 2005, with small adjustments that changed little to none of its original content.

3. Economic regulation

3.1. Types of regulation

The level of competition acceptable in an industry, determined by its structural features of a technological and economic nature, and ultimately, by entry barriers to the market limited by it, is a key factor in determining the scope of regulation to which this industry must be submitted.

Traditionally, the existence of two distinct regulatory approaches, developed in the twentieth century, applied to monopoly and competition conditions, respectively, are considered: (1) the regulation of natural monopoly and (2) the regulation of competition.

Nevertheless, Vargens (2005; p. 34) argues that in view of structural changes implemented in telecommunications by technological advances, neither of the two traditional regulation approaches would be solely applicable to the industry. According to this approach, the evolution of telecommunications has been requiring new regulatory parameters, better suited for imperfect competition conditions, to asymmetrically combine elements of regulating natural monopolies and competition.

Below, the main characteristics of three regulatory visions are summarized: the regulation of the natural monopoly, competition and imperfect competition, and the

combination of the appropriate conditions to guide the economic regulation of the telecommunications sector, in Brazil and worldwide.

REGULATION OF NATURAL MONOPOLY

The theoretical-conceptual instrument of this type of regulation was developed during the twentieth century so that the government would be able to control the infrastructure sectors classified by economic theory as natural monopolies.

The large economies of scale that characterize natural monopolies are not only technical (production and distribution), but also commercial and managerial. A remarkable occurrence of these economies makes the fragmentation of structure to offer infrastructure services economically unfeasible. The basic characteristic of natural monopolies is that costs are lower if there is a single firm in the market and higher costs otherwise.

This property, according to Pinto Jr. and Fiani (2002; p. 516), is known as the subadditivity of cost function and algebraically expressed as such:

$$X^* = X_a + X_b \quad (3.1),$$

where X^* , X_a and X_b are vectors that represent the quantities required from various services of a certain industry. This will be considered a natural monopoly if

$$C_c(*) < C_a(x_a) + C_b(x_b) \quad (3.2).$$

C representing the cost functions of firms a , b , and c , the equation (3.2) shows that the industry is composed of a natural monopoly if the cost to produce the quantity required by the entire market in a single firm c is lower than the sum of costs when this product is divided between firms a and b .

In industries characterized as natural monopolies, competition does not consist of adequate regulatory policy to promote economic efficiency. Thus, the feasible alternatives for the government are restricted to the direct offering of infrastructure services or to the active regulation of delegate private agents (under the legal system of concession or authorization).

The second option implies a strict governmental supervision of infrastructure services offered by private monopolies in order to ensure appropriate provision and to minimize the risks of abuse of economic power.

The regulation of natural monopolies, also called active regulation, is based on the restriction of possibilities of choosing the private agent to provide the regulated service. Among various mechanisms adopted, Pires & Piccinini (1999; p.221) point out tariff control, the monitoring of service quality, the creation of institutional barriers to entry onto and exit out of the market (via concession or permission agreements), the establishment of investment plans, the definition of technical standards for the operation and assignment obligations, and global service supply goals.

Currently in Brazil, this type of regulation is used in certain infrastructure industries, for instance, concessions in highway and railway transportation and sectors such as sanitation (water and sewage) and gas distribution.

A few years ago, telecommunications were considered to be a natural monopoly. In the United States, this type of regulation was applied for several years to AT&T, which

operated in the market as a private monopoly until its dissolution in 1984; it was the sole U.S. telecommunications company until 1970, when the entry of MCI was authorized to compete in the long-distance segment. In Brazil, telecommunications were considered a natural monopoly until the privatization of the Telebrás System in 1998.

REGULATION OF COMPETITION

The regulation of competition, also called reactive regulation, aims at preventing and restraining practices that benefit concentration and/or would harm competition, in addition to stimulating the evolution of competition on markets in general. Its assumption is the freedom of choice of economic agents, only accepting intervention in the event of imminent risk or evidence of damage to the economic order on the part of these agents.

