

Open-Access Issues in the Chilean Telecommunications and Electricity Sectors

Carlos A. Díaz

Universidad de los Andes

and

Raimundo Soto

Universidad Alberto Hurtado

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1. Introduction

The recent wave of infrastructure restructuring and privatization in Latin American countries is characterized by the introduction of competition in areas that in the past were considered to be natural monopolies. Regulation efforts have successfully expanded the scope of competition in various sectors with network and natural monopoly characteristics. Industries like electricity, natural gas, telecommunications and even transport have been being restructured and competition is being introduced in different degrees depending on the particular conditions of the markets. In most of these industries, the competing activities still need to use the existing networks to provide the service, so the policy relevance of the access conditions and pricing has been heightened. For competition to be effective, and to take advantage of network externalities, open access to some still-regulated facilities of these industries is required.

The policy maker must create proper conditions for entry into the competitive sector while not inducing excessive entry, not expropriating previous investments or discouraging future investment in the monopolized part of the industry and not generating inefficient bypass. In this respect, Chile has had a pioneering role. The two-decade experience provides valuable insights with regards to the effects of different institutional arrangements on access, access pricing, and tariff setting mechanisms, as well as the role of the authorities in fostering competition and reducing the adverse of ambiguous or incomplete regulation. This study concentrates on the Chilean experience in regulating access to network in two specific sectors: electricity and telecommunications.

Regulatory reform to facilitate the transition to competition began almost two decades ago. Chile engaged in an active policy of restructuring and transferring services and publicly owned firms to the private sector, eliminating the limitations to market entry and allowing private sector participation even when transfer of property was deemed inefficient or politically unacceptable (e.g., franchising public infrastructure). The process has involved both privatization and liberalization, with the latter aimed explicitly at promoting market entry. In general, the sectors involved were characterized by the existence of barriers to entry, important degree of market power by incumbents and sufficient economies of scale and scope so that the most efficient industrial organization was a regulated (private) monopoly.

The objective of the Chilean Government was to implement the necessary conditions for market competition in all areas in which monopoly power could not be exerted by incumbents or imposed by technology. For the latter, strict regulation was designed to provide incentives to incumbents to behave as in a competitive market and avoid non-competitive practices upstream or downstream. Consequently, provisions

were made to facilitate the introduction of competition in different segments of the markets. Such is the case for generation and commercialization in the electricity sector and, more recently, mobile, long distance and local telephony.

Despite government's efforts, deregulation and privatization have not been, as coordinated and smooth as one would have desired. The privatization process in some cases we study in this paper was implemented before the regulatory framework was in place allowing incumbents or newcomers to exert market power and obtain rents. In particular, the privatization of the electricity led to a degree of vertical integration, which, in a context of an incomplete regulation regarding transmission tolls, has severely hampered access and competition in retail markets. On the contrary, in telecommunications the government has had a significant role in fostering competition by modifying the regulation to induce increasing degrees of competition in the different segments of the market. In particular, the introduction of a multi-carrier system in long-distance is, perhaps, the most significant accomplishment of the regulator.

The paper is organized as follows. Section 2 presents some analytical issues on network economics identifying a set of policy recommendations that governments should consider introducing effective competition and enhancing welfare.

Section 3 of the paper analyzes the structure and evolution of the regulation in the telecommunication sector. The restructuring of this industry involved both privatization and liberalization, with the latter aimed explicitly at promoting market entry. As we discuss in detail in this section, to remove obstacles to efficiency and increase competition, the Chilean authorities developed rules for incumbents to provide open, non-discriminatory access to interconnection and network services. The study focuses on three aspects that are crucial to the functioning and regulation of networks: access, pricing and tariffs, and unbundling of services. These are the main areas in which regulation has played a significant role in fostering competition in the Chilean case. The paper concentrates on local, mobile, and long-distance telephony, but makes some remarks concerning related markets such as cable TV, and Internet services.

The evolution of the Chilean regulation and experience in open access has been remarkable in two aspects: first, its pioneering effort to develop the multi-carrier system for long distance communications and, second, the ability of the authorities to improve access and counteract problems derived largely from the dominant role of the incumbent in local telephony and the weaknesses of the privatization process. Although the regulatory design has improved markedly during the last years, there still remain areas in which it is incomplete, fostering inefficient resource allocation and allowing firms to obtain rents.

After years of dealing with incomplete regulation and interconnection-related lawsuits, several lessons emerge from the Chilean experience. Open access to networks need to be supported by clear technical rules and methodologies for setting tariffs to avoid costly disputes. Dominant firms, sometimes vertically integrated, can exert market power even if open access is guaranteed and other firms participate in the market. Hence, the authorities must still address competition problems such as cream skimming, segmentation, input foreclosure, and blockading. The technical capacity, access to information from market participants, and independence from political and interest groups have been in some periods important limitations for an effective regulation.

Section 4 analyzes the case of the regulation of the electricity sector with emphasis on the adverse effects of vertical integration on open access and the efficiency of the energy generation market. The main problems arise from the ambiguous regulation of high-voltage transmission tolls, which have been at the center of many of the litigation process among firms. These problems, compounded by the presence of vertical integration, led the National Economic Prosecutor to initiate two large-scale lawsuits, which is subsequently lost.

Nevertheless, there are additional issues in the distribution (retail) market for energy which can potentially impede competition among generators and are not properly addressed by the regulation: in particular, sub-transmission and transformation are non-regulated services that present several of the features which led the authorities to regulate high-voltage transmission. In addition, the intra-concession access tolls for generators serving free (non-regulated) clients are not regulated nor recognized by the Law as a significant component for an efficient functioning of the free-client segment of the market.

2. Analytical Issues on Network Economics

The recent economic literature provides ample evidence of the benefits a society can reap from privatizing and deregulating public services such as the electricity and telecommunications sectors, in particular in terms of expanding coverage, reducing costs, enhanced productivity, and improving quality and product/service diversity. However, those benefits depend to a large extent of the particular form in which the private sector is allowed to participate in markets characterized by monopoly power. Chile was one of the first Latin American countries to engage in full-scale market deregulation and public sector divestiture and, consequently provides a number of interesting case studies.

Traditional reasons for regulating telecommunications and electricity services are the presence of scale economies leading to natural monopoly, the presence of network externalities, a dominant position by incumbents, and the existence of bottlenecks or essential facilities.

In the last two decades, fundamental changes reshaped the structure of telecommunications and electricity markets. Technological and regulatory developments lowered entry barriers and increased the ability of new firms to enter these industries at different productive stages. In turn, this has substantially altered the way in which both industries operate and mitigated the importance of monopoly power to justify economic regulation. Nevertheless, they also raise new challenges to regulation derived from network competition.

In several countries, technological and regulatory changes in the telecommunications industry led to a significant degree of competition, to the point that many observers argue that traditional justifications for regulating network industries no longer apply.¹ In fact, Laffont, Rey and Tirole (1998) predict that decades of regulatory scrutiny will give way in the near future to a competitive marketplace from which detailed regulation will withdraw. Sidak and Spulber (1997) demonstrate that for the US: (1) local telephone networks have lost or are quickly losing their monopoly nature and that the existence of a natural monopoly in a market is not necessarily a barrier to entry; (2) the problem of duplicate facilities and the sunk cost argument no longer applies; (3) entry barriers are not an issue because costs have already been sunk for multiple networks; (4) the erosion of the local exchange monopoly eliminates the possibility of leverage and self-dealing; and (5) the local networks are no longer essential facilities.

In the electricity sector, arguing that the entire sector presents natural monopoly properties is no longer correct. Monopoly is also giving way to competition. The decline of scales economies in generation and the fact that energy as a product can be separated from transmission as a service has opened the market to competition (Hunt and Shuttleworth, 1996).

Technological improvements have created more opportunities for competition and increased the contestability of these markets. However, in some segments of these industries bottlenecks remain and need to be regulated to accelerate the transition toward competition and avoid the social cost of duplicating essential facilities that would otherwise arise. The incumbent can raise entry barriers in a market that would otherwise be competitive by controlling the access to an essential facility or input necessary for competition to take place.

¹There are many alternatives to the existing monopoly products and services which, in turn, makes competition possible. The potential facility-based competitors include access providers, long-distance telecommunications companies, cable television operators, gas networks, cellular and PCs carriers, and electricity utilities.

In the telecommunications sector, local exchange companies still hold a dominant position and control access to some essential inputs. Therefore, for competition to succeed, open access to some components and services of the local network is required. In such case, regulation usually in the form of network interconnection and the unbundling of services are key to create conditions for effective competition.

In electricity, regulators must harmonize the introduction of competition in production and marketing with maintaining natural monopolies in transmission and distribution services. To achieve wholesale and retail competition, regulators ought to require all electricity utilities to transmit energy for others in equal terms and to wheel power over its transmission and distribution network that their competitors have generated. The open access to transmission and distribution wires will allow all customers to choose between trading directly with producers or through intermediaries of their choice.

Another reason that justifies implementing regulatory schemes in the form of open access or common carriage is the presence of externalities in networks. These externalities drive a wedge between private and social prices, so to have an efficient resource allocation regulation would be required. Network externalities makes a fully interconnected network the most efficient supply structure and, consequently, allow an incumbent provider to preserve his dominant position by refusing or overpricing interconnections.² In telephony when new subscribers join the network, existing subscribers benefit from receiving calls and being able to call them without paying an additional charge. Likewise, in the electricity sector, a producer benefits from interconnection not only by being able to sell energy to a larger market but also because it can rely on the capacity of other producers as backup instead of having to build its own reserve units.

