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DISCUSSION PAPER

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Armando Castelar Pinheiro



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REGULATORY REFORM IN BRAZILIAN INFRASTRUCTURE: WHERE DO WE STAND?¹

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SINOPSE

Os principais objetivos do processo de reforma regulatória e privatização no setor de infra-estrutura foram: atrair investimentos privados para expandir a capacidade de produção, aumentar a sua eficiência e reduzir a dívida pública, usando as receitas da privatização. Enquanto a evidência disponível sugere que a reforma regulatória (incluindo a privatização) foi bem-sucedida em acelerar o crescimento da produtividade e melhorar as contas públicas, bem menos foi alcançado em termos de elevar os níveis de investimento. O setor de telecomunicações foi a única exceção a essa regra. O que explica o fracasso da privatização e da reforma regulatória em promover um substantivo aumento no investimento em infra-estrutura nos demais setores? Ocorreu um erro de diagnóstico, uma implementação malfeita ou faltaram reformas adicionais que dessem suporte a esse processo? O que explica o atípico sucesso no setor de telecomunicações? Que lições extrair desse processo e como usá-las para fazer as necessárias correções de forma a gerar o necessário aumento do investimento em infra-estrutura?

Este artigo tenta responder a essas questões, revendo e analisando o processo de reforma regulatória nos principais setores de infra-estrutura. Em particular, ele examina por que o investimento deixou de aumentar mais significativamente. O artigo discute a reforma regulatória nos setores de telecomunicações, eletricidade, transporte e água e saneamento, e faz recomendações sobre iniciativas que podem ser tomadas para corrigir os problemas apontados no texto. Conclui-se que ainda que muito tenha sido feito e alcançado na reforma da infra-estrutura no Brasil, muito resta por fazer.

ABSTRACT

The main objectives of regulatory reform and privatization of infrastructure in Brazil were to attract new private investment, increase efficiency and reduce the public debt through the use of privatization revenues. Whereas the evidence suggests that regulatory reform (privatization included) has succeed in fostering productivity growth and improving the fiscal accounts, much less has been accomplished by way of raising investment levels. The telecom sector is apparently the only exception to this rule. What accounts for the failure of privatization and regulatory reform to produce the expected boom in infrastructure investment? Was it an error in diagnosis, faulted implementation or lack of additional supporting reforms? What explains the atypical success observed in telecom? What lessons can be learned from this process and how can these be used to make the necessary corrections so as to produced the needed rise in infrastructure investment?

This paper tries to answer these questions, reviewing and analyzing the process of regulatory reform in the main infrastructure sectors. In particular, it examines why has investment failed to expand more significantly. The paper discusses regulatory reform in the telecom, electricity, transportation, and water and sanitation sectors, and makes some recommendations for future action. It concludes that although much has been accomplished in reforming Brazilian infrastructure sectors, at least as much remains to be done.

1 INTRODUCTION

The 1992-2001 decade was a period of significant ownership changes in Brazil's infrastructure sectors. Over this period, private participation rose significantly in telecom, electricity, railways, ports, roads, and water and sanitation, with the sale of government shares and concession rights generating US\$ 58 billion in revenues. Privatization is now completed in the telecom and railroad sectors. In the electricity industry, 63 percent of distribution and 22 percent of generation are in private hands. The vast majority of cargo that enters and leaves the country is now handled in private port terminals. Private participation is incipient in roads and water and sanitation, but there is a large potential for expansion.

Together with privatization, these six sectors also experienced substantial regulatory reforms, with the dismantling of a regulatory framework that in some cases had been in place for half a century. Although the reform process evolved independently in the various sectors, with differences in timing and emphasis, the diagnosis that motivated it and the principles underscoring the new regulatory model were essentially the same. Thus, in all sectors reform was motivated by the perception that the state-led model in place since the mid XX century had exhausted its usefulness. In particular, after the investment slump of the 1980s, infrastructure sectors badly needed an expansion in output capacity, which was beyond the reach of the public sector, on account of the fiscal crisis, which not only reduced capital transfers to SOEs (state-owned enterprises), but also imposed policy constraints on their ability to invest, even when they would have been able to raise funds in the market.

Bringing private investors in was the solution to raise investment without sacrificing fiscal discipline. However, because infrastructure sectors lacked a good regulatory framework, this needed to be revamped if private capital was to be attracted. Traditionally, regulation and supervision had been entrusted to departments in the sector ministries that controlled the corresponding SOEs. The departments (DNAEE, Dentel, etc.) lacked independence from government, were captured by SOEs, and did not control tariffs, which were set by the Ministry of Finance in accordance with macroeconomic objectives. Tariff structures carried a number of cross-subsidies, across consumer groups and companies, leading to allocative and technical inefficiency. Lack of proper regulation also meant that SOEs were left unaccountable regarding the quality of services offered to consumers, not the least because they faced no competition. Moreover, sector ministries had lost their ability to plan and to set policy, activities which were often left out to SOEs.

Infrastructure regulation started to change in the early nineties, but the first critical steps were given in 1995, when the Concessions Law was approved and the constitution amended to end public monopolies in telecom and pipeline gas distribution and discontinue the restrictions to foreign entry in some key sectors, in particular electricity generation. These changes in the legal framework unleashed reforms, and especially privatization, in all infrastructure sectors.

Following international practice, infrastructure regulatory reform involved the separation of commercial, regulatory and policy activities. SOEs continued to be responsible for commercial activities, but were restructured, often through

privatization. As the new regulatory model stressed the introduction of competition, privatization was often accompanied by the vertical and/or horizontal breakup of SOEs and the end of barriers to new private entry. To reduce the risk of expropriation, new regulatory agencies, with relative financial and administrative independence from the government, were entrusted with the responsibility of fixing tariffs — subject to rules set out in the concession contracts and the general principle of “financial and economic equilibrium” established in the Concessions Law. Policy responsibilities were ascribed to sector ministries.

The main objectives of regulatory reform and privatization were to attract new private investment, increase efficiency and reduce the public debt through the use of privatization revenues. Private ownership and competition were expected to raise efficiency and, together with adequate tariffs and the higher creditworthiness of the new private owners, facilitate the access to finance, fostering higher investment levels. Moreover, in private hands former SOEs would be free from the limitations imposed by fiscal policy, being able to base investment decisions on their own business criteria, rather than on the goals of the Ministries of Finance and Planning. The greater flexibility and sounder management practices of private investors were expected to lower investment costs, increasing its return and thus further leveraging investment levels.

Whereas the evidence suggests that regulatory reform (privatization included) has succeed in fostering productivity growth and improving the fiscal accounts, much less has been accomplished by way of raising investment levels. In particular, whereas the new private owners invested in rehabilitation and modernization, not much was invested in *greenfield* projects, so the expansion in output capacity was rather limited.¹ The telecom sector is apparently the only exception to this rule. What accounts for the failure of privatization and regulatory reform to produce the expected boom in infrastructure investment? Was it an error in diagnosis, faulted implementation or lack of additional supporting reforms? What explains the atypical success observed in telecom? What lessons can be learned from this process and how can these be used to make the necessary corrections so as to produced the needed rise in infrastructure investment?

This note tries to answer the above questions, reviewing and analyzing the process of regulatory reform in the main infrastructure sectors. In particular, it examines why has investment failed to expand more significantly.² The note is structured in six sections, in addition to this introduction. Sections 2 to 5 discuss regulatory reform in the telecom, electricity, transportation, and water and sanitation sectors, respectively. A final section sums up the main findings and makes some recommendations for future action.

1. Empirical evidence on the impact of privatization on the investment levels of former SOEs is provided by Pinheiro (2000).

2. The paper does not discuss, though, the relevant influence of macroeconomic developments on the decisions and choices made as part of the privatization and regulatory reform of infrastructure. This issue is partly covered in Pinheiro and Giambiagi (2000).