It is worth mentioning that this assumption is diametrically opposed to the regulation of monopolies, which is based on the restriction of choices by the regulated firm.

In reactive regulation, *“monitoring is carried out ad hoc, not systematically, triggered by two mechanisms: by the initiative of private interests or diffuse threats, involving anti-competitive conducts provided for by law, or in the occurrence of “concentration acts” (mergers and acquisitions), also provided for by law, capable of substantially increasing the market power of companies involved, and thus, the risk of future conduct harmful to competition”* (Possas *et alii*, 1997; p.87-88).

The defense of competition, as a government policy, aims at creating and maintaining the basic conditions of competition, preserving and fomenting competitive environments with the purpose of increasing economic efficiency resulting from the manifestation of market forces. The defense of competition policy aims at preventing the abuse of market power, considering that economic agents holding this power are capable of jeopardizing the competitive process. It is not opposed to market power itself, but against its abusive use. According to Mello (2002; p. 489), the defense of competition laws requires neither the economic agents to effectively compete nor to instruct how to do so, but rather seek to guide the companies' strategies concerning competition, preventing the bidding process from being restricted by strong agents.

In order to prevent the abuse of market power, according to Pondé *et al* (2001; p. 2), those responsible for the defense of competition policy operate by prohibiting *“anti-competitive conduct and concentration activities”*. In the first case, practices capable of restricting the competitive process are restrained, with eventual punishment for those responsible for such conduct. The second aspect is related to structural parameters conditioning anti-competitive conduct: it aims at preventing the rise of more concentrated market structures that increase the probability of the abusive exercise of market power by means of the preventive control of mergers and acquisitions.

Important to the analysis of competition is the concept of market power.

According to Pindyck & Rubinfeld (1999; p. 370), market power is the capacity of a firm to sustain economic profit⁷ and permanently maintain prices above marginal costs. It can be measured by the Lerner Index (LI), where

$$LI = (P - C_{mg})/C_{mg}$$

⁷Normal profit is an economic concept which means the return that produces only the opportunity cost of capital, while economic or extraordinary profit refers to positive return exceeding opportunity cost.

P is the product or service price and **C_{mg}** its marginal cost.

The sources of market power are barriers to entering the industry, with a direct proportionality ratio is maintained. Frequently confused with the level of concentration in the industry, market power is not always directly related to this variable, despite being routinely used as a form to measure it, given that it is easy to determine, unlike marginal cost (and even with average cost), necessary to calculate the Lerner Index. As a result, market share cannot be automatically used as an approximation of the market power of a firm without carrying out an evaluation of the domestic rivalry and the competitive dynamics of the industry.

The idea of market power is essential to the antitrust analysis; restrictions to competition are only caused by those retaining such power. Obviously, its existence is a necessary condition to exercise it abusively, however, it is not a sufficient condition, since restriction to competition also relies on anti-competitive effects deriving from conduct or concentration behavior.

In order to assess if one or more telecommunication companies hold market power within a geographic or marketing segment, and accordingly, the capacity to harm the competition, the European Union (Official Journal of the European Communities; 7/11/2002: paragraph 78) recommends the consideration of the following parameters for the analysis of competition defense in telecommunications:

- size of the regulated company;
- control of infrastructure which cannot be easily duplicated;
- technological advantages or superiority;
- bargaining power in the purchase of inputs, especially telecommunications equipment;
- access to financial resources and capital markets;
- diversification of products and/or services;
- economies of scale and scope;
- vertical integration;
- sales network and distribution channels;
- existence of potential competitors; and
- barriers to expansion.

The regulation of competition is usually applied to the industry sectors that have characteristics of oligopoly⁸. It is attributed to one or more antitrust authorities having a general feature (non-sector related). In Brazil, agencies such as the Administrative Council for Economic Defense (CADE) and the Secretariat of Economic Law of the Ministry of Justice (SDE) have the authority to deal with this matter. These agencies operate both reactively, on demand, and on a preventive basis, when they detect a threat to competition in a specific market.