The existence and enforcement of open access to multiple networks are crucial to bring the benefits of competition and network externalities to the telecommunications and electric industries. To implement this policy, regulators have to specify clearly both the technical and the economic conditions under which the incumbents shall grant competitors access to their network services. The incumbents must follow those specifications and allow competitors, customers, and suppliers to have access to their facilities with a level of ease that is comparable to that of the company's own access. Pro-competitive reforms will not achieve their objectives, and might even prove counterproductive, unless prices and terms of access become economically efficient signals to guide investment and production.

² Occasionally, an incumbent would like to subsidize rivals to enter the market in order to appropriate those externalities (market and network creation) as is the case when introducing new technologies (Economides, 1996).

To be effective, open access policies under the presence of incumbent monopolies need to be supported by quite detailed regulations including technical procedures, efficient pricing formulas, and explicit time frames for interconnection. These clear rules together with an adequate regulatory structure are needed to enforce interconnection rights without incurring in long costly disputes.

The methodologies for setting access tariffs must be technically sound and known in advance by firms. If the regulation is not well designed, the setting of incorrect interconnection and access charges could jeopardize the introduction of competition into network industries. However, this is a difficult matter since there is an active discussion among scholars regarding what these prices should be, ranging from the efficient component pricing rule (or Baumol-Willig rule) to Ramsey and accounting prices (see Armstrong and Doyle, 1995; Economides and White, 1995).

Access to information by regulators and the strengthening of regulatory agencies from an institutional point of view are also important limitations to effectively regulate these sectors. Access and interconnection charges requires detailed information about incumbent's cost structure, so it is important to ensure that regulators can collect the necessary information from market participants to allow them to regulate effectively. In the regulatory process there also exist some areas in which it is not possible to eliminate all ambiguities, so regulators need to have the autonomy and the resources to shield technical decisions from lobby and political interference by interest groups.

Expanding the number of potential suppliers and customers is likely to make the electricity and telecommunications industries more efficient and more competitive but, even under open-access conditions and an adequate regulatory framework, there may be circumstances in which dominant firms, occasionally vertically integrated, are able to exercise market power. Consequently, the authorities must still address competition problems in concentrated and vertically integrated markets. Developing a competitive market when there is an important dominant operator is a costly and long-term process. These costs may justify engaging in market-power reduction schemes through industry restructuring and divestiture.

3. Open-access Issues in the Telecommunications Sector

As is the case in most developing and developed countries, state-owned firms prior to its restructuring in the early 1980s largely dominated the telecommunications sector in Chile. Local telephony was provided by CTC, a network acquired from ITT by the government in 1974, while long-distance telephone services were provided by ENTEL, a firm created by the government in 1964. Only telex services were to some extent competitive as Telex-Chile, ITT, and VTR (a joint venture by RCA and local investors) split the market. A standard practice by the Chilean authorities was to set tariffs at very low values for political reasons, so that the return on investment was negligible, the quality of service was minimal, cross-subsidies were widespread, and customers had to wait for prolonged periods in order to obtain a telephone line.

Deregulation started in the mid 1970s with the elimination of anti-private sector regulation and the modernizing of state-firms management. In 1977 the government created the Undersecretary of Telecommunications (Subtel), an agency of Ministry of Transport and Telecommunications, in charge of enforcing the law. The main functions and attributions of Subtel are to (i) elaborate sector policies, (ii) develop, issue, and enforce technical standards for the operation of the industry, (iii) overview the compliance with local regulations and international agreements, (iv) grant licenses and franchises, and (v) sanctioning illegal practices.

In 1978, Subtel allowed the entry of private firms to the local telephony market. Two smalls privately owned telephone companies were established and granted concessions overlapping parts of CTC's service areas in Santiago (CMET and Compañía Telefónica Manquehue). These companies took advantage of the severe shortage in the supply of telephone lines, especially in affluent residential and commercial districts. CTC was required to interconnect to the new networks, which partly duplicate CTC's own network.

The entry of private firms to local telephony and the desire to privatize the sector led the government to issue the 1982 Telecommunication Law which reshaped the structure of the sector along the lines of tariff deregulation, open access to market, and private-sector management. However, the definite impulse to reforms was given when the government announced the privatization of CTC and ENTEL and the sale of its participation in Telex-Chile. Between 1985 and 1987, the authorities sold 25% of CTC and 33% of ENTEL but transferred the control of the firms to private investors. By 1990, the two firms had been completely privatized.

The evolution of the telecommunication sector since 1987 has been amazingly dynamic, as shown in Table 1, in all five segments of the telecommunications market: local telephony, long-distance telephony, mobile phones, cable TV and Internet services.

Table 1
Main Indicators of the Telecommunication Sector

	Local Telephony			Long Distance Telephony		Mobile Phones
	Lines (thousands)	Density (Lines/100 inhabitants)	Waiting List (thousands)*	Domestic (MM minutes)	International (MM minutes)	Subscribers (thousands)
1987	581	4.65	232			-
1989	689	5.40	284			-
1991	1,056	8.02	241	597	57	36
1993	1,516	11.10	198	984	72	85
1995	1,894	13.42	117	1,847	137	197
1997	2,693	18.20	n.a.	2,704	242	410
1998	3,046	20.40	n.a.	2,975	259	964

Source: Subtel's database and Melo and Serra (1996). (*) CTC only.

As of 1998, CTC continues to be the dominant firm in **local telephony** with 87% of the market. Other firms -such as CMET, Manquehue, Entelphone, and VTR Telesat- also operate in local telephony but tend to concentrate in particular segments of the market (high-income families, commercial, closed systems). See Table 2. Investment in network expansions has been substantial and line density quadrupled from less than 5 lines per 1000 inhabitants in 1987 to over 20 lines in 1998. The entire network is digital.

Regarding **long-distance telephone** services, before the multi-carrier system was implemented in 1994, CTC had the monopoly in domestic long-distance telephony (DLD) although the majority of its lines were leased from Entel. The latter dominated the international segment (ILD), despite some competition by Chilesat who entered the market in 1992. The entry of a large number of carriers dramatically altered the functioning of the market and tariffs reduced in 60% for international calls and 40% for domestic long-distance calls.

Currently, 10 firms operate at a national level. Entel and CTC continue to have an important share of the market but are far from the monopoly status they enjoyed: Entel's participation in 1998 reached 39% in DLD and 35% in ILD. CTC's share was 34% in DLD and 20% in ILD. Chilesat and Bellsouth hold 18% and 10% of the ILD segment, respectively.

In 1989 Subtel decided to split the country in three areas and franchised two concessions for **mobile telephony** in each of them. Startel, a company formed by the fusion of CTC's and VTR's cellular-phone branches, holds one concession in each area, while Entel holds one concession in two of the areas and Bellsouth the third one. Consequently, Startel has a participation of 57% of the market, while Entel reaches 23%, and Bellsouth 20%. **Digital telephony**, PCS, was introduced in 1996 when Subtel auctioned three concession areas with national coverage. The mobile-telephone branch of Entel obtained two of these concessions while its rival Chilesat PCS won the third one.

Finally, **Cable TV** is offered nationwide by two companies: Metr polis Intercom (a CTC subsidiary that rents its parent company network) and VTR, which operates with its own network. As of 1998, 23% of households were connected (680.000) of which VTR's participation reached 56% while Metropolis Intercom held 42%. **Internet service**, on the other hand, is a relatively new segment of the market, serving around 75.000 households. Nevertheless, it is a very dynamic area with monthly growth rates of over 12% (DCR, 1998). There are over 30 Internet providers, but two firms dominate the market: Entel (60%) and a CTC affiliate (CTC-Reuna, 35%). Until May 1999, the expansion of the market was severely limited by the high tariffs charged by CTC to customers for local calls to connect to the Internet provider. Changes in the tariff regulation discussed below eliminated this distortion and tariffs reduced by 50%.

After 15 years of deregulation, the most striking characteristic of the structure of this sector is undoubtedly the dominant role of the two former state monopolies in local and long-distance telephony. As shown in Table 2, CTC maintains its dominant position in local telephony and has been able to extent to other complementary markets such as Internet services and cable TV. On the contrary, Entel has reduced its share of the long-distance market but has gained access to mobile phones and Internet services thus diversifying its portfolio.

Table 2
Market Shares in the Telecommunication Sector in 1998 (%)

	Telephony			Cable TV	Internet	
	Local Exchange	Long Distance				
		Domestic	International			
Entel and affiliates	1.5	39.0	35.0	23.0	-	60.0
CTC and affiliates	87.0	34.0	20.0	57.0	40.0	35.0
Telex and affiliates	1.2	18.0	15.0	-	-	-
VTR and affiliates	0.7	2.8	9.7	-	58.0	-
Bellsouth	-		10.0	20.0	-	-
Manquehue	2.2				-	-
CMET	2.6	-	-	-	-	-
Other companies	4.7	6.2	7.3	-	2.0	5.0

Source: DCR (1998).

3.1 Evolution of the Regulations in Telecommunication

Until 1982, the telecommunications sector did not have a regulatory framework of its own and was regulated by the Electricity Law, largely a reflection that the sector was organized in state monopolies and the authorities did not need to implement specific regulatory procedures. The 1982 Law changed substantially the concept of how telecommunication markets should operate. It granted open access within a non-discrimination basis, it allowed market determination of tariffs, and made interconnection mandatory for all firms operating in the market. Table 3 presents a summary of the main innovations introduced by the Telecommunication Law to the previous regulatory framework in terms of entry, tariffs, interconnections, and regulatory authorities.