2 REGULATORY REFORM IN TELECOM

The most successful case of regulatory reform cum privatization has been, undoubtedly, that of telecommunications, in the sense that not only output capacity increased significantly, but also that this was achieved while the state successfully transferred all commercial activities to the private sector. Initially, though, regulatory reform was thought of simply as the opening up of the sector to private investors, while keeping Telebrás as a SOE. Thus, regulatory reform clearly preceded ownership change, with the first step in the reform process being the end of Telebrás's monopoly, through a constitutional amendment approved in 1995.³

The second step, still in 1995, consisted of the rise and re-balancing of telecom tariffs, ending the system of cross-subsidies — between local and long-distance services and among different subsidiaries of Telebrás — that had marked the telecom system since the 1970s. Novaes (2000) correctly argues that this change in the tariff structure was a critical step in the process, for it brought the level of tariffs, corroded by inflation, to international standards, eliminated the possibility of cream skimming, and created incentives for firms to be efficient, incentives that were lacking in the previous tariff system. It was also a bold move: “At one blow, the Brazilian government increased the residential subscription by a factor of five, and the cost of local calls by 80 per cent.” [Novaes (2000, p. 155)]. This process was completed in 1997, when the cost of local calls were again increased and that of international calls reduced.

Realizing the complexity of reforming the sector's regulatory framework on short notice (and still unconvinced of the need and benefits of selling Telebrás), the government started to set up the new regulatory model by sending to Congress the so-called “ Minimum Law”, which was approved in 1996 and enabled the B-Band cellular telephony concessions to be auctioned. This underscored the government's concern with establishing a competitive market structure, substituting a duopoly in the mobile phone market for the Telebrás monopoly previously in place.

The government also started important organizational reforms of Telebrás to prepare it for competition, increasing its productivity and reducing costs and personnel. As observed by Novaes (2000, p. 162) , “[t] here was an improvement of 46 per cent (in productivity) from 1994 to 1997, using as indicator the number of fixed lines in service per employee. Indeed, the number of employees in the Telebrás system fell from 95,600 in 1994 to 87,300 in 1997, while the number of fixed lines in service increased from 11.2 million to 15.4 million.”

By this time, though, it became apparent that state ownership would likely be inconsistent with competition, for, tied up by a number of restrictions imposed on SOEs, Telebrás would find it hard to compete with the more agile private companies. So, when the sector's regulatory framework was eventually approved, in the form of the General Telecommunications Law, in 1997, it established, among other things, that the state should no longer be a provider of telecom services, staying responsible only for regulating the sector.

3. The market remained, however, closed to new entries pending approval of a new law regulating the sector.

Anatel, the sector's (independent) regulator, was established in 1997 and entrusted with the responsibility of preparing two key elements of the sector's new regulatory framework: *The General Concessions Plan*, which established "the rules for concessions of public telephone services", specifying that concessions were not exclusive, and dividing the country into concession areas, indicating the number of service providers in each region and the duration of the concession contracts; and *The Telecoms Services General Universalization Plan*, which established "targets for numbers of telephones installed, public telephones, the time in which consumers' demands must be met etc., for the companies holding wireline telephone service concessions." [Quotes from Novaes (2000, p. 159-160)].

The main elements of the new regulatory framework were the formal commitment by public service concessionaires to meet quantitative and quality targets in a relatively short period and the strong reliance on competition as a mean to lighten the regulatory burden faced by the sector regulator. The concession contracts, signed in 1998, required an expansion in the number of fixed lines from 15.3 million to 50 million, and in the number of cellular lines from 4.0 million to 26.2 million, respectively, in ten years. A host of quality indicators, such as the proportion of incomplete calls or time period for fixing problems faced by consumers, were also established, with an increasingly demanding schedule to guarantee a rapid improvement in service quality.

To foster competition, prior to its privatization, in 1998, Telebrás was divided into 13 companies, of which one was the long-distance carrier, three were fixed-line and nine mobile-phone companies.⁴ Restrictions were also placed on a single investor having stockholdings in more than one area or more than one service. In 1999, new concessions were auctioned for fixed-line operation in each area and in the long-distance segment, creating duopolies in the two cases. The fixed-line companies were allowed to compete with the long distance operators within their own concession areas beginning in 1999. New concessions for mobile telephony (Bands C, D and E) were auctioned in 2001-2002. Entry in all markets was deregulated starting in 2002, for those operators meeting the quantity and quality targets set up in the concession contracts, and in mid-2003 (five years after the sale of Telebrás) market entry is scheduled to be fully liberalized. To help new entrants compete with incumbent companies, they were given greater flexibility and burdened with lighter requirements than incumbent service providers.

The impact of reform on investment was dramatic: in 2000, investment in the sector amounted to US\$ 12 billion, against US\$ 3 billion invested in 1994, an expansion that was even larger than suggested by these figures, on account of the large devaluation of the Real that took place in the meantime [data from Carneiro and Borges (2002)]. In 2000, two years after privatization, the number of fixed lines had already reached 35.0 million and that of cellular phones 21.5 million, almost doubling the combined number of lines. By mid 2002 the regulatory reform process in telecom sector was greatly advanced, with a large increase in supply and a full-blown competitive environment in place. In June 2002, the number of installed fixed line phones had reached 45.1 million, with 38.2 million in use. The number of

4. The nine mobile operators corresponded essentially to the concession areas previously auctioned for the B-Band.

mobile phones, in turn, reached 35.3 million in January 2003, with 36.6 percent of them operated by companies other than those resulting from the spin-off of Telebrás.

All the steps and the sequencing adopted in telecom were important to make regulatory reform a success. Three of those steps seem, though, to have been the most critical to allow the boom of investment that has followed the decision to reform. First, the adoption of tariffs aligned with international standards and high enough to give an attractive return to investors. Second, the adoption of clear regulatory rules and, in particular, the establishment of Anatel prior to privatization and in time to participate in the definition of the sector's regulatory framework. Indeed, telecom companies signed concession contracts, in which the new regulatory environment was embedded, while they were still state owned, so that the new owners knew exactly what rules would be in force after privatization. Furthermore, as noted by Novaes (2000):

“[I]t is Anatel which establishes the tariff structure for each type of service. Further, tariffs are set by the ‘concession-granting power’ (Anatel) in the concession contract. Thus, the companies which acquired control of the Telebrás companies were aware of their tariff levels. *This is a very important institutional change.* Before the General Law, tariffs were proposed by the Communications Ministry, but approved by the Finance Ministry. They were frequently set on the basis of other criteria than the requirement to offer services within a competitive environment (for example, controlling inflation, leading to profound distortions in the tariff structure).” (Emphasis in the original).

A third critical component was the emphasis on competition and its use as an incentive to foster investment. Incumbents used their brief monopoly to expand their clientele before their markets were open to competition. Also, by meeting their targets before the scheduled time, firms were free to enter the markets of future competitors. These incentives led firms to make large investments to protect and possibly expand their market shares, causing a rapid aggregate expansion in the telecom infrastructure. It is rather telling, in this regard, that in most cases the targets established prior to privatization were met two years before the deadline set in the concession contracts.⁵

Finally, it was crucial for the success of reform that adequate financing instruments were made available to the new owners, to fund the investments required to both establish new companies (B-, C-, D- and E-band and mirror operators) and expand and improve the supply of incumbent companies.⁶ This at a moment when the new owners had just invested large sums in buying new concessions and the former Telebrás companies. Finance was made available in essentially two ways. First, the National Treasury directly financed the privatization of Telebrás, allowing the buyers to pay in three installments over a two-year period. This prevented the exposure of public banks to these investors to rise significantly, as was the case with

5. A negative side effect, however, has been the great market power kept by incumbent operators, which will restrict competition in the medium to long run.