REGULATION OF IMPERFECT COMPETITION

Liberal reforms and a new definition of the government's role over the past two decades introduced competition into the infrastructure sectors. In telecommunications, deemed a natural monopoly even a few years ago, the competition has been consolidating

⁸ Type of market structure, in capitalist economies, where few companies hold the control of a higher market share. Sandroni, P. Dicionário de Economia. Ed. Best Seller, 2^a ed., São Paulo. 1989.

in the industry on a gradual and asymmetric basis due to institutional changes and technological advancement. Thus, it is possible to say that telecommunications have been losing the characteristics of a natural monopoly; however, the sector still does not have the characteristics of competitive markets in view of bottlenecks in which the competition remains restricted, as is the case of the residential local fixed line segment in peripheral areas.

Taking into account the particular aspects and the evolution of competition in telecommunications, what would be the scope of regulation capable of promoting the economic efficiency of the sector?

To answer this question, we must first investigate how the economic literature conceives the structure and the industrial dynamics of telecommunications and which regulatory scope is recommended for the sector. In this regard, Gaffard & Krafft (2000; p.5) point to two theoretical theses that explain the structural conditions of telecommunications; the bottom line to be acquainted with the nature of regulation appropriate for the industry: **traditional industrial micro-economics** and the **theoretical framework of evolution**.

The **traditional micro-economics** of the industry analyzes the structure, concerned with economic efficiency associated with organization and competition in the sector. Two of the main representatives of this thesis are Jean-Jacques Laffont and Jean Tirole.

The analysis of Laffont & Tirole (2000; p. 21) is focused on competition between incumbents and entrant operators. The former owns and controls the network infrastructure. Entrant operators do not own the network infrastructure, but play an important role of competing with incumbents in the offering of services to the users. Thus, they need to implement their own networks and/or use incumbents' networks. They face a problem in deciding on implementing or leasing a network infrastructure and they may implement three typical strategies, or a mix among them: (1) the construction of owned infrastructure, (2) resale, or (3) the lease of means and unbundling⁹. In a few cases, a fourth strategy is typified: interconnection.

According to this theoretical thesis, the role of the regulator is to create and maintain the necessary conditions for the entrant operators to be able to compete with incumbents. How is this done? By ensuring the minimum rules of the sharing of infrastructure and interconnection and correctly establishing a tariff regulation system for the industry by defining price levels of services provided to consumers and competitors (interconnection tariffs). The price system must correctly point out incentives for the construction and leasing of network infrastructure, guiding the performance and investment of telecommunication firms in order to ensure expansion conditioned by demand and the economic and operational efficiency of the sector. Within this context, the main problem faced by the regulator is to outline a tariff and incentive system so that the social cost of network duplication by entrants is offset by the benefit deriving from competition in the offering of telecommunications services.

⁹By means of resale, entrant operators lease large sets of lines or minutes from incumbents through wholesale and resell them to commercial and residential customers through retail. By means of unbundling, entrant operators may share elements separated from incumbents' networks and thus conclude their network infrastructure.

Another theoretical thesis proposes explaining the structural and industrial dynamics of telecommunications: the **evolutionist theoretical framework**, and Martin Fransman is its main proponent. According to this concept, the evolution of telecommunications market structures cannot be reduced to competition between entrant operators and incumbents.

For Fransman (2002; p.2), the concern is to identify the main forces that condition the industry's evolution. Within this context, instead of taking for granted the interaction between entrants and incumbents, the evolutionists attempt to explain the conditions that allow the entry and the sustainability of new firms in the industry.

Fransman (2000; p.13-29) analyzed the evolution of telecommunications that took place in the 1990s, identifying four main aspects associated with the process, materially impacted on the sector structure.

First, we point to the downfall of technical barriers to entrance, resulting from the process of almost vertical specialization of telephony operators and telecommunications equipment manufacturers, which concentrated investment in research and development over earlier years. As a result, new firms were able to enter the industry without investing in R&D.