Table 3
Changes in Regulations of the Telecommunication Sector

	Law of 1959 (DFL 4)	Law of 1982 (N°18.168)	Changes in 1985/87	Law of 1994
Entry	Only a government license was required to operate in local telephone. In practice, licenses were not granted in areas covered by existing concessions. Monopoly operation was the norm. Telegraphs and long-distance telephony were public monopolies by law.	Any person can apply for concessions and licenses. Concessions have no limitations in terms of the nature of services (local telephony, long distance, etc.) and locations (geographical overlaps allowed).		Implemented a multi-carrier system in long-distance allowing vertical integration. Required local companies to provide consumers equal access to carriers.
Service Tariffs	In principle, tariffs were fixed in order to guarantee a fixed rate of return on assets of 10%. In practice, tariffs were usually set in nominal terms and eroded by inflation.	Tariffs determined by private negotiation, unless the National Economic Prosecutor determines that market structures inhibit competition. In such case, the Ministry of the Economy sets tariffs. Specific procedures, however, were not properly established in the Law.	The Antitrust Commission was named to qualify which service tariffs should be regulated. In such case, the Ministry of the Economy and the Ministry of Transport and Telecommunications set tariffs. Service tariffs are to be determined according to an "efficient-firm" model.	
Network Interconnection	No specific regulations.	Firms are required to interconnect (easement) under the technical standards determined by Subtel.		Set technical standards and connection points for network interconnections. Established time limits for interconnection in long-distance.
Interconnection tariffs	No specific regulations.	Tariffs are determined by private negotiation, unless the National Economic Prosecutor determines that market structures inhibit competition. In such case, the Ministry of the Economy sets tariffs. Specific procedures, however, were not properly established in the Law.	The Antitrust Commission was in charge of qualifying if interconnection tariffs should be regulated. In such case, the Ministry of Economy and the Ministry of Transport and Telecommunications set tariffs. The procedure to set tariffs is according to an "efficient-firm" model.	The Ministry of the Economy and the Ministry of Transport and Telecommunications set tariffs, according to an "efficient-firm" model.
Regulatory Institutions	Bureau of Electrical Services and Interministry Tariff Commission	Undersecretary of Telecommunications (Subtel). Antitrust Commission	Allowed referees to resolve disputes within a six months period. Judgments can be appealed to the Supreme Court.	

Although the 1982 Telecommunication Law introduced important changes in the regulation allowing for private sector entry to the market, it presented several limitations for an efficient operation of the industry after its complete privatization. Consequently, in 1987 the Law was modified in several areas:

The local and long-distance telephony segments were differentiated for regulatory purposes. This allowed the authorities to set different quality standards, technical requirements and, eventually, tariffs in these two segments of the market.

It sanctioned that in cases where the Antitrust Commission determines that competition in a market is unlikely, the methodology to set tariffs should be based in the incremental (marginal) cost of an "efficient-firm" model. Tariffs are to be set so that the net present value of expansion projects is zero, when discounted at a rate reflecting the sector's capital cost. The capital cost is estimated using the capital asset-pricing model. If no investment is to be undertaken, tariffs should be based in marginal costs. Rather than using actual costs, those of ideally efficient companies were used, reflecting the situation that would result from using the most appropriate technologies available. In case that incremental costs were not enough to cover total costs, they would be increased in order to obtain a set of tariffs that ensured near-maximum economic efficiency as well as self-financing for every service, every region, and every company. An indexation formula was included in the model for each company.

The sector operated under this framework until 1994 when a new Telecommunications Law was passed. In the interim, there were numerous disputes concerning interconnections, tariff setting procedures, and vertical integration. The 1994 Telecommunications Law introduced a major modification in the regulatory framework by opening the long-distance segment to competition through a multi-carrier system. In order to foster competition it established the necessary technical requirements to guarantee open access to network facilities and services, provided for equal access to different carriers, and it allows for vertical integration.

3.2 Open-access Issues in Telecommunications

In this section we examine how prices, terms of access, and unbundling measures were implemented in Chile.

3.2.1 Interconnection

In 1978 and 1980, Subtel granted concessions to CMET and Telefonica Manquehue in areas of Santiago where line shortages were more acute. Telefónica Manquehue, in fact, was founded to increase the value of property in a large real-estate development project in an affluent neighborhood of Santiago. The incumbent in the surrounding areas, CTC, expected to serve the areas but did not have the capacity to provide a timely service.

As CTC visualized that entrants would become important rivals in the market it became to delay, and sometimes outrightly obstruct, interconnections with its network. In turn, this led to substantial litigation in the Antitrust Commission, as reflected in Table 4. Litigation costs and the slowness of the Chilean Judiciary system effectively delayed the entry of these companies and retarded competition. To a large extent CTC was able to succeed with its strategy because the regulatory framework was ambiguous and incomplete with regards to the conditions in which interconnection should be achieved.

The 1982 Telecommunications Law established mandatory interconnection for concessionaires of public services under the technical standards of Subtel. In case of disagreement between the parties regarding connection fees, interconnection could be initiated before the Courts have reached a final judgment. The main drawback of the Law was that procedure and deadlines for interconnection were not specified, nor were the compensatory fees for the use of the incumbent's network.

It is noteworthy that telex companies did not engage in disputes with CTC during this period, despite the fact that telephone services are a substantial part of their costs. According to Coloma and Herrera (1990) there are two non-excluding explanations. First, CTC did not provide telex services, so those telex operators did not represent a threat; in fact, services were usually complementary. Second, since the telex market is somewhat modest, the returns to monopolizing were also reduced. However, CTC feared that its dominant position could be challenged if it pursued an aggressive strategy in this additional area.³

³ Economides (1996) discusses the incentives of the incumbent to block or foster entry based on the complementarity or substitutability of the services provided.

Table 4

Proceedings of the Antitrust Commission Regarding Interconnections in Telecommunications.

	Accusation	Judgment
CMET against CTC (1981)	CTC fetters interconnections with CMET.	CMET and CTC reached an off-court compensatory agreement in 1982.
CMET and National Economic Prosecutor against CTC (1982)	CTC engages in anticompetitive practices: <ul style="list-style-type: none"> Unauthorized sale of lines in CMET's concession areas Continued to make interconnection difficult 	The Antitrust Commission sanctioned in 1983 that CTC engaged in anticompetitive practices, abusing its monopoly power to create entry barriers. Set a deadline of 15 days to interconnect CMET and CTC in two cities.
Telefónica Manquehue against CTC (1982)	CTC engages in anticompetitive practices: <ul style="list-style-type: none"> Unauthorized sale of lines in Telefónica Manquehue's concession areas Continued to make interconnection difficult Unjustified delays in interconnections. Abuse of monopoly power by charging an access fee. 	In 1983, the Antitrust Commission sanctioned that CTC engaged in anticompetitive practices, abusing its monopoly power to create entry barriers. The judgment includes a procedure for the interconnection of networks.
Post Office, ITT and Transradio against ENTEL (1981)	In 1980 Entel applied for a concession to operate telex services. In January, 1981 the three companies sued on the basis that Entel's status as legal monopoly in international communications precluded its participation in telex services.	The claim was accepted by the Antitrust Commission in 1983 which sanctioned that Entel was not allowed to operate telex services.
Transradio, ITT, and National Economic Prosecutor against Entel and TEXCOM (1982)	A contract between Entel and TEXCOM allowed the former to operate in the telex market thus defying the judgment by the Antitrust Commission. Terms and access conditions of this operation were discriminatory with regards to Transradio and ITT.	In 1983 the claim was accepted by the Antitrust Commission which sanctioned that Entel should give TEXCOM the same conditions given to other private firms.
CMET against CTC (1986 and 1989)	CTC makes interconnections with CMET froward.	The Antitrust Commission sanctioned that, according to the 1985 Law, disputes should be solved by arbitration or Subtel.
CMET against CTC (1988)	CTC does not allow CMET to install components (trunk lines) in a facility leased to a third party.	The Antitrust Commission sanctioned that CTC could not impede such practice if it was technically feasible (1990).
Subtel against Startel (CTC) (1999)	Startel engages in anti-competitive practices when introducing the Calling Party Pay system.	Startel was fined in US\$ 500,000

In fact, disputes in the telex service actually involve the other state-monopoly. In 1980, Entel applied for a license to operate telex services. The existing companies complained to the Antitrust that Entel had a legal monopoly over international long-distance which explicitly precluded it from pursuing other commercial interests. After the claim was accepted and Telex restricted to participate, it formed a joint venture with TEXCOM (currently its subsidiary) to offer telex services. Again, existing firms complaint to the Antitrust Commission, which sentenced that Entel must offer to TEXCOM the same prices and quality standards it supplied to the existing telex firms.

By the end of 1985, the authorities implemented a legal mechanism to reduce litigation costs and delays. It allowed interconnection tariffs disputes among parties to be reviewed and sanctioned in first instance by a referee chosen by the firms in advance (or, if necessary, nominated by Subtel) in a maximum period of six months. Appeals to the referee's decision could only be reviewed by the Supreme Court. In addition, Subtel was granted additional powers to obtain information and data from concessionaires to speed up decisions. Although these measures reduced time delays and might have helped improve the quality of judgments, it did not solve the ambiguities and limitations of the regulation.