6. This point is repeatedly stressed by Carneiro and Borges (2002), as when they note that “the existence of a single domestic source of long-term credit (BNDES) committed with these targets (universalization) and indicators (quality enhancement) created a key element to understand the future outlook of the Brazilian telecom market.”

the privatization of electricity companies. Second, establishing credit lines for telecom operators willing to invest using domestically produced equipment and materials. Carneiro and Borges (2002, p. 159-160) provide a description of how these investment finance schemes came into being:

“Since 1996, when the Minimum Law for the B-Band was approved, the Brazilian government, concerned with the impact of the enormous needs of funds to finance the investments required for overcoming the sector’s challenges, and with the impact that (this) would have on the trade balance, started to discuss a special program of funds to be offered by the BNDES.

To achieve this objective, BNDES funds were made available not only to the telecom operators, but (also) to manufacturers of equipment produced domestically, being totally directed to the acquisition of domestically produced infrastructure networks, as well as to electronic equipment — radio-base stations, alternators, etc. — assembled in the country. This policy was successful and its results are clearly visible in the sector’s trade balance. For that, the BNDES had as a target to develop mechanisms that could provide funds to be used for equipment and networks produced domestically, as a way to keep the telecom equipment trade balance under control.”

Moreover (p. 161-162),

“At the time of privatization of the Telebrás System, the BNDES established the Program of Support to Investments in Telecommunications (Programa de Apoio a Investimentos de Telecomunicações), which in addition to keeping and improving the requirements of nationalization of equipment, established differentiated (favored) conditions for the acquisition of equipment manufactured in Brazil with national state-of-the-art technology, or for domestically developed software.”

Although, as one may infer from the above quotes, the government’s main original concern was less with expanding the system than with averting an increase in imports of telecom equipment, these credit lines, together with the January 1999 devaluation, which made domestic manufacturers more competitive, provided adequate finance for the surge in investment that characterized the sector after privatization. Moreover, due to the way Telebrás used to secure investment finance, the company was very unleveraged, and in this way the new operators were able to borrow without compromising the financial health of the companies resulting from the spin-off of Telebrás.⁷

7. In principle, finance should not be a problem for “deep-pocket” foreign investors, once a sound regulatory framework was in place. That is to say, the difficulty of securing low-cost finance should reflect above all problems with the sector’s regulation. And to some extent that is indeed the case. In fact, as discussed by Pinheiro and Cabral (2001), finance by public banks and multilateral financial institutions created a mutual hostage situation that helped to mitigate incentives for opportunism and long-run uncertainties that are perceived to be present in the regulation of infrastructure. But, on the other hand, the cost of finance to infrastructure is also influenced by macroeconomic (sovereign) risk and other risks related to infrastructure investment [Sirtaine (1994)] that are not the result of poor regulation. In particular, the cost of finance is very high for all sectors in Brazil, not just infrastructure. Moreover, when markets are efficient, company ownership, whether foreign or national, should make no difference to the actual cost of finance.

Three other important elements, not connected to the sector's regulatory reform, also help to explain the success of reforms in telecom, while at the same time differentiating it from other infrastructure sectors. One was the rapid pace of technological progress in the sector, which reduced the cost of service provision and increased product diversity, helping to boost competition. Another was the expectation of rapid market growth, on account of a large pent up demand, declining equipment and service costs, and rising product diversity. These helped to boost company valuations and expected rates of return on investment. A third was the absence of inter-government coordination problems, since all assets, except for the telecom company of the State of Rio Grande do Sul and a couple small private and municipal operators, were owned by the federal government. As partly discussed in the next sections, coordination among different government levels, both in privatizing and setting up regulation, was a demanding part of the reform process in electricity, transportation and water and sanitation.

3 THE ELECTRICITY SECTOR

The decision to implement deep regulatory reforms in the electricity sector stemmed from reasons similar to those in other sectors. In particular, greater private participation was sought for as a way to revert the investment slump observed since the 1980s, that risked turning the access to electricity once again into a constraint to economic growth, as would eventually happen in 2001. Indeed, after the investment boom that characterized the electricity sector from the fifties to the eighties, when generation capacity expanded at an average 9.8% p.a. (1951-1980), capacity grew at a modest 4.1% p.a. in 1981-1993, being outstripped by the growth in consumption (5.3% p.a.).

The diagnosis supporting the reform process linked this fall in investment to an inefficient regulatory framework, the poor productive and financial performance of SOEs, and the constraints imposed by the fiscal adjustment process on SOE spending.⁸ State ownership, political interference, nationwide price equalization, cross-subsidies and rate of return regulation were factors that contributed to reduce technical and allocative efficiency in the electricity sector. The poor financial health of electricity SOEs, in turn, resulted from low efficiency, the large debts accumulated after cheap sources of earmarked funds — taxes and compulsory loans paid on electricity consumption — were discontinued; and the low levels of electricity tariffs, used by the Ministry of Finance, since the mid-seventies, to artificially lower inflation rates. An additional problem was the rising marginal cost of expanding output capacity, which reflected the increasing distance between consumer markets and new sites suitable for hydroelectric generation, and the higher costs of meeting the more stringent demands of environmental agencies.

The decision to reform the electricity sector and attract private entry became explicit in mid-1992, when Light and Escelsa, the two electricity distribution companies owned by Eletrobrás, were included in the National Privatization Program — Programa Nacional de Desestatização (PND). The regulatory reform process, per

8. For a description of how the electricity sector operated prior to reforms and a discussion of why reform was deemed necessary see Ferreira (2000).

se, began in 1993, with Law 8631, which promoted a “netting out of arrears” (“encontro de contas”), improving the financial health of local state distribution companies, although at a cost of US\$ 26 billion to the National Treasury. Concomitantly, nationwide price equalization and guaranteed rates of return on assets were discontinued, with the electricity companies becoming free to fix their own tariff rates, upon approval of DNAEE, the sector’s regulator.⁹

The following critical step was the approval of the Concessions Law in 1995, complemented by Law 9074, which dealt specifically with the renewal of concessions in the electricity sector. With this basic legal framework in place, Escelsa and Light were privatized in late 1995 and early 1996, respectively. Later in 1996, the National Electric Energy Agency — Agência Nacional de Energia Elétrica (Aneel) was legally created. Aneel only began to operate, however, in 1997, and even then the lack of a new regulatory model for the sector compromised its activities. To help define this model the government contracted Coopers & Lybrand, also in 1997, with the model developed with Coopers & Lybrand being eventually adopted, with the creation in September 1998 of the Energy Wholesale Market — Mercado Atacadista de Energia (MAE) and the National System Operator — Operador Nacional do Sistema (ONS), two central elements of the new regulatory model.

As in other sectors, the new regulatory model proposed for the electricity sector stressed the introduction of competition. This was reflected, for instance in the concern to establish a competitive market structure, with the vertical (generation, transmission and distribution) and horizontal separation of SOE activities at the federal and state levels. Moreover, Aneel set limits on market concentration, at national and regional levels, for distribution, generation, and the sum of the two.¹⁰ Also, a timeframe was established to allow an increasing number of consumers to freely choose from which company to buy electricity, with a gradual reduction in the minimum level of demand necessary for a consumer to have such freedom. Finally, it was expected that generators and distributors would have an increasing flexibility to contract between them.

The available evidence suggests that regulatory reform and privatization have succeeded in improving quality and efficiency — lowering losses in the distribution network and reducing overstaffing — and in raising investment, although mostly geared to the rehabilitation of the existing network.¹¹ As the 2001 power shortage made clear, however, the benefits of regulatory reform and privatization in the electric energy sector have been much less substantial than in telecom, notably regarding the expansion of generation capacity, which continued at a slow pace. A number of factors contributed to the modest outcomes of a decade of reforms in the electricity sector.