Second, the author noted that the nature of the competitive process in telecommunications started under a complex phenomenon, in which assets, technologies, networks, and services used and offered by each one of the companies played a significant role. In this process, competition does not take place only among companies, but also among technologies, standards, networks, and services, and therefore, it cannot be reduced to the interaction between incumbents and entrant operators.

Third, we also point out the role of financial markets. Privileged relationships with financial institutions favor the competitiveness of certain firms in relation to others, facilitating mergers and acquisitions to the hiring of specialized labor by means of share transactions and call and put options.

Finally, we noted that the development of new market segments, such as mobile telephony, and mainly the Internet, has been evidenced by a growing segmentation of demand and by the creation of new services and market niches. This opens various possibilities for new firms to operate in several relationships of the telecommunications production chain, which do not need to be restricted in specialized market segments and play a significant role in competition with incumbent operators.

The evolutionist concept adds new elements to the analysis, mainly due to the fact of explaining competition in industry as a more complex process than a simple interaction between concessionaries and entrant operators, which also comprises competition among services, networks, technologies, and companies located in several areas of the production chain. The evolutionists acknowledge that the telecommunications structure is evolving from a typical natural monopoly to a more competitive structure.

Based on the reading of both theoretical theses (traditional industrial microeconomics and evolutionist) and in the practical experience of telecommunications regulators in Brazil and worldwide, we may conclude that the regulatory framework of the sector must comprise an asymmetric combination of instruments for the regulation of natural monopolies and competition. This is what we call the regulation of imperfect competition or asymmetric regulation.

This deals with a regulatory scope adequate to the imperfect competition conditions prevailing in the telecommunications sector, which acknowledges significant competitive differences among industry players. For this reason, it makes the rules asymmetrically applicable to service providers.

In this regard, the companies defined by the regulator as owning significant market power (PMS), taking into account certain product and geographical areas, are submitted to more strict rules, should the product or its basic component be deemed a public utility. Concurrently, the regulator submits those that do not have PMS to more flexible and softer rules.

One of the most relevant issues of this type of control is the dosage or the combination of instruments for the regulation of natural monopoly and competition.

Among its main instruments we point out (1) universalization targets, destined to ensure global access by the entire population to telecommunication services and (2) tariff regulation as a mechanism of creating and simulating competitive conditions to overcome drawbacks to competition in the industry. Both mechanisms are only applicable to PSTN incumbents, deemed as having PMS.

Among mechanisms to regulate competition, we point out (1) the determination of rules aimed at ensuring minimum conditions of relationship and joint operations among telecommunications service providers, preventing the eventual abuse of market power by those firms having this power, by means of anti-competitive conduct that discriminate and impose obstacles to other firms or use crossed subsidies for associated subsidiaries or controlled by the same economic group, and (2) the determination of service quality parameters, as this is the case of the General Quality Target Plan of PSTN, applicable to all service providers, regardless of ownership of concessions or authorizations.

Briefly, the regulation of imperfect competition has the following main characteristics:

- utilization of mechanisms of both classic standards, weighted based on the asymmetry of companies' market power—the concept of significant market power (PMS);
- regulatory asymmetry in relation to the duties of service providers (additional obligations for firms having PMS);
- regulatory isonomy in relation to service providers' rights: all firms are entitled to provide services under the same conditions, regardless of having or not having PMS;
- adoption of tariff regulations, focused on productivity, tariff ceilings, and the definition of interconnection tariffs and lease of means;
- universalization obligations, service and quality, weighted according to regulatory asymmetries;
- adoption of an incentive system and protection of the evolution of competition;
- measures required that forbid the abuse of market power.

Anatel incorporated certain principles of asymmetric scope of regulation of imperfect competition into the regulatory framework and also used the concept of PMS introduced by the European Union in its regulatory framework in 2002.

3.2. Tariff regulation

Regulated companies, having significant market power be fully free to set prices, might be tempted to raise them to levels which, generating the highest possible return, would be harmful to users. In order to avoid this situation, the role of tariff regulation is to establish prices that distribute economic gains between firms and consumers in order to properly remunerate the former, without however, burdening the latter. The two most common models of tariff regulation are price cap tariffs and cost-based tariffs.