Furthermore, the authorities did not show interest in attacking one of the main impediments to competition in the sector --interconnection procedures and fees-- as reflected in the reforms of the Law of 1987 and in the 1988 tariff-setting process. As discussed, the former related mostly to setting the institutional framework for competition but it did not address the manner in which such competition was to be carried away. The latter focused on reducing cross-subsidies but, rather surprisingly, maintained access fees that were substantially above marginal costs (Tabja, 1997).

During this period, CTC continued to enjoy a substantial monopoly power and was able to keep entrants under control by means of inducing continuous interconnection problems. As apparent from Table 4, entrants had to recourse to arbitration, the Antitrust Commission and the judiciary system to solve the disputes. However, fines were too low to deter CTC from anticompetitive practices. The largest fine applied to CTC in this period barely reached US\$ 300.000.

High long-distance tariffs, for both domestic and international calls, generated high profitability in this segment of the market. Consequently, several local telephony firms applied for concessions in long-distance while firms operating in the long-distance telephony segment applied for local telephony concessions. This, in turn, posed Subtel the problem of allowing vertical integration in the market and confronted the authorities with

the fear of regulating a powerful integrated firm. This was a reflection of the lessons learnt in the electricity sector where integration made regulation very demanding (see section N° 4).

In 1988, and before granting any franchise, Subtel required the Antitrust Commission an opinion regarding the costs and benefits of vertical integration in telecommunications and the advantages of segmenting the markets, forbidding firms in one segment to participate in the other. The Antitrust Commission sanctioned in first instance that to enforce competition in long-distance telephony, local telephony could not participate directly or indirectly in such services (decision N° 718/763 of 1989). The judgment was based on the notion that local telephony had monopoly power and could use it to monopolize the long-distance market. According to the Commission, an efficient participation of local telephone companies would require the overseeing of a large number of conditions and the authorities lacked the necessary technical and operative capabilities to monitor vertically integrated firms in a context of asymmetric information.

An appeal by local telephone companies to the second-instance court of the Antitrust Commission successfully revoked in the same year (decision N°332 of 1989) the aforementioned judgment and sanctioned that local telephony firms could participate in the long-distance market if such market was organized as a multi-carrier system. In addition, it sanctioned that long-distance firms could also participate in the local telephony market if certain conditions were satisfied. Among the latter, the judgment ruled that firms should guarantee egalitarian treatment of access to network interconnections service, including interfaces, network intelligent functions, switching services, maintenance, customer information, and billing and ordering systems.

The incumbent monopoly in long-distance telephony, Entel, appealed to the Supreme Court, which sanctioned in 1990 that the Antitrust Commission had technically failed to prove its case and that the previous judgment was not valid. The Court determined that the Antitrust Commission "omitted the necessary technical and expert reports to supported the ruling, though it was required to do so". In September 1990, the Antitrust Commission ruled to maintain the legal-monopoly status of Entel. This situation remained unchanged until Entel's long-distance monopoly was abolished in 1992. However, real competition did not begin in this market until the 1994 Telecommunication Law was passed.

Meanwhile, in April 1990 the Antitrust Commission studied a complaint against Telefonica of Spain claiming that according to the Chilean competition law, it was forbidden to participate in the property of CTC and Entel simultaneously. The Antitrust Commission ruled (decision N°735/240) that Telefonica could only hold interest in one of these companies or should seek a special consent from the Government to be allowed to own shares in both companies simultaneously. Several telecommunication companies, against and in favor

of the ruling, appealed to the second-instance court of the Antitrust Commission. In 1992, the latter resolved (decision N°368) that Telefonica should sell its participation in either CTC or in Entel in an eighteen months horizon. In the end, Telefonica sold its share in Entel and kept CTC property.

Despite some limitations, the 1994 Telecommunication Law established a regulatory framework that enforces open access and stimulates competition, particularly in the long-distance market. Among the conditions that it requires from local exchange companies in order to foster long-distance competition are: (1) to provide consumers equal access to carriers so they can select the carrier dialing the same number of digits; (2) to provide non discriminatory and equal access to interconnection and network services in terms of quality and time frames; (3) to operate with regulated interconnection fees; and (4) to allow market participants to have access to the necessary information about subscribers, including the volumes of traffic generated.

In addition to this, the new law also established more detailed procedures and norms related to interconnection of networks in general. Some important aspects were: (1) that it applies to all telephone operators; (2) it defines the location of points of interconnection; and (3) that the prices of all network services should be subject to regulation according to procedures described by the law. These changes were important in order to improve the negotiation capabilities of entrants and small competitors to enforce their interconnection rights, reducing disputes and lawsuits related to the technical and economic conditions of the interconnection of multiple networks.

In spite of this significant reform, the authority did not introduce detailed norms with regard to the procedures and timing at which local interconnections should be implemented. As a consequence, interconnection problems among local telephone companies persisted. During 1995, CMET and CTC had a dispute derived from interconnection problems that ended with the application of a fine to the latter. In September 26, 1995, in an attempt to solve these problems, Subtel established a detailed procedure and also a three-month deadline to set and accept telephone interconnections. From this date on, it can be said that local interconnection regulations were completed in what respects to timing and procedures.

The existence of all this detail interconnection rules and procedures makes incumbent monopolies difficult to deny, delay or overprice the interconnection of multiple networks in an attempt to preserve their dominant position. However, problems related to the services tariffs setting have continued, which we analyze in what follows.

3.2.2 Interconnection and Access Tariffs

The law of 1982 established that services prices are free, unless the National Economic Prosecutor determines that market structures inhibit competition. In such case, the Ministry of Economy and the Ministry of Transport and Telecommunications were in charge of setting tariffs according to direct costs and a profitability margin. In 1982 and in 1985, the National Economic Prosecutor assessed that local telephone services were not offered under competitive terms so they should be subject to tariff setting. However, giving that the law did not establish specific procedures, within 1982 and 1987 the tariffs were not recalculate but rather only adjusted by a price index.

The law was modified in 1987, introducing the procedure of setting tariffs according to an "efficient-firm" model, and assigning to the Antitrust Commission the responsibility of qualifying which services tariffs should be regulated. The first occasion in which this tariff setting methodology was applied was in 1988.

In 1993 and in 1998 the Antitrust Commission listed which telecommunications services should be regulated and in 1994 the law established that certain services have to be in any case subject to tariff setting. The Antitrust Commission identified the services for each firm and regional markets as shown in Table 5.

To set service and interconnection tariffs, companies are required to present their own studies along the technical and economic lines elaborated in advance by the government. After the study is submitted to the authorities, the Ministry of the Economy and the Ministry of Transport and Telecommunications -operating coordinately through Subtel- have 120 days to make objections and propose alternative tariffs. In case of conflict, the parties can consult a panel of three experts (one selected by each party involved and the third chosen by mutual consent) for a recommended solution. However, the Ministries retain the right to set definitive tariffs and their decisions can only be appealed to the Supreme Court.

Table 5
Main services subject to tariff regulations.

By Law	By resolution N° 515 (04-22-1998)
<p>Network interconnections and services.</p> <p>Switching services, maintenance, customer information, and billing and ordering systems.</p>	<p>CTC and some other local exchange companies in specific areas.</p> <ul style="list-style-type: none"> • Phone lines • Telephone connections • Local calls within a company. • Access for long-distance and wireless providers. • Switching and transmission services provide as private circuits. • Local segments of calls originated in a local exchange company and transmitted to the network of another local company, to a long-distance network, or to a wireless firm. <p>Long-distance switching and transmission services provide by Entel, CTC and Chilesat.</p> <p>Services provide to suppliers of complementary services.</p>

Several pitfalls can be identified in the procedure to set tariffs. In turn, these shortcomings facilitate disputes among incumbent firms and regulators. In particular:

- First, when using as a benchmark an ideally efficient company, it is very difficult to reach an agreement with regards to costs and efficiency parameters. In particular, the privatization of CTC as a single provider of local telephony impeded the government to implement yardstick competition with which to measure CTC's performance.

- Second, as discussed in the analytical section, models are still unable to solve the problem of allocating common-carriage costs among different services and regions. In turn, this hampers network expansions by introducing incentive to free-ride.
- Third, the current regulation does not provide a procedure to determine unambiguously which one is the ideal efficient network design. Hence, there exists the possibility that ex-ante definitions of the network used to evaluate investment projects at the firm level do not match ex-post evaluations by the authorities and that price wedges between both parties lead to sub-optimal investment plans.

Tariffs tend to be quite sensitive to the cost of capital used in simulation models. But, as it is well known, in general the authorities do not have enough information to calculate the cost of capital and a proxy has to be adopted. Moreover, the tariff-setting process assigns to the regulated company an important role in providing the information regarding its operating and capital costs. In turn, this leads to substantial problems of asymmetric information to the disadvantage of the regulators.

Throughout the years, the authorities have shown a tendency to overcome a number of institutional limitations that weakened the regulatory framework beyond the abovementioned shortcomings. In particular, Subtel has developed the capabilities to enforce regulation, monitor compliance with technical and economic norms, and provide guidance for the tariff-setting procedures. This has been an important counterbalance to the large power, both economic and politic, of incumbents. Technical proficiency also tends to shield the authorities from political pressures.

3.2.3 Unbundling of Services

The most recent impulse to transparency and competition in the telecommunications sector is the unbundling in an extensive way of the services provided by local exchange companies implemented in 1999. Unbundling refers to the separate sale of lines, switching, and transmission services.