9. Also in 1993, the federal government attempted to create an independent National Transmission System — Sistema Nacional de Transmissão (Sintrel), as an additional step to increase flexibility and competition in the electricity sector. The Sintrel never came into being, though, due to opposition of vertically integrated local state companies and the failure to agree on a transmission tariff. See Pires (2000) and Pires and Goldstein (2001) for a more detailed discussion of Sintrel.

10. 35% of the market in the North, Northeast and Center-West, 25% in the South and Southeast, and 20% in the national market as a whole. For generation and distribution together, the limit is 30% of the national market.

11. Pires (2000) notes, for instance that “privatized companies have accomplished major increases in productive efficiency with the implementation of several organizational changes and investments to reduce the loss of energy.”

Differently from telecom, in the electric energy sector privatization and not the introduction of a new regulatory framework was the main driving force pushing reform forward. So, while a new regulatory model was being discussed (and opposed by insiders), privatization proceeded at full-blast: nine electricity companies were privatized by local state governments in 1997 and another five in 1998 — a total of 18 companies were sold before the MAE and ONS were legally established (including CERJ, sold in November 1996), attesting to the serious problems in the sequencing of reforms in the power sector. The quality of sector regulation suffered from these sequencing problems, with a slow progress in establishing regulatory rules and institutions, compromising the credibility and clout the regulatory agency to operate and limiting its prestige in the eyes of the public at large. It also helped to make regulation more ad hoc.¹²

Privatization in the electricity sector was substantially more complicated than in the telecom sector. For one, because the sector's ownership structure was much more complex. As noted by Ferreira (2000), although the state owned essentially all the power sector, the federal government owned generation and transmission assets, while the local states owned almost all the distribution companies, as well as some vertically integrated power companies, which controlled significant shares of transmission and generation.¹³ For another, because the electricity companies were much more leveraged than their telecom counterparts. So, while the latter reacted to the end of the National Telecommunications Fund — Fundo Nacional de Telecomunicações (FNT), a source of cheap earmarked funds, by financing their growth through the sale of equity, tied to the pre-payment of telephone lines (indeed, the government owned just 21 percent of Telebrás at the time of privatization), the electricity companies went deep into borrowing. Reliance on debt started in the late seventies, when low tariffs blocked the self-finance of investments, and sovereign guarantees allowed borrowing in foreign markets at relatively low cost. The high leverage of SOEs was further compounded when some state governments started to use them to finance their deficits.¹⁴ Eventually, the poor financial health of these companies led to generalized arrears in the sector, especially of (local state) distribution companies with (federal) generation companies, and to a halting of ongoing investments, increasing their financial burden.¹⁵

So, as remarked by Ferreira (2000, p. 181), in the electric energy sector “[b]oth the ownership and debt situations militated against implementing privatization as a one-shot, all-inclusive deal”, as was the case in telecom. In particular, this required

12. This was not a result of a misconceived strategy. Rather, to some extent moving ahead with privatization was a way to force reform to proceed despite the strong resistance to it prevailing among sector insiders, a resistance which was virtually absent in telecom, and which eventually succeeded in stopping the process. Macroeconomic factors also helped to both motivate and facilitate privatization in the electricity sector more than they did with regulatory reform. Also, from a political economy perspective, one may argue that the mid-nineties offered a window of opportunity to foster ownership change in the sector that, with hindsight, we know did not last for long.

13. In 1995, the local state companies controlled 38 percent of the power generation capacity [Ferreira (2000)].

14. This is treated in more detail by Ferreira (2000). The author also presents empirical evidence showing how low tariffs and rising levels of debt service eventually led to a sharp contraction in investment, in addition to causing the power sector to present a negative net working capital from the second half of the 1980s onward.

15. By 1992, the power sector SOEs had some US\$ 10 billion in dead capital, represented by resources invested in power plant projects left unconcluded, which were not operative and therefore produced no return [Pires and Piccinini 1998]. These projects were the first to be auctioned to the private sector.

privatization to start with the sale of distribution companies, for otherwise private investors would not be interested in power generators, for they would fear selling to local state-owned distributors with a record of successive unchecked defaults. For the same reason, privatization of distribution companies was also essential to encourage entry of Independent Power Producers. In this regard, privatization was rather successful, with the private sector currently controlling two-thirds of the electricity distribution, as opposed to almost nil in the early nineties.

However, as the privatization drive lost steam in early 1999, ownership restructuring in the electricity sector stopped mid-way, leaving the implementation of the new regulatory model unconcluded. A telling example is the incomplete separation of transmission and generation activities, a critical step in the implementation of competition, which was to be the cornerstone of the new model. Although market and ownership restructuring virtually stopped, the policy rhetoric continued to stress the government's commitment to privatization. This greatly complicated sector planning, since policies were based on the incorrect assumption that SOEs — which controlled 78% of the generation capacity — would soon be transferred to private hands, masking the consequences of the ensuing fall in government investment.¹⁶

Several aspects of this unconcluded regulatory reform operate to discourage private investment. One is the substantial market power of SOEs. Not only do the main power companies — Furnas, Chesf, Eletronorte, Cemig and Copel — remain vertically integrated, but they also control very large portions of the markets in which they operate (far and above the ceilings established by Aneel). The dominant position of SOEs in generation complicates regulation by keeping the state as both regulator and concessionaire, creating conflicts of interest that increase regulatory risks from a private investor's point of view. As noted by Pires, Giambiagi and Sales (2002, p. 40):

“The incomplete separation of regulatory and business activities in the public sector was one the factors that magnified the crisis experienced by the electricity sector and the poor reputation enjoyed by the regulatory agency. *For instance, the federal companies are the only companies in the sector that do not have concession contracts signed with Aneel.* Furthermore, these companies have not respected decisions by Aneel that go against their own interests, as was the case of Furnas and Eletrobrás, respectively with regard to debts with MAE (already solved) and the excess of Itaipu (still pending, due to an injunction secured by Eletrobrás). *As a consequence, the negative effects on the decisions to invest of the private sector are significant, since this perceives that regulation does not apply to the public companies in the sector.*” (Emphasis in the original).

The risk imposed on private investors by the presence of dominant, vertically integrated SOEs over which the sector regulator has little clout is magnified by their control of low-cost, nearby hydroelectric power plants, most of them fully depreciated on accounting terms. Therefore, while the average tariff for “old” electricity ranges between \$10 and \$12 per MWh, for the “new” electricity tariffs

16. Eletrobras, for instance, invested an average 0.3% of GDP p.a. in 1991-2000, and just slightly more in 2001-2002, compared to average annual investments of 0.8% of GDP from 1980 to 1990.

range between \$32 and \$34 per MWh for hydroelectric plants, and \$39 to \$41 per MWh for thermoelectric plants [Pires, Giambiagi and Sales (2002)]. The “old” energy is used to keep average electricity prices down, and in the absence of a large and sustained increase in demand its low cost is sufficient to render new generation plants non competitive.¹⁷ Pires, Giambiagi and Sales (2002) note, for instance, that the “mere possibility of dumping or of a mixed price by the federal generators is enough to make new private investors economically non viable.”