PRICE CAP TARIFF

This mechanism is a tariff adjustment rule applied by means of government index of prices, accompanied by a projection of cost savings by increasing productivity. It refers to a simple method of low cost for the regulator that is transparent and tends to induce increases in the microeconomic efficiency of infrastructure sectors. Its basic formula is

$$p = (IP - X)p_0$$

where **IP** is a price index and **X** is a previously defined transferrer of productivity to the consumer. Thus, an initial price **P₀** is adjusted within a percentage lower than inflation, compelling the companies to seek cost savings. The basic formula may also be increased by introducing a component **Y**, related to “cost shocks”:

$$p = (IP - X + Y)p_0$$

where function **Y**—which may assume positive or negative values—is to absorb transitory and unpredictable variations in production costs, dissociated from the long-run incremental behavior of technology and productivity.

The price cap methodology shows difficulties, such as the determination of various price caps for industries providing various services, the assessment of improvement in the quality of services, and the preliminary definition of **P₀** basic pricing.

The efficient use of the price cap method should be based in five basic assumptions:

- the **P₀** initial tariff level must be previously balanced with costs associated therewith and ensure the economic-financial equilibrium of the operator from the start of effectiveness period of mechanism of sharing productivity;
- the regulated operator shall have the conditions to transfer to tariff eventual fluctuations in its costs caused by inflation, which is ensured by the existence of an **IP** price index in the formula of periodic adjustment;
- the rule must contain provisions ensuring the operator of the possibility of conducting, by itself, the adjustment of tariff and related costs ratio; i.e. the rebalancing of tariffs. This possibility derives from the circumstance that price cap rules the behavior of a certain tariff basket and not of each tariff component, and the operators are responsible for modifying the set of its tariff structure within the price cap;
- the rule will include correction factors of eventual imbalances in the economic-financial condition of operators, in view of the perception of disarrangements in the economic-financial conditions of operators, in view of the perception of disarrangement in the tariff level practiced. Therefore, it is possible to stipulate periodic tariff reviews, in order to assess the results during the performance of the agreements. In addition,

extraordinary adjustments may be introduced between tariff periods, whenever there are unforeseen imbalances (factor Y);

- the **X** value must be feasible and compatible with effective market conditions in which the companies operate, so that the mechanism of sharing productivity induces gains of efficiency, instead of punishment.

Once defined, the functions of each of the elements of price cap methodology are clear in their original formula: the role of element **P0**, jointly with tariff rebalancing, is to ensure the “long-run equilibrium” of service rendered; the role of Factor **I** is to ensure that this equilibrium is maintained over time, against alterations in sector costs resulting from inflation; the role of the **X Factor** is to establish the magnitude with which the efficiency gains attained by operators will be transferred to users; finally, the **Y** factor operates as an emergency resource to be triggered in eventual extraordinary alterations to the costs of services rendered.

COST-BASED TARIFF

The Cost-based tariff model essentially consist of defining prices within a level similar to costs of service, to which profit margin is added, taking into account a return rate adequate to offset opportunity costs.

According to definition of OECD (2004; p. 164), “a set of prices is considered as based on costs if it generates revenues, which considered over the company’s life cycle, makes the present value of free cash flow (profit less capital investments) for investors is equal to zero” [our translation].

The purpose is to simulate competition on the market by imposing the **price = marginal cost** condition to increase the efficiency level. In economic theory, the marginal cost is the cost of producing an additional unit of the product, including the opportunity cost of capital ($C_{mg} = dCT(q)/dq$). Given the practical difficulty of assessing the function of $CT(q)$ cost, and accordingly, the C_{mg} marginal cost, it is possible to adopt alternative solutions to estimate it. The long-run incremental cost (LRIC) of an efficient company, adopted in the Regulation on the Separation and Allocation of Anatel’s Accounts, represents an alternative solution to assess an estimate of competitive cost that approximates the marginal cost. The concept and form of assessing LRIC will be covered in next chapter.