The 1994 Chilean telecommunication law does not contain any provision on this regard. However, it allows the authorities to set tariffs -on an individual basis- for those services identified by the Antitrust Commission as being offered non-competitively (see Table 5). In 1998, the latter issued the corresponding list of services with the proviso that Subtel ought to elaborate the most disintegrated tariff scheme possible to value the services provided by local exchange companies. Although, the definition of individual services and network

components is necessarily arbitrary (since any service is a bundle of features), the spirit of this mandate was to further the unbundling of facilities to induce more competition at the local telephony level. Since by law the tariffs were to be revised in 1999, Subtel produced a detailed Technical Report to serve as the basis for tariff setting.

In May 1999, the authorities issued a new tariff schedule that was immediately disputed by CTC. However the Court of Appeals and then the Supreme Court rejected the claim. In addition to legal matters, several aspects of the process have been controversial and deserve particular attention: (1) the absence of detail procedures for using CTC's facilities; (2) how excessive and economically justifiable are the unbundling requirements; and (3) the "efficient-firm" cost standard used for setting prices for unbundled elements. In any case, unbundling is likely to become an important change in the regulation of the sector, as it will open spaces for more competition .

Finally, it can be seen in table 6 that for most services there was a substantial cut in tariffs, which reflects the unbundling requirements, cost reductions due to technological changes, and the fact that in some cases previous tariffs were set too high.

Table 6
1999 Tariff Revisions for CTC
(Ch \$/minute)

	Previous Tariffs	New Tariffs
Fixed cost	6.304	5.213
Local calls within CTC's network.		
Normal hours	15.4	13.3
Discount hours	2.6	2.2
Local segments of calls originated at CTC's network and transmitted to the network of another company.		
Normal hours	15.4	5.7
Discount hours	2.6	1.0
Domestic Long-Distance Access Charge		
Normal hours	9.7	3.5
Discount hours	1.6	0.6
International Long-Distance Exit Access Charge		
Normal hours	9.7	3.5
Discount hours	1.6	0.6
International Long-Distance Entry Access Charge		
Normal hours	135.8	3.5
Discount hours	135.8	0.6

Note: (*) previously, fixed cost were set as a lump-sum tariff. The new tariff value corresponds to the fixed cost per minute times the mean time of household consumption.

Source: Subtel.

4. Open-Access Issues in the Electricity Sector.

Open-access issues in the electricity sector arise in two areas where monopoly power is customary: high-voltage transmission and electricity distribution. As we discuss in detail in this section, access problems in the Chilean case are exacerbated by the rugged, mountainous topography of the country and by the property structure of the sector that emerged from the privatization process. Despite its careful design, the regulation of the sector remains incomplete, fostering inefficient resource allocation and allowing rent-seeking activities.

4.1 Structure of the Electricity Sector

This section describes the main characteristics of the Chilean electricity sector in terms of its structure, the privatization process, and the regulatory framework in which it operates.⁴ Chile is a very long but narrow country (4,400 km long with an average width of 200 km) located alongside the Andes mountain range. The northern half of the country comprises one of the driest deserts in the world and it is largely inhabited. Power generation relies mostly on thermoelectric facilities (gas and coal based) and demand concentrates in for mining activities. In the southern half, on the contrary, rain and snow accumulation is abundant (rendering hydroelectric generation efficient) and consumption concentrates on industrial and residential uses. There are two main and independent electric systems (the Greater North Integrated System, SING, and the Central Integrated System, SIC)⁵, each comprising their own generation plants, transmission lines, and distribution networks (see Figure 1).

Currently, four institutions rule the activities in the electricity industry (excluding the Antitrust Commission and the judiciary system):

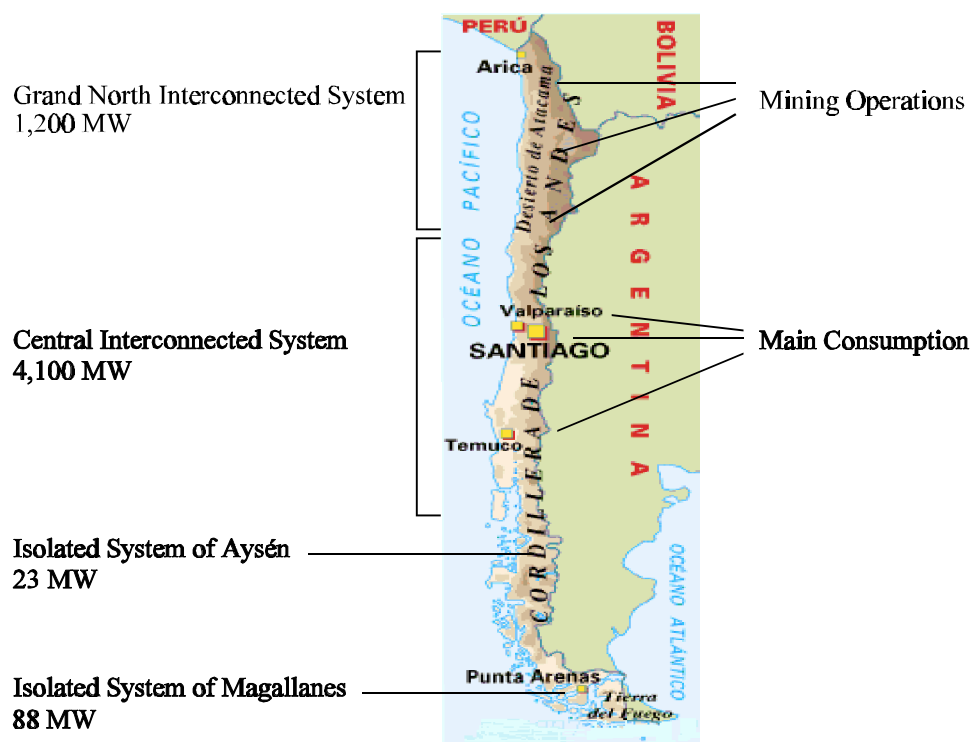
- The *National Energy Commission (CNE)* is an agency advising the government on all matters related to energy (including, electricity, fuels, nuclear power, etc.). Its duties include defining the sector's policies and development strategies, studying and proposing economic and technical norms, and calculating tariffs and prices.
- The *Ministry of the Economy* has the right to set tariffs (as proposed by the CNE) and promote the efficient development of the generation, transmission, and distribution.

⁴For a detailed analysis of the regulation see Basañes, Saavedra and Soto (1999).

⁵There are two other isolated, state-owned systems in the extreme south of Chile, which we exclude from the analysis in view of their small size (23MW and 88MW).

- The *Superintendency of Electricity and Fuels (SEC)* is an independent supervisory agency (related to the Ministry of the Economy) in charge of monitoring compliance with the law and regulations; control the quality of service and safety of facilities; processing applications for concessions; and preparing the information required to set tariff rates.
- The *Economic Load Dispatching Center (CDEC)* is a coordination entity designed to optimize the operation of the generation system and energy dispatch. In the short-run, the CDEC acts as a clearance house in the energy market, while in the long run it is in charge of planning the operation of the combined generation-transmission system.

Figure 1
Structure of the Electricity Sector in Chile



The geographical situation configures a peculiar situation for the electrical industry and suggests the importance of open-access issues. Since the country is narrow, there is a generally accepted opinion that a unique high-voltage transmission line is the only economically viable structure. The existence of important scale economies in transmission reinforces this view. Consequently, the regulation of the electricity sector

implemented after privatization was based on the notion that this configures a “natural” monopoly for transmission. As discussed in detail in section 3.2, the Law explicitly considers the access problem that arises in this context, however the regulation is plagued with inconsistencies and ambiguities that have rendered this area a major source of conflicts and legal disputes.

In addition, the structure of consumption also raises access issues. In the SING consumption corresponds mostly to large, isolated mining operations that negotiate supply contracts with generators directly. On the contrary, in the SIC electricity consumption is largely concentrated in Santiago (50 percent of industrial and residential consumption) where more than 45 percent of the population lives. This concentration of demand makes the Santiago distribution company (Chilectra) a very large local monopoly and an important player in the industry. Although a strict regulation has been implemented concerning tariffs, service quality, and required investments, access to free-clients within the concession area remains controversial, as discussed in section 3.3.

Access problems are exacerbated by vertical integration structures resulting from the privatization process. The electricity sector in Chile was traditionally dominated by state-owned enterprises at the generation, transmission, and distribution levels. Vertical and horizontal integration was widespread. The privatization process initiated in the late 1980s was carried out under the presumption that generation was a potentially competitive market, while distribution and transmission were local and natural monopolies, respectively.⁶ For the latter two, the plan envisioned a scheme combining private property and management under strict government regulation.

The privatization process, however, produced a market structure inconsistent with the design envisioned in the regulatory framework in two important areas. First, high-voltage transmission lines were sold as part of the main generating firm, Endesa, thus conforming, de facto, a vertically integrated firm. Although Endesa was required to separate transmission lines from generation plants, it retains 100% of the property of transmitter Transelec. Second, the government did not enact the necessary restrictions to ownership across segments of the industry. As a result, a large conglomerate -Enersis- was able to control the main distribution company (Chilectra), the main producer (Endesa), and the monopoly in high-voltage transmission lines (Transelec, a subsidiary of Endesa).⁷ See Table 7.

⁶For a detailed description of the institutional evolution of the electricity sector see Soto (1998).

⁷In addition, Endesa benefit from privileged information on new commercial areas, water rights, reserves management, and would have been able to discriminate or block entry of potential competitors (see Saavedra and Soto, 1999).