It is interesting, in this regard, to contrast the different situations in the telecom and electricity sectors, stemming from the different slopes of the long-run marginal cost curve. In telecom, once the market was open to private investors, privatization was a must, for otherwise the competitive advantage of private investors would wipe out most of the market value of Telebrás. In electricity, with a positively sloped cost curve, the presence of powerful vertically integrated incumbents with low-cost energy blocks new entry by private investors.¹⁸ Indeed, as noted by Pires, Giambiagi and Sales (2002, p. 35):

“The actual experience of sectors with a significant presence of the state sector ratifies this assertion. In the oil sector, the important private investments have occurred in partnership with the Petrobras, while in the electricity sector the large investments occurred in areas in which the public sector holds a minority position (distribution), in regions where the public sector is no longer hegemonic (in the South region sub-market or in the electricity transmission segment) or, at last, in projects aimed at hedging the consumer (case of large consumers that bought concessions for construction of hydroelectric projects). So, it is unlikely that there will be a full-fledged competition between the public and private sectors in areas in which the public sector continues to predominate.”

Private investment has also been discouraged by poor intra- and inter-sector coordination. For one, there is still no clear separation between the functions of the various agencies involved (Aneel, ONS, the Ministry of Mining and Energy and Eletrobrás), reducing the accountability of the various institutions.¹⁹ For another, the coordination among Aneel, ANP (the oil sector regulator), ANA (the water sector regulator) and Ibama (the environmental protection agency) is still weak, increasing the costs and risks associated with new thermo- and hydroelectric generation projects.²⁰ Moreover, ANP does not have a mandate to fight the abuse of market power in the natural gas sector — a mandate that, in a broad sense, is left out to the anti-trust authorities, which lack expertise, trained personnel and political prestige

17. Furthermore, the tariff structure, essentially unchanged since the eighties, continues to contemplate large cross-subsidies among the different types of consumers, reducing allocative efficiency.

18. Ferreira (2000) notes that this situation also contrasts with what it is typically observed in countries in which electricity is mostly thermo-generated, in which case technological progress tends to keep the unit cost of expanding capacity more or less stable or even declining.

19. The lack of a clear separation of responsibilities became evident during the blackout of March 1999 in the Southeast region and the supply problems in Rio de Janeiro in the summer of 1998 [Pires (2000)].

20. See Pires (2000) for further discussion.

and clout to do that — and this further increases the risk of investing in thermo-generation.²¹

Clearly, the main bottlenecks in the electricity sector lie in generation and transmission. A situation that is unlikely to change while the sector's institutional framework remains a mix of the old and new models. The question, then, is where do we go from here? Since nothing in the original diagnosis seems to have changed, completing the reform process, including the privatization of power generators, continues to be the first best option. Pires, Giambiagi and Sales (2002), for instance, correctly advocate in favor of this alternative:

“So, despite some possible disadvantages of selling already depreciated generation assets in the electricity sector, privatization appears as a more adequate solution to encourage private investment, be it for reducing barriers to entry, eliminating the threat of (unfair) competition from companies with market power, or for creating conditions for the state to unqualifiedly exercise its role as a regulator, freeing it from (commercial) risk activities.”

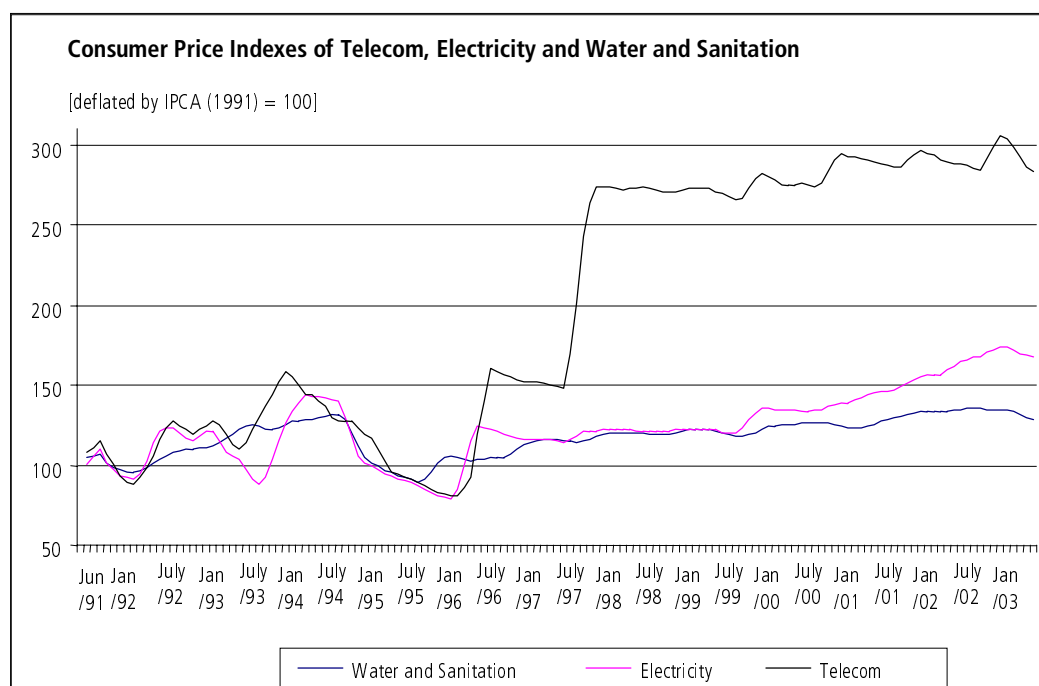
The authors seem to think, though, that further privatization is politically unfeasible in the current environment. By the same token, the alternative of returning to a state-led model is equally unfeasible: “With current fiscal restrictions, it is unlikely that the public sector will be able to raise its investment level by 0.5% of GDP.” The authors argue, then, in favor of a mixed model that keeps existing SOEs under state ownership but significantly deepens regulatory reform, so as to attract private investment and create a truly competitive environment. Three initiatives are especially important. First, raise tariffs to levels consistent with the marginal cost of expanding the electricity system: “at the margin investments will have to contemplate a positive sloped cost curve, including an increasing participation of thermo generation. This will have to be reflected in the prices of electricity, whoever owns the new power plants.” [Pires, Giambiagi and Sales (2002)]. It is important to note, thus, that regulatory reform in the electric energy sector has involved a less significant rise in tariffs than in telecom and only after they suffered the impact of the devaluation of the real in 1999 (see graph below).²²

Second, control the market power of SOEs in the electricity and natural gas (Petrobras) sectors. In particular, the government needs to vertically break up the large power generators, separating generation and transmission activities, and to expand ANP's mandate to include controlling the exercise of market power by

21. As noted by Pires and Goldstein (2001), “[t]he natural gas segment is still very incipient. Petrobras controls all segments of the chain, except for the downstream segment, in which the local state companies, several with equity participation of Petrobras, have the regional monopoly.”

22. A more substantial rise in electricity tariffs has been avoided due to the large income transfer from consumers to power generators that it would entail. An in-between solution has been the adoption of the so-called “Initial Contracts”, which guarantee that distributors will have access to a mix of low- and high-price energy, to be gradually phased out, so that a) the price of energy would increase over time until reaching a competitive level; b) new investment would be attracted by the perspective of rising prices according to a known timeframe; and c) the impact on consumer income would be felt only gradually. These initial contracts were adopted as part of Law 9648, with all power companies signing purchase power agreements for the 1998-2005 period. Starting in 2002, in each year an incremental 25 percent of the energy will be freely negotiated in the market. The recent experience has shown, however, that this model has been insufficient to generate the sustained and stable rise in electricity prices necessary to encourage a surge in private investment.

Petrobras in the natural gas market. Third, improve intra- and inter-sector coordination with a focus on reducing the costs and risks of greenfield investment projects.



A good regulatory framework, a tariff hike similar in scope to that operated in the telecom sector, good management practices and well-protected property rights will possibly be sufficient to spur the volumes of investment required by the electricity sector. However, it is important to consider that the substantial expansion in the electricity sector in 1951-1980 also owed much to the availability of reliable and stable sources of finance at a cost compatible with the returns offered by electricity tariffs. In this sense, Eletrobrás played a role as the sector's "bank" that was as important as its role in setting policy and planning. The sources of funds on which Eletrobrás relied — earmarked taxes, compulsory loans, loans with sovereign guarantees — should be unavailable in the future. Still, a significant rise in sector investment would be much more likely if adequate insurance and finance instruments were developed.