Concerning price cap, the cost-based model of regulation is burdensome and faces additional complexities, such as:

- difficulties in assessing costs on which pricing is based, mainly due to the asymmetry of information between regulated companies and the regulator;
- problems associated with the determination of historical and reproduction costs;
- the non-definition *a priori* as to return rate applied;
- the induction to inefficiency and over-investment, in view of the lack of incentives to cost savings and the absence of competitors;
- high amounts disbursed with the survey and processing of information and costs (Possas *et al*, 1997, p. 89).

Among Brazilian telecommunication companies, this model is now adopted according to the terms established by rules in order to define prices of products offered at wholesale by companies of the sector, referring to:

- interconnection tariffs of local fixed and long-distance network; i.e. Usage Tariff of Local Network (TU-RL) and Usage Tariff of Long-Distance Network (TU-RIU);
- interconnection amount of mobile network, which is the Mobile Network Termination Tariff (VU-M);
- Leased lines leasing price.

These provisions are outlined in the remuneration rules of the PSTN and PCS/MCS networks, as well as in leased lines Rules. In turn, the cost models that are the basis for defining these tariffs are included in the Regulation on the Separation and Allocation of Accounts, the purpose of discussion of the next sections.

4) The option adopted in Brazil

Between 1998 and 2007 Brazilian tariff regulation was based exclusively on the price cap model both to interconnection tariffs and to final telephony services. With the guidance for interconnection tariffs and leased lines prices at cost, projected as of 2008, via the models outlined in Resolution 396, Anatel introduces the regulation by cost-based model in Brazil.

This implies the existence of two tariff regulation models in the Brazilian scenario: price cap, applicable to the adjustment of tariffs of the PSTN final services basket, and the cost-based model, adopted to define interconnection tariffs and leasing prices for lines and connection means.

It refers to a solution that aims at becoming compatible with the application of tariff regulation models, typical instruments of natural monopoly regulation with a regulatory scope adequate to the asymmetric sector, and under imperfect competition conditions. The purpose is to simulate perfect competition in the market with the guidance of these prices at cost, so that all the companies may acquire network under isonomic conditions, facilitating competition in the primary market and thus increasing efficiency levels. We presuppose, as infrastructure is the main impediment to competition in telecommunications, that the regulator's determination of prices at cost in the secondary market creates competitive conditions in the offering of final services on the primary market.

If all competitors may acquire interconnection and dedicated lines at cost price, also taking into account the remuneration of company's capital owning the network, under same conditions, this company and these competitors may compete under equal conditions in the supply of final services to consumer.

Theoretically, this would eliminate the need for regulating final prices on the primary market. Obviously, this assumption may not be confirmed, due to various factors, among them the inevitable limitations of new players, especially when serving peripheral areas.

Thus it is reasonable to maintain the price cap rule in tariffs of basic telecommunications services, the PSTN, becoming compatible with a level of regulation which is less authoritative, less burdensome, and subject to fewer risks, as is the case of cost-based model, capable of ensuring a minimum level of benefit to the user by means of a gradual reduction of actual service price via periodic transfers of productivity.

The most immediate outcome of introducing the cost-based rule in the telecommunications sector is the requirement of great effort of analysis by the regulator and firms subject to this type of obligation. Its operation relies on criteria, parameters, and

separation and allocation models required to assess cost of services and network components. Several of these elements were established by Resolution 396. These are explained in the next chapter, which provides an overview of this resolution and the mechanisms that enable the allocation and assessment of costs.