Table 7
Market Structure in the Electricity Sector in 1997 (percent)

Generation	SIC	SING
<i>Endesa & affiliates</i>	59.2	8.0
<i>Gener & affiliates</i>	22.1	11.0
<i>Colbún</i>	12.0	-
<i>Tocopilla</i>	-	50.0
<i>Edelnor</i>	-	21.0
<i>Others</i>	6.7	10.0
<i>Total</i>	100.0	100.0
High-voltage Transmission		
<i>500KV: Endesa-Transelec</i>	100.0	0.0
<i>220KV: Endesa/Chilectra</i>	80.4	0.0
<i>Gener</i>	5.0	0.0
<i>220KV: Edelnor</i>	0.0	100.0
Distribution		
<i>Chilectra (Santiago)</i>	40.0	-
<i>Chilquinta (Valparaíso)</i>	20.0	-

The authorities have claimed repeatedly that Endesa's dominant role in generation and transmission does not allow for fair competition in the sector. This vertically integrated structure has been the source of a large number of legal disputes and conflicts. The first major attempt to separate the integrated firm started in 1990 when the *Fiscal Económico* (National Economic Prosecutor) complained to the Antitrust Commission against Chilectra, Endesa, and Transelec for noncompetitive behavior (discrimination against the small producer, Pullinque). The accusation was rejected, as was an appeal to the Supreme Court. The prosecutor initiated a second procedure immediately after the first trial ended. The second trial lasted until June 1997 and was again rejected.

After privatization, it is clear that the government could have imposed tighter ownership controls to prevent Enersis from holding interests in distribution, transmission, and generation simultaneously. Ownership,

however, is not the main issue when regulation is correctly enacted and informational asymmetries are not significant (Shapiro and Willig, 1990). This is, unfortunately, not true for the Chilean electricity industry.

4.2 Open-Access issues in Transmission

As discussed, both scale economies and Chile's particular geographical conditions support the notion that high-voltage transmission is a natural monopoly. Consequently, to ensure competition the Law guarantees open-access to transmission lines in the form of an easement: as long as lines have excess capacity, a transmission company cannot refuse to serve any producer interested in dispatching energy to a consumer or to be sold in the spot market, even if the tariff has not been agreed in advance. Regulation, however, is incomplete in two important areas: transmission tolls and new investments required to expand the network when necessary.

The 1982 Electric Law did not establish clear procedures for setting transmission charges. In the 1980s this was not a problem for Endesa which was a state monopoly at the time and simply charged between 5 and 8 percent of energy cost. After privatization, however, the lack of definition became a problem. The legal framework was modified in 1990 to establish the price system for the transmission sector. Although the law was passed and it covered the basic lines along which prices are to be set, its corresponding statute was not enacted for several years -fostering conflicts- and when it was finally published it did not provide a clear mechanism to set tolls.

The law only defines that tolls are to be determined as prorates between users and should cover facilities within the "area of influence" of a generating unit, that is, "the network of transmission lines and other installations necessarily affected by injections of power by a user".⁸ Clearly, the definition of what exactly is the area of influence is highly ambiguous since in any action by a user must necessarily affect the entire system. As discussed extensively in Diaz (1998) and Soto (1998), the ability to affect the network, however, does not necessarily imply that tolls should be paid. A number of examples displayed in figure 2 show the ambiguities and limitations of the concept of area of influence and the sources of conflicts.

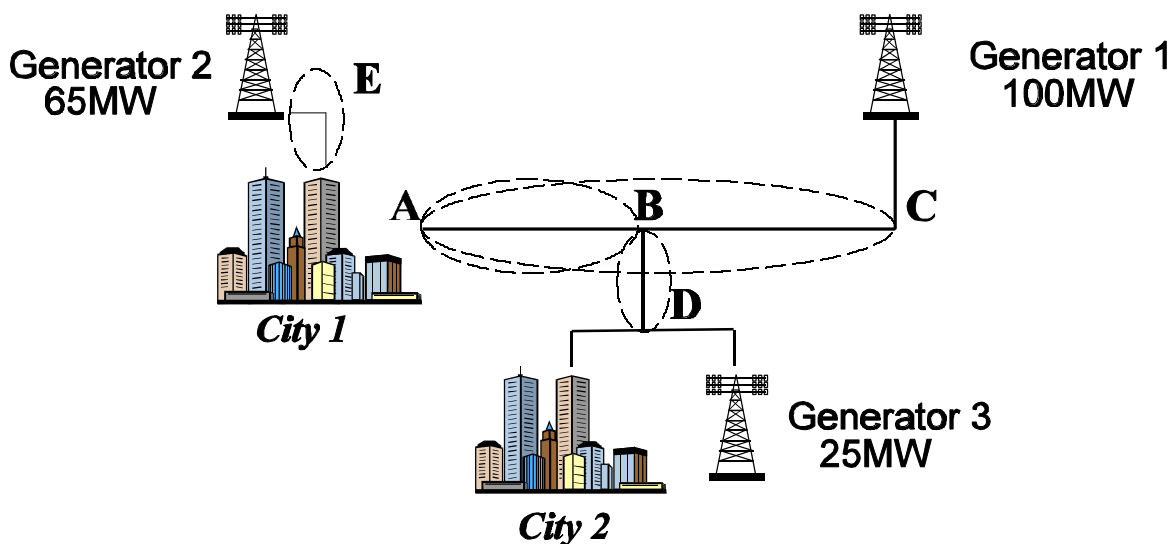
Consider, first, the case of a generator (generator 3) that installs near a consumption center (city 2). If demand in city 2 is less than what generator 3 produces (say, 25MW), the rest of the latter's production is

⁸The law also establishes that the transmission company should calculate the value of the toll, the areas of influence, the capital replacement value and prorates. A user who does not agree with the toll calculated by the company has recourse to arbitration, but faces litigation costs.

consumed by city 1. In such case, all generators sell to city 1, but only generators 1 and 3 should pay for the use of the transmission line. Generator 1's area of influence is the segment AC, while generator 3's area is ABD. According to regulation, they should pay at a prorate segment AB and face the full cost of segments BD (generator 3) and BC (generator 2). In this case, and abstracting from transmission losses, the current regulation could provide a useful guidance to pricing transmission.

However, consider what happens when generators 1 and 2 were originally serving both cities and generator 3 installs and sells *less* than what city 2 consumes. Necessarily, it will displace the less efficient rival. Assume that Generator 2 is less efficient than 1 and is located within City 1. Hence, installing Generator 3 implies to reduce the demand of Generator 2 and thus vacate some capacity in the transmission line. However, generator 3 has “affected” installations and facilities in the two segments AB and BD and, thus, should pay tolls according to one interpretation of the current regulation. It is, nevertheless, striking that a producer can be charged when it is not using the transmission line and it may be the case that a socially efficient outcome (displacing an inefficient producer) is de-stimulated by compensating the transmitter for transmitting less energy. Moreover, assume now that generator 2 is remote from City 1 but is still displaced by generator 3. In such case, generator 3 will have to pay also for transmission line E although it does not use that line to reach any actual or potential client. The law mandates payments to the transmitter only when “a generator uses the facilities to reach consumers”.

Figure 2 Pitfalls in Setting Transmission Tolls in Chile



This problem of the lack of definition of transmission tolls has become increasingly important since in the last years there has been substantial investment in gas-based thermoelectric plants installed around Santiago. A number of disputes and lawsuits have been initiated, but to date the authorities have advanced no solution nor have court settlements produced a useful methodology to value these services. Private arbitration has been occasionally called for to end disputes.

The absence of a clear mechanism to set transmission tolls is aggravated by vertical integration. Although open-access to lines curtails the monopoly power of the high-voltage transmission company (Transelec), it still retains important informational advantages with which it can benefit its parent company, Endesa. For example, when bidding for a supply contract an important component of the offer of all generators is the transmission toll. Being a subsidiary of Endesa, Transelec cannot guarantee fair treatment to other generators and, as a result, competition is not always achieved.

When capacity is limited or new transmission lines are necessary, the law presumes that interested firms and the Transmission Company can negotiate an agreement to undertake the required investments. The potential user, therefore, has the choice of connecting with the network of the transmission company (and avoid undertaking the investments) or, alternately, building the lines to satisfy its own requirements and connecting with the network at the points it deems most suitable. The law does not consider the possible asymmetric bargaining power of firms, in particular when the additional demand is not substantial. In the SING, this problem is minor since large mining operations are able to deal efficiently with this problem through public auctions of their demand for energy. In these cases, the negotiation usually involves generation and transmission companies. As is usually the case, when a satisfactory offer is not possible, the generating company offers to build its own (dedicated) transmission line. This option, however, is limited in the SIC where there exists a substantial number of customers with small demands for which a dedicated line is economically not viable. In this latter case, the Transmission Company can exert its market power.

Perhaps the most emblematic case of inefficiency arising from open-access problems in the transmission segment of the electricity sector is Colbún's decision of building its own high-voltage transmission line in the mid 1990s. During the 1980s, when the electricity sector was mainly publicly owned, Colbún sold its energy to Endesa and had the option of supplying its own customers. Traditionally, Endesa had charged flat fees of between 5 and 8 percent of energy prices and, as long as existing contracts were in place, disputes were minimal. In 1990, and as contracts were to be renewed, conflict appeared when Endesa, which at the time was the sole owner of high-voltage transmission lines, raised substantially its charges for transmission. From the beginning, Colbún and Endesa disagreed on transmission tolls and connection fees. By the end of that year, both firms agreed to call on an arbitration commission to settle the matters. However, the Commission was unable to determine what the transmission costs should be and the proportion that Colbún had to pay. Between 1992 and 1997, Colbún made annual provisions (tentative payments) for US\$12 to US\$13 million, until the dispute was solved.