Finally, the planning and policy making capabilities of the Ministry of Mines and Energy, as well as its commitment to the sector's new institutional framework, should be strengthened. It is telling, for instance, that despite all the problems listed above, and all the evidence that there is virtually no political will to move ahead with privatization, until recently the Ministry of Mines and Energy projected private investments in the expansion of the electricity generation and transmission system amounting to R\$ 33 billion, or 77% of the R\$ 42 billion in total investments projected for the sector in 2002-2004 [Pires, Giambiagi and Sales (2002)]. The worst scenario is certainly the continuation of the current in-between and uncertain situation, in which neither the state invests nor creates the conditions for private investment to take place. In this regard, Pires, Giambiagi and Sales (2002) note that, above all, "the main challenge of the government is how to avoid repeating the 1934-64 experience, when the lack of regulatory definitions about the sector transition

between private and public ownership blocked the investments necessary to expand supply in tandem with demand.”

4 THE TRANSPORTATION SECTOR

More than in telecom and electric energy, fostering investment and improving the efficiency and quality of services were key objectives of privatization and regulatory reform in the transportation sector, with comparatively less emphasis being given to collecting fiscal revenues. So, differently from what happened in those two sectors, privatization in the transportation sector did not involve the sale of physical infrastructure, except for some low-value assets, but rather the sale of the right to explore these assets. To some extent, this reflected the relatively low ratio of operating revenues to the replacement value of these assets.²³

As in other sectors, however, regulatory reform has also involved the separation of policy, regulation and commercial activities; has sought to improve the overall quality of regulation; and has placed great emphasis on establishing competition. With a large share of the transport network in Brazil already transferred to private operators through long-term concessions, it is possible to see that the outcomes of privatization (concessions) and regulatory reform in the transportation sector resemble those observed in the electricity sector.²⁴ On the one hand, private ownership has led to better management and to investments in the rehabilitation of the physical network. Labor productivity, for instance, increased very substantially, although largely on account of the reduction in bloated labor forces, since output changes were comparatively modest.²⁵ So, as noted by Castro (2000*b*, p. 274):

“The initial phase of privatization of the transportation sector in Brazil has had unequivocal success. Its most remarkable achievement has been the dismantling of the antiquated and burdensome state management structures that operated in the sector, though some of them still exist. The most significant benefits already obtained are a reduction in the fiscal resources necessary to maintain these structures and efficiency gains accruing from private management.”

On the other hand, privatization and regulatory reform in transportation have not led to major expansions in the transportation network. According to Castro (2000*b*), this situation is unlikely to change until three major weaknesses of the current institutional model are overcome. First, planning and policy activities need to be improved, so as to better explore the positive externalities resulting from a better interconnection of the various transportation modes and different networks/companies in the same mode. As noted by Castro (2000*b*, p. 275):

23. The privatization (concession) of transportation facilities generated revenues of US\$ 2.3 billion, against a replacement value for the assets transferred to private investors estimated by Castro (2000*b*) to amount to US\$ 36 billion, just for ports and railways. In contrast, privatization revenues in telecom and electric energy mounted to US\$ 30.5 billion and US\$ 24.7 billion, respectively.

24. The following paragraphs draw on Castro (2000*a*, 2000*b* and 2002).

25. The labor force of RFFSA alone shrank from 40,000 to 20,000 during the reorganization that preceded its privatization. After privatization it contracted further to about 11,500 employees, with some increase in the volume of services provided. By the same token, effective employment in public ports declined from 26,400 workers in 1990 to about 5,000 in December 1997.

“[T]he privatization process has divided the ownership structure of the transportation system into a mosaic of private participation and interests. There is no guarantee that “market forces” will be sufficient to coordinate entry and exit of companies in the sector or to determine investment decisions and prices in an efficient and effective manner. In fact, this new multifirm environment has created a new form of uncertainty regarding the timing of investments by different decision making units which may have an effect of deterring or postponing the decisions to increase the sector's capacity. This uncertainty is amplified by the magnitude of the competitive and complementary relations that characterize the transportation systems.”

Second, regulation has been weak and often absent, in practice reinforcing the lack of appropriate instruments to foster intra- and inter-modal connectivity. Poor reform sequencing was a particularly critical problem in the transportation sector, since the sector's regulatory agencies — National Surface Transports Agency — Agência Nacional de Transportes (ANTT) and the National Waterway Transportation Agency — Agência Nacional de Transporte Aquaviário (Antaq) — were created only in 2001, when all the sector's privatizations / concessions had been concluded. The hands-off economic regulation adopted until 2001 was particularly troublesome, given the complexity of regulation in the transportation sector, stemming from the need to simultaneously foster competition and secure intra- and inter-sector coordination, a problem greatly compounded by the fragmented and often vertically integrated ownership structure that resulted from the privatization process, notably in the rail and port sub-systems.

A third fundamental issue refers to the finance of new investment. The new operators should be able to draw a profit as long as they generate sufficient revenues to cover operational expenses and remunerate the capital invested in buying the concessions or, in the case of unrequited concessions, the capital invested in doing the rehabilitation and expansion investments included in the concession contract. The evidence available so far, however, suggests that these revenues are not sufficiently large to cover operation expenses and remunerate the much larger volumes of capital necessary to implement greenfield projects [Castro (2000a)].²⁶ Moreover, while investing in the acquisition of existing assets posed no significant market, construction or environmental related risks, these are critical risks in new projects. So, the ability to attract greenfield investments will depend not only on the ability to exploit network externalities and reduce regulatory risks, but also on the establishment of insurance and finance schemes compatible with the risks and the rate of return offered by such projects.²⁷ As noted by Castro (2000a, p. 5):

“In this regard, multi-mode planning and the creation of instruments to support private finance are key to mitigate the risks associated to interdependences of the new investment projects. Without these mechanisms, it is unlikely that we will see a significant

26. As they would have been insufficient to remunerate investors had they been asked to buy the assets, paying a price equal to replacement value, rather than just paying for the relatively low-cost concessions.

27. For an overview of the main issues on the finance and insurance of greenfield infrastructure projects and some empirical evidence on rates of return see Sirtaine (1994), Pinheiro (1994), Bernard and Garcia (1995) and Garcia (1995).

participation of the private sector in the expansion of the transportation infrastructure, as well as in the strengthening of the weaker links of the transportation infrastructure.”

This suggests that to make new investments in the transportation sector viable the state may need to participate, either providing some of the needed finance at rates compatible with the rates of return yielded by these projects, or providing guarantees that mitigate some of the main risks involved. In cases in which network externalities are more significant, direct investments by the public sector should not be ruled out. The need for a significant presence of the state in the transportation sector also becomes evident when one takes into account that, except for the railway segment, only a small share of the overall assets are currently covered by concessions to private operators. Consequently, the investments expected to be carried out by private investors are small compared to the total demand for investment in transportation, estimated to be no less than 1 percent of GDP per year [Castro (2000*b*, p. 245)].

Although the above are common features to all transportation segments, there are also aspects of the sector’s regulatory reform that are specific to each segment. The following looks at each segment separately.

Most of the rapid expansion in Brazil’s highway network occurred in fifties, sixties and seventies, following the creation of the National Highway Fund — Fundo Rodoviário Nacional (FRN) in 1945, which was extinguished in the early 1980s. Castro (2000*a*, and 2000*b*) notes that up to the late seventies, annual investment in the highway infrastructure was consistently above 1% of GDP — and an average 1.6% of GDP in 1967-1976 — falling to less than 0.5% of GDP in 1980-1996. This led to an increase in traffic density and a deterioration in road quality.