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Glossary

ABC - Activity Based Costing

ABM - Activity Based Management

Abrafix - Brazilian Association of PSTN Incumbents

ACCC - Australian Competition & Consumer Commission

AICE - Individual Access – Special Class

Anatel - National Telecommunications Agency

AT&T - American Telephone and Telegraph Corporation

AUP – Agreed Upon Procedures

CCA - Current Cost Accounting

Ceterp - Ribeirão Preto Telephony Exchange

CFC - Federal Accounting Council

Contel – National Telecommunications Council

CRT - Riograndense Telecommunications Company

CTA - Current Technology Assets

Ctad-Conarq - Technical Chamber for Document Evaluation at the National Archive Council

CTBC - Central Brazil Telecommunications Company

CVM – Brazilian Securities and Exchange Commission

CVR - Cost-Volume Relationship

Detraf - Traffic Statement

DSAC – Document of Separation and Allocation of Accounts

EBITDA - Earnings Before Interest, Taxes, Depreciation & Amortization

Ecpr - Efficient Component Pricing Rule

EILD – Leased Lines

Eircom - Eire Telecommunications

Embratel - Brazilian Telecommunications Company

EOT - Telecommunications Operator Company

EPMU - Equal Proportionate Mark Up

FAC - Fully Allocated Costs

FCC - Federal Communications Commission

FND - National Development Fund

FNT - National Telecommunications Fund

GVT - Global Village Telecom – a telecommunications “mirror company” operating in Region II of the General Granting Plan.

HCA - Historical Cost Accounting

IAS - International Accounting Standards

Ibracon - Brazilian Institute of Independent Auditors

IDDF - Physical Data and Demand Information

ILD - International long distance

Intelig - long-distance telecommunications “mirror company” operating in Region IV of the General Granting Plan (all Brazilian territory).

IRS – PwC’s Infocomm Regulatory Services

ITP - Internal Transfer Pricing

LGT - General Telecommunications Law

LRIC – Long-Run Incremental Costs

MCI - an American telecommunications company
MCS – Mobile Cellular System
MEA - Modern Equivalent Asset
NDL - National long distance
NPO - Assurance Rules and Procedures
OECD - Organization for Economic Cooperation and Development
Oi/Telemar - a telecommunications company operating in Region I of the General Granting Plan
OFCOM - Office of Communications
R&D - Research and Development
P&L - Profit and Loss
Paste - Program for the Retrieval and Expansion of the Telecommunications System
PCS – Personal Communication Service
PDDF – Demand and Physical Data Forecast
PGMQ - General Quality Target Plan
PGMU - General Plan for Universalization Targets
PMS – Significant Market Power
PNA - Non-Allocated Product
PST - Telecommunications Service Center
PSTN – Public Switched Telephone Network
PUC - Utility-Convenience Service
RDSI - Integrated Service Digital Network
RSAC - Separation and Allocation of Accounts Regulation (Brazil’s Resolution 396, internationally known as Accounting Separation and Cost Modeling Regulation)
RTA - Replaced Technology Assets
SAC - Stand Alone Cost
SAS–ABM - Software for the application of ABM methodology developed by the SAS company
SCM - Multimedia Communication Service
SEC - Securities Exchange Commission
Sercomtel - Londrina Telephony Communications Service
SLD - Dedicated Line Service
SLDD – Digital Dedicated Line Service
SMC - Cellular Mobile Service
SME - Specialized Mobile Service
SMGS - Global Mobile Service by Satellite
SRTT - Telecommunications Transport Network Service
PSTN - Switched Fixed Telephony System
SCR – Revenues Accounting System
TAP - Public Access Terminals
Telebrás - Telecomunicações Brasileiras S.A.
Telefônica – incumbent company operating in Region III of the General Granting Plan
Telesp - Telecomunicações de São Paulo S.A.
Telmex - Teléfonos de México
TELRIC - Total Element Long-Run Incremental Cost
Telstra - Telecom Australia
TSLRIC - Total Service Long-Run Incremental Cost

TUP - Public Use Terminals

TU-RIU – Long-distance Network Usage Tariff

TU-RL - Local Network Usage Tariff

VAS – Value-Added Services

VoIP - Voice Over Internet Protocol

VU-M - Mobile Network Termination Tariff (Brazil)

WACC - Weighted Average Cost of Capital

Wi-Fi - Wireless Fidelity or High Fidelity

Wi-Max - Worldwide Interoperability for Microwave Access

xDSL - x Digital Subscriber Line (x could take various forms; e.g. ADSL: Asymmetric Digital Subscriber Line)