In April, 1994, Transelec demanded Colbún payments of annual transmission fees of US\$21 million, although prior to the dispute Transelec charged transmission fees of between US\$16 and 18 million a year. Colbún rejected this proposal on the grounds that it was arbitrary, monopolistic, and aimed at increasing the pressure on the arbitration commission to solve the dispute concerning unpaid transmission fees. In July 1994, Transelec reduced its claim to US\$16 million.

Fearing it could lose the arbitrage and face further litigation costs, Colbún also initiated the analysis of an alternative solution to its transmission problem, in the form of building its own transmission line to Santiago. The study concluded that the cost of building the line would be US\$70 million, which represented US\$7.5 million a year in terms of Colbún's cost of capital. Yearly operation costs varied depending on the tension of the line. Building a 500KV line would imply annual operating costs of US\$1 million, whereas two 220KV lines would cost US\$3 million a year. For security reasons, however, Colbún should consider building a double independent transmission line. Consequently, owning its own transmission lines would represent, at most, a cost of US\$11.5 million a year, or US\$4.5 million less than the amount requested by Transelec for the same service.

After Colbún decided to build its private transmission line, Transelec followed two different strategies. The first one was to convince Colbún that an independent line was an inefficient solution from a private perspective. Hence, Transelec offered a transmission fee of only US\$10.5 million a year in June 1995. By the end of 1995, Transelec had reduced its fees to US\$10.3 millions a year. The second strategy was to convince the government that a second line was inefficient from a social point of view and that it was willing to reduce or eliminate vertical integration between generation and transmission. Endesa offered to divest Transelec and retain only 30 percent of the shares, while the rest would be allocated in the stock market to be purchased by pension funds and other generating companies. As part of the plan, Endesa proposed Colbún to build only one 500KV line (and use existing Transelec facilities as backup), and later transfer the line to Transelec as a capital participation.

Colbún did not agree to this scheme and in January 1996 started to build two 220KV-transmission lines. Despite indications that two transmission lines would be socially inefficient, the government did not intervene. The main reason behind Colbún's decision seems to be that the annual cost of building and operating its own transmission lines were only US\$ 1 million more than under Transelec's final proposal but Colbún could avoid litigation costs. Considering the history of conflicts between Transelec and Colbún, this seems a reasonable strategy. In addition, Endesa proposal of hiring backup services from Transelec at unregulated fees gave Colbún no assurances that it would not use its monopoly power in the future to extract rents.⁹ Colbún's transmission lines entered into operation in August 1997.

⁹In the end, Enersis decided not to open Transelec to any other firm or institutional investor and maintain Endesa's total control over Transelec. The National Economic Prosecutor considered this a threat to the efficiency of the electricity market and decided to pursue the second vertical integration trial against Endesa-Transelec.

Disputes did not end after Colbún started building its lines. The main problem resulted from the construction of Endesa's new hydroelectric plant, Pangué, which was scheduled to enter into service in March, 1997. When Transelec requested permission to expand the capacity of its transmission lines to accommodate Pangué's production, the authorities responded that an expansion was unnecessary because Pangué's needs could be covered by Colbún withdrawal as a Transelec client. Colbún's new transmission lines were expected to be in service in June of that year. Since the existing lines were insufficient to transport Pangué's energy without considerable losses, Endesa initiated a strong debate in order to obtain compensation from Colbún for delays in the construction of its lines. Private arbitration settled the matter.

The previous analysis suggests that the authorities have had an important role in allowing anti-competitive practices by the incumbent and that a more active stance would have reduced disputes and social losses. As mentioned, the 1982 Electric Law did not establish clear procedures for setting transmission charges. The legal framework was modified in 1990 to establish a price system for the transmission sector based on influence areas (for valuing operation costs) and incremental-cost estimates (for network expansions). Although the 1990 Law did not detail the manner in which such tariffs were to be calculated, it mandated the CNE to issue within a year the corresponding technical and economic details of the procedures to be used in calculating transmission tolls and other regulated features of the sector. This Electricity Sector Statute was not issued until early 1998 and has been disputed by regulated firms at the Supreme Court as inconsistent with the electricity law. Not only the Statute was not issued for almost eight years -inducing uncertainty, inefficiency, monopoly abused, and rent-seeking activities- but when it was finally released it did not contain a useful methodology to determine transmission tolls.

In addition, the authorities have been lenient toward vertical integration problems. In 1994, the Supreme Court judges issued a number of recommendations to achieve more transparency in the transmission sector (recommendations are considered mandatory in spirit):

- The pertinent authorities must issue a statute for the sector as soon as possible. To resolve existing ambiguities regarding the use of transmission lines and setting toll charges, the authorities must stimulate the enactment of all necessary changes to existing legislation.
- Because of the existence of information asymmetries, Transelec must become the owner of the assets it now manages. This should be undertaken in a manner determined by Transelec shareholders but within a relatively near time horizon.

- Given the lack of adequate procedures to ensure the expansion of the transmission network when that becomes necessary, Transelec should open itself up to participation by other interested firms, whether or not they are involved in generation.
- In order to increase transparency, distribution companies should purchase energy and power by means of a public auction. The rules and regulations governing the auctions should be established freely by the distribution companies. These should apply generally to all and be nondiscriminatory, and public information should be readily available (contrary to current practice). The latter is necessary in order to eliminate any possibility of arbitrary or illicit discrimination, and to transfer any potential cost reduction to users.

Of these provisions, only the second one was implemented but in such way that Transelec behaves as an Endesa subsidiary and not as an independent company. Regarding the other three, the government has not demanded its compliance.

The Statute is technically complex, in particular when considering network expansions. Calculating prorate under asymmetric (and largely unobservable) information is very difficult. In addition, its provisions will affect large players in the market in different ways, leading to political difficulties as a result. The two main holdings in the electricity sector (Enersis and Gener) have commercial interests in several other areas of the economy and in other countries in Latin America, and are thus important players in the political arena. In addition, private sector executives consider the CNE to be politically and technically weak; the recent mismanagement of the severe 1998-99 drought supports this notion (see Díaz, Galetovic, and Soto, 1999).

4.3 Open-access Issues in the Distribution Segment

Retail sales of energy in Chile are separated according to the Law in two markets: consumers with a power demand above 2MW are allowed to negotiate directly their supply with generators (free clients), while consumers below that benchmark pay distribution companies regulated prices. Since electricity distribution presents large-scale economies at a local level, regulated prices are required to inhibit distributors to use their monopoly power.

These tariffs are determined based on two charges: the basic cost of energy and the value added of distribution. These charges are determined according to two independent methodologies. First, every six months the authorities calculate the *nodal price of energy*, which corresponds to the production costs at each point in the network including transmission losses. Nodal prices consider a forecast of the short-to-medium-run cost

of energy production optimized with regards to the availability of water. Second, every four years the distribution value added is revised according to an efficient firm model. Since such an efficient firm does not exist, a simulation model is used as a benchmark. Under symmetric information, the mechanism should provide adequate incentives to firms to reduce costs by forcing them to compete against the simulated optimal firm. Under asymmetric information, however, this mechanism has the obvious drawback that the regulator does not have enough information to determine the cost structure of the efficient firm since actual market data costs are strongly influenced by those of the existing monopoly. Hence, the mechanism tends to converge to the standard rate of return model.

To avoid discrimination, the Law demands distribution companies to serve all customers within its concession area at equal tariffs and equivalent quality conditions. There are, nevertheless, two areas in which the original regulation was incomplete: concession overlaps and the access to free-clients within a distributor concession area.

Regarding the overlapping of concessions, distributors were granted concession areas, which are, most of the time, exclusive and based on historical (pre-privatization) precedents. The regulators can grant concessions without limitations but have traditionally expressed doubts about allowing overlapping distribution networks given the economic cost of duplicating facilities. The CNE supports the notion that concession areas are largely determined by technical rather than economic factors. Areas of concession can be urban or suburban, facing different legal and regulatory treatment (e.g., they face different regulated prices). Nevertheless, the regulation does not address the issue of which prices should be applied when urban and rural concessions overlap.

Conflict, nevertheless, arose in 1990 when a large distribution firm (Chilectra) was accused of predatory practices by a rival (Sinel) in an area where, de facto, concessions overlapped. When Chilectra began to sell in Sinel's concession area, the latter feared that it could be eliminated from the market if cross-subsidies from urban to semi-urban consumers were allowed (semi-urban distribution costs are 15 percent higher than in the urban case). The Antitrust Commission interpreted the electricity law as setting tariffs for customers, not for geographical areas and, hence, sanctioned that concession areas were not exclusive (thus allowing overlaps) but prices could no differ.

The main access problem, however, relates to the effective capacity of generators to compete with distribution companies for those clients located within the concession area. In the SING, this is hardly a problem as large mining operations -which comprise a substantial portion of the free-clients segment- are

invariably located outside the limits of concession areas. However, in the SIC a significant fraction of free clients -mainly industrial and commercial firms- are located within distribution areas.