The highway concession program has been largely a way to self-finance the rehabilitation and maintenance of some of Brazil’s main roads. The concession model used for highways was based on the franchise bidding, or concession auction model proposed by Demsetz (1968) and others as an alternative to economic regulation. In federal privatization auctions, a minimum set of investments was defined, including rehabilitation and expansion of the existing network, and the concession was given to the bidder that offered to charge the lowest toll rate. Once this was decided, regulation was limited to inspection of investment and operation activities and the annual tariff adjustments — that is, regulation has been mostly technical. The states, which as a group privatized nine times as much as the federal government, followed a similar model, but some of them charged a fixed positive price for the right to explore the concession.

Anecdotal evidence suggests that the concession model has been successful in fostering the improvement of highway conditions and allowing for some incremental investments in capacity expansion. It also indicates that, barring changes in the regulatory framework, this model will allow for the finance of long run increases in the capacity of privately operated highways, given the natural expansion of a largely captive traffic and considering that the concession program has targeted the densest highways in the country.

There are, however, three concerns regarding the feasibility of basing future expansions in Brazil's highway network in this model. First, that only a small share of the network is privately operated, and the possibility of extending the concession model to the rest of the network is limited. Second, that the assumption of no changes in the regulatory regime is far from simple, and realization of this fact may discourage needed investments. Indeed, the potential for regulatory risks has already been demonstrated in the road concession programs of the states of Paraná and Rio Grande do Sul. Another telling example is the pressure made by the federal government in early 2003 to reduce the contractual price adjustments scheduled to happen in the electricity and telecom sectors. Third, that the tolls necessary to cover the construction costs of a new road are much higher than those necessary to cover the costs of rehabilitation and maintenance of an existing road. An increase in toll values may trigger an opposition that has not been faced so far. Moreover, high tolls carry the risk of significantly reducing demand, to the point of making the project unfeasible, as was the case of highways built under that scheme in Mexico. High tolls also increase political risk.

So, although the new institutional model for the road segment has functioned well so far, it is insufficient to generate a large increase in investment in the highway network. While a pure private model may be feasible for the densest roads, provided that regulation is stable and predictable, some sort of public-private partnership will be necessary in the rest of the system. In both cases, investment finance is a key issue. Thus, as remarked by Castro (2000*b*, p. 273):

“This discussion highlights the importance of highway financing schemes in the context of the networks that still remain under the direct custody of the public sector, and which are far from being solved. Even in the context of the private sector, the issue does not appear to have been adequately addressed. In fact, the private highway concessions already in operation have not managed to find long-term private financing for their investments, despite the fact that they provide a favorable cash flow and have captive demand. Thus far concessionaires who managed to obtain private financing have used short-term instruments such as commercial paper.”

The privatization of railroads included the RFFSA (former federal railroad network), Fepasa, Ferroeste and the railroads owned by CVRD (sold with the rest of the company). Currently, all the long-distance rail network and, in Rio de Janeiro, the suburban passenger transportation system and the subway are operated and maintained by private companies.²⁸ This was the privatization in which the greatest responsibility was given to competition, in this case inter-mode competition, as an instrument of self-regulation. The result has in general been positive, due to the predominance of highway freight haulage in Brazil, with large increases in productivity, admittedly from a very low base, and the rehabilitation of critical parts of rail network. However, as in other transportation sectors, it has not produced a large expansion in output capacity. As before, the problems relate to the quality of regulation and the finance of new projects.

28. The following, though, does not discuss the privatization of suburban trains and metro in Rio de Janeiro.

Castro (2000*b*) suggests that the large number of stakeholders, their heterogeneous interests, the unstable equity structures, the existence of non transparent shareholder agreements and the lack of an active sector regulator (until 2001) seriously compromised the quality of the regulatory environment in the rail sector. Before being sold, RFFSA was split horizontally into six networks, and railway concessions were mostly awarded to consortia formed by large customers. With a 20% cap set for the shareholdings of each investor in each network, this increased the fragmentation of the ownership of the transportation network, transformed into a mosaic of participations and interests. In particular, some investors saw the railways as an extension of their own industrial businesses, lacking an interest in expanding them. Moreover, these investors are in a position to harm their competitors by discriminating against them in the supply of railroad services, and there have been cases of abuses of captive consumers and price discrimination [see for instance Estache, Goldstein and Pittman (2000)]. Further, several companies have not met the contractual targets for production and reduction in the number of accidents without sanctions having been imposed.

Also as consequence of this fragmentation of networks and interests, the participation of Brazilian railways in the transportation of goods over distances above 600 km remains incipient, in contrast with the much lower costs per ton.km of the railways over long distances and the situation in other large countries, such as the USA (Castro 2000*b*). This and the competition imposed by road transportation cause the profit margins of rail operators to remain low, reducing their ability to finance new investment. Indeed, the econometric results presented by Castro (undated) indicate that the average rail tariffs are below the long run operational costs, but above the operational expenses of these railways, so that:

“From a private perspective, the new rail companies will likely sustain positive cash flows, with a relatively good return on the price paid for the concession; however, it is unlikely that such return will be sufficient to justify or sustain any investment in expanding capacity or, in some cases, even to finance the proper maintenance of the system.” [Castro (2000*a*, p. 21)].

Moreover,

“[T]he combination of low density traffic, reduced transportation distances, high unit costs, and limited net operational results imply low investment capacity and of expanding output, strengthening the vicious cycle, and imposing a low participation of the railways in the Brazilian transportation market, if one excludes iron ore.” [Castro (2002, p. 32)].

The author also points out that if the railways succeed in expanding their participation in the long-distance haulage industry, this situation could change significantly. According to Castro (2000*a*), “a back of the envelope estimate would suggest that the railway concessionaires, as a group, could obtain revenues of over R\$ 4 billion [some US\$ 2.2 billion] in this market, enough to fund investments in capacity expansion”. The author concludes, therefore, that in Brazil “a quantum leap in the sustainability of the rail sub-sector depends strongly on the effective

connectivity among the railway companies”, which, in the current situation, depends on a substantial revamping and strengthening of the policy and regulatory authorities, since the law and sector regulations already contemplate instruments that permit great progress to be made in this area:

“In the rail subsector, the large market for long distance freight transportation may represent the element that will make viable and give sustainability to these concessions. On the other hand, it is necessary a regulatory stance that brings elements of incentive to mutual traffic arrangements and right of passage among the rail concessionaires.”
[Castro (2000a, p. 38)].

The regulatory reform in the port sector was launched with Law 8630, of February 1993. Since then, the central policy of the federal government in this sector has been to consolidate the transfer to the private sector of port operations, as well as to decentralize the administration of ports to local states and municipalities, or, in the case of ports still under federal jurisdiction, to give them administrative and financial independence. The federal government would be in charge only of supervision, control and promotion, keeping a systemic view of the national transport chain. According to this new regulatory model, all port services would eventually be carried out by private operators. As in other sectors, regulatory reform in the port sector has also stressed the introduction of competition.

The privatization process in the port sector has focused on container terminals, since private terminals already handled the great majority of bulk and liquid cargo. Container terminals in all Brazil’s major ports were privatized. The evidence so far is that privatization has made possible an increase in investment and productivity, but that a minor part of this rise in productivity was transferred to consumers by way of lower prices.²⁹ The explanation for this appears to be the absence of significant competition, which in turn resulted from two factors: high concentration of traffic in the port of Santos (above 40%), and the low efficiency of the railroads.