In this regard, the regulation is incomplete in two areas. First, electricity transformation from high voltage to industrial or commercial standards is a largely non-regulated service and an important component of end-user costs. Determining an appropriate return to transformation is crucial for an efficient operation of the market, in particular when contracts are auctioned. When bidding for an energy contract involving large consumers, generators find it efficient to provide also the transformation service by installing the necessary equipment. However, for medium-size clients (which are significant part of the market) this option is economically inefficient and generators are usually forced to hire services from distributors. In this case, distributors have monopoly power and can extract rents from the market. This problem is aggravated when there is patrimonial integration between distributors and generators (e.g., Chilectra and Endesa) and contracts made by distributors are not public knowledge.

Second, when servicing a free-client within a concession area the generator must negotiate sub-transmission tolls with the local distributor or build a sub-transmission line and install the necessary equipments. These tolls are not regulated but left to negotiation among the interested parties. The Law, thus, implicitly presumes that their negotiating power is equivalent. In general this is hardly the case and it is certainly not true when there is vertical integration between generators and the distribution company. For a distributor it is easy to benefit its affiliate generator in energy auctions by simply charging rival generators a higher sub-transmission fee. In the largest Chilean market (Santiago) the situation is even worse because the distributor is allowed to compete against generators for free-clients within its concession area. Obviously, competition under these circumstances cannot be fair since the distributor will not undercut itself.

5. Final Remarks

Chile was one of the first Latin American countries to engage in full-scale market deregulation and divestiture of state owned enterprises. The electricity and telecommunications sectors are among the most interesting cases of network privatizations. The benefits of divestiture in both sectors have been undoubtedly significant, in terms of increasing the efficiency of production, improving the quality of services, and extending coverage. The evolution of these sectors, however, present an interesting contrast from a regulatory point of view. While regulation in the electricity sector was once considered pioneering, it has not properly adapted to market evolution and is now to a large extent outdated. On the contrary, in the telecommunication sector, the initial regulation was weak and incomplete but has steadily progressed and adapted to changes in the industry.

This paper analyzes the Chilean experience with network privatization, focusing on three important aspects of regulation: open-access provisions, tariff-setting mechanisms, and service unbundling. Open-access issues are at the center of deregulation processes but, as this paper suggests, they are hardly sufficient to guarantee a successful outcome from market restructuring. In both sectors, open-access provisions were a key component of the design of regulation.

However, ambiguities and limitations in the regulatory framework regarding the practical application of the open-access principle led to substantial distortions in the functioning of the electricity sector. Vertical integration have deepened the adverse effects of poor regulation. In the telecommunication sector, on the other hand, implementing open-access provisions has demanded a substantial effort on the side of regulators to overcome both the limitations of regulation and the economic and political power of telephony incumbents.

The evolution of the Chilean regulation in the telecommunications and electricity sector offers an interesting contrast regarding the role of the authorities in overcoming the limitations imposed by regulatory ambiguities and inefficient privatization outcomes. In the telecommunications industry, the authorities have pursued an active stance of attacking the sources of monopoly power and introducing competition policies in local and long-distance telephony markets. On the contrary, in the electricity sector lack of regulation has led to substantial litigation over monopoly power, overinvestment in transmission facilities, and friction among competitors in the generation market.

Several lessons emerge from the Chilean experience that can be useful to other countries. First, the existence and enforcement of provisions guaranteeing open access to networks are crucial to reap the benefits of privatizing the telecommunications and electricity industries.

Second, while it is true that without open-access clauses incumbents can easily use their monopoly power, it does not follow that open-access provisions are sufficient to guarantee an adequate an efficient operation of the industry. Open-access policies need to be supported by detailed regulations including technical procedures, efficient pricing formulas, and explicit conditions for interconnection. These rules are essential to enforce interconnection rights without incurring in costly disputes.

Third, the methodologies for setting tariffs must be technically sound and known in advance by firms. Setting incorrect interconnection and access charges could jeopardize the introduction of competition in network industries. Insufficient access to information by regulators is an important limitation to achieve an effectively regulation in the sector. Setting access and interconnection charges requires detailed information about the

incumbent's cost structure; it is this important to guarantee that regulators have access to the necessary information from incumbents to enforce regulation.

Fourth, incumbents can exercise market power even if open-access is guaranteed and other firms participate in the market. Consequently, the authorities must still address competition problems in concentrated markets such as cream skimming, segmentation, and blockading. Developing a competitive market when there is a dominant operator is a costly and long-term process. These costs may justify to implement market-power reduction schemes before the divestiture of the industry and to introduce vertical integration restrictions during the privatization process.

Fifth, the strength of regulatory institutions and agencies from an institutional point of view is crucial to promote competition and shield technical decisions from lobby and political interference. Even if privatization leads to quasi-competitive market structures, the operators of public utilities tend to have an important political and economic power. In the presence of ambiguities in regulation, lobbying and disputes are likely to appear and, though some may be legitimate, they would mostly reflect rent-seeking behavior. In addition, since conflict is not unusual, it is important to design the regulatory structure so as to minimize litigation costs.

6. References

- Armstrong, M., S. Cowan, and J. Vickers. 1994. *Regulatory Reform: Economic Analysis and British Experience*. MIT Press.
- Armstrong, M. and C. Doyle (1995): *The Economics of Access Pricing*. OECD Report.
- Baumol, W., J. Panzar, and R. Willig. 1982. *Contestable Markets and the Theory of Industry Structure*. Harcourt Brace Jovanovich.
- Baumol W. and G. Sidak. 1994. *Toward Competition in Local Telephony*. MIT Press and AEI Press.
- Bitrán, E. and P. Serra. 1994. Regulatory Issues in the Privatization of Public Utilities: The Chilean Experience. *Quarterly Review of Economics and Finance* N° 34, número especial.
- Chadwick, E. 1959. Result of Different Principles of Legislation in Europe: of Competition for the Field as Compared with Competition within the Field of Service. *Journal of the Royal Statistical Society*, Series A22.
- Coloma, F. and L. Herrera. 1990. Análisis institucional y económico del sector telecomunicaciones en Chile. *Cuadernos de Economía* año 27, N°82.
- Demsetz, H. 1968. Why Regulate Utilities? *Journal of Law and Economics* 11: 55 - 66.
- Díaz, C.A. 1998. Análisis del Sistema Tarifario de Transmisión Eléctrica, mimeo, Universidad de los Andes.
- Díaz, C.A.; A. Galetovic, and R. Soto (1999): "Anatomía de una Crisis Eléctrica I y II", mimeo, Universidades de Chile, de los Andes and Alberto Hurtado.
- Duff & Phelps, Chile Clasificadora de Riesgo. 1998. Informe Sector de Telecomunicaciones.
- Economides, N. 1996: "The Economics of Networks", *International Journal of Industrial Organization*, vol. 14, no. 2.
- Economides, N. 1998: "U.S. Telecommunications Today", *Business Economics*, April, Volume XXXIII, Number 2.
- Economides N. and L. White. 1995. Access and Interconnection Pricing: How Efficient is the "Efficient Component Pricing Rule"? *Antitrust Bulletin* Vol. XL, N°3:557-579.
- Hart, O. and J. Moore. 1988. Incomplete Contracts and Renegotiation. *Econometrica* 56: 755 - 785.
- Hunt S. and G. Shuttleworth. 1996. *Competition and Choice in Electricity*. John Wiley & Sons Ltda.
- Laffont J-J., P. Rey, and J. Tirole. 1998. Network competition: I. Overview and nondiscriminatory pricing. *Rand Journal of Economics* Vol. 29, N°1:1-37.
- Laffont, J.J. and J. Tirole (1994): "Access Pricing and Competition", *European Economic Review*, vol 38, pp.1673
- Laffont, J.J. and J. Tirole. 1993. *A Theory of Incentives in Procurement and Regulation*. MIT Press.
- Maskin, E. and J. Tirole. 1997. Unforeseen Contingencies, Property Rights, and Incomplete Contracts. Mimeo, Harvard University.
- Melo J. and P. Serra. 1997. Competencia y regulación en telecomunicaciones: la experiencia chilena. *Perspectivas* : 215-247.

- Montt, L. Ley Antimonopolios. Jurisprudencia de la Comisión Resolutiva 1981-1994. Ed. Jurídica.
- Schmalensee, R. 1995. What Have we Learn about Privatization and Regulatory Reform? *Revista de Análisis Económico*, Vol. 10, 2.
- Schwartz, M. 1989. The Nature and Scope of Contestability Theory. *Oxford Economic Papers* 38 (Supplement) 37 - 57.
- Shapiro, C. and R. Willig. 1990. Economic Rationales for the Scope of Privatization. In *The Political Economy of Public Sector Reform and Privatization*, eds. E.N. Suleiman and J. Waterbury. Westview Press.
- Sidak G. and D. Spulber. 1997. *Deregulatory Takings and the Regulatory Contract. The Competitive Transformation of Network Industries in The United States*. Cambridge University Press.
- Soto, R. 1998: Ambigüedades en la Tarificación de la Transmisión Eléctrica en Chile, mimeo, Universidad Alberto Hurtado.
- Spiller P. and C. Cardilli. 1997. The Frontier of Telecommunications Deregulation: Small Countries Leading the Pack. *Journal of Economic Perspectives* Vol. 11, N° 4: 127-138.
- Tabja, R. 1997. Análisis de la Tarificación en Telecomunicaciones. Universidad de Chile, unpublished, Tesis de Magister en Ingeniería Industrial.
- Vogelsang I. and B. Mitchell. 1997. *Telecommunications Competition. The last ten miles*. MIT Press and AEI Press.
- Zupan, M. 1989. The Efficiency of Franchise Bidding Schemes in the Case of Cable Television: Some Systematic Evidence. *Journal of Law and Economics*, Vol. 32.