Moreover, regulatory reform in the port sector has stopped mid-way and has not produced yet a well-defined institutional framework, with different sector agencies having overlapping responsibilities and conflicting interests. As analyzed in more detail by Castro (2000a and 2000b), the main undefined aspects of the new institutional framework designed for the port sector are: *a*) the scope of action of the federal government in planning, regulation and finance; *b*) the strategy and criteria of port decentralization to states and municipalities; *c*) the role of states and municipalities; *d*) the new institutional model for the port administration; *e*) the restructuring of the Companhias Docas; *f*) the institutional and economic configuration of the jurisdiction of the Port Authority Councils — Conselhos de Autoridade Portuária (CAP) and of the terminals and public ports, notably regarding the delimitation of the area of the public port; and *g*) the institutional configuration of the CAP and the Labor Management Unit — Órgão de Gestão da Mão-de-Obra (OMGO), its representation structure and the viability of it exercising its role. Particularly important problems, according to Castro (2000a), are: *a*) the insufficient progress attained in reforming and modernizing labor regulation; *b*) insufficient

29. Some evidence in this regard is provided in Goebel (2002).

separation of commercial and regulatory activities; *c*) the situation of the Port Authorities, which lack autonomy and a strategic view for the port business and are “plagued by wrong incentives, conflicts of interest poor definition of responsibilities”; and *d*) the lack of interest of the CAPs and other stakeholders in fostering competition, in an environment of vertical integration between ship owners and port operators.

5 WATER AND SANITATION

The water and sanitation (W&S) sector experienced a great expansion in the sixties, seventies and eighties, notably while the Plano Nacional de Saneamento (Planasa) was in activity. The institutional framework in place during this period was based on *a*) central planning by the federal government; *b*) commercial and investment activities carried out mostly by the State Basic Sanitation Companies — *Companhias Estaduais de Saneamento Básico* (Cesb), which accounted for roughly 80 percent of the system; and *c*) low cost finance provided by budget funds and especially the *Fundo de Garantia de Tempo de Serviço* (FGTS), managed by the federal-owned National Housing Bank — *Banco Nacional da Habitação* (BNH), later absorbed by the *Caixa Econômica Federal* (CEF). The focus was on expanding the supply network, and planning, not regulation, was the core element of this strategy.³⁰

In this context, it is not surprising that the W&S sector suffered so much with the collapse of the federal government’s ability to plan and finance the sector’s expansion. Moreover, as in other sectors, the sector suffered with the real decline in tariffs, as a result of controls imposed as part of anti-inflationary policies, and the deterioration in the performance of sector SOEs, whose financial health was compromised by these low tariffs, unsound management and financial practices, soaring debts, low productivity, a progressive loss of skilled technical and managerial staff and political interference [Parlatore (2000)]. Indeed, Parlatore (2000, p. 283-284) points out that the sector reached the 1990s with a long list of problems:

“(i) Priority was given to producing water to the detriment of optimizing its distribution. This resulted from a historical perspective that favored the construction of new plants as a way of providing adequate services, giving preference to increased production rather than reducing losses and rationalizing consumption.

(ii) Insufficient commercial initiative, principally due to the lack of suitable registers of users and installations, poor consumption metering, inadequate tariff policies and structures, and a lack of effective regulations regarding supply disconnection of defaulting customers. All of the above led to effective loss of billings and revenue.

(iii) Inadequate service to users, with delays or failures to respond to requests for service, and difficulties in communication, especially with regard to explanations of tariff policy.

(iv) Overstaffing due to political interference.

30. In this way, Parlatore (2000) notes, for instance, that until very recently, the Cesbs had never been supervised or regulated by any kind of regulatory institution.

(v) Delays in responding to opportunities for technical and administrative modernization, which led to large operating costs.

(vi) Lack of administrative continuity, associated with unprofessional management.

(vii) Low provision for sewage collection and treatment, causing public health problems and pollution of water resources.”

The end result of the problems faced by the sector’s planning, financial and operating institutions was, like elsewhere in infrastructure, a significant contraction in investment, from about 0.3-0.4 percent of GDP until the late 1980s to only 0.12 percent of GDP in the early 1990s, recovering to around 0.2 percent of GDP after 1995.³¹ All available estimates indicate that this investment level will be insufficient to reduce the gap in supply and deal with the growing environmental problems caused by the improper treatment of wastewater. Margulis et al. (2002), for instance, estimate that, in sanitation alone, to achieve full coverage in urban areas, investments worth R\$ 30 to 39 billion will be necessary in 2003-2012 (roughly 0.24% of GDP per annum). Seroa da Mota and Avenburg (2002), in turn, report that:

“The total volume of investments required to achieve full coverage of water and sanitation services to the population in the 1999-2010 period was estimated by SEDUR to be US\$ 36 billion. Sewage collection and treatment would account for 45.8 and 22.4 percent, respectively. The rest would be split equally into water supply and reposition needs. The required volume of investment would be equivalent to annual investment expenditures of US\$ 3 billion, or the equivalent of 0.5 percent of 1999 GDP.”

Estimates by DS/Sepurb, reported by Parlatore (2000), point out that achieving universal coverage in water and sewerage services will require investments of some R\$ 42 billion (1995 prices) over a fifteen-year period, resulting in annual investment needs of roughly US\$ 3.1 billion, a value similar to that reported by Seroa da Mota and Avenburg (2002).³² As noted by Parlatore (2000, p. 292), annual investment needs of R\$ 2.8 billion (1995 prices) are well above the average volume of funds made available to the sector in recent years:

“The FGTS, which has been the main source of sector funding in 1970-96, during which period it provided an average of R\$ 700 million per year, will hardly be able to go much beyond that. Likewise, the estimated annual contribution from the General Federal Budget will probably remain about R\$ 300 million. This implies a need for additional funds of about R\$ 1.7 billion per year.”

Regulatory reform and greater private sector participation were deemed the solution to most of the sector’s problems, including the lack of funds to step up investment levels. Private ownership, or at least private management, was expected to

31. Data from Abicalil (2002), as presented in Seroa da Mota and Avenburg (2002). See also Parlatore (2000) for more evidence of the decline in investment levels in W&S.

32. This amount includes the investment needed to eliminate the current gap in the two areas (about two-thirds of the total) and to attend the increment in demand projected to occur over those 15 years.

bring sound business practices, which in turn were perceived as essential, together with the creation of independent regulators, with freedom to fix tariffs in a way that protected investors, to encourage the finance of new projects. With commercially sound services, access to finance and free of the constraints imposed on spending by the fiscal adjustment process, investment in the sector was expected to naturally rise.

During the second half of the 1990s, a new institutional framework, along these lines, was sought for the sector. Regulatory reform, and consequently greater private participation, was delayed, however, by doubts about which government sphere should be responsible for granting concessions and regulating the W&S sector in the metropolitan regions. This, in turn, made the status of the Cesb, many of which without a valid concession contract, highly uncertain, creating a large financial risk for the states. The failure to solve this dispute has left the W&S sector in a regulatory limbo, with consequences similar to those observed in the electricity sector. In particular, investments were delayed while a definition was sought about who would be responsible for them — if the Cesb or the new private owners. Moreover, while the sector remained almost entirely state-owned, the focus of regulatory reform was on creating an environment to attract private participation.

In practice, therefore, the W&S experienced little progress towards privatization and regulatory reform. There have been, however, concessions awarded to private operators in several municipalities, mostly outside the metropolitan areas, for which there seems to be a uniform understanding that the municipal government holds the authority to award concessions. An assessment by Parlature (2000), based on the operations concluded until 1998, showed that some 3.2 million people, corresponding to roughly 2 percent of the Brazilian population, lived in cities with private operators.³³ These have pledged to invest US\$ 843 million during the concession period, amounting to per capita investments of US\$ 263, slightly more than the per capita investment level proposed in the National Water and Sanitation Policy (R\$ 42 billion/150 million inhabitants = R\$ 280 or US\$ 233 per capita, at the 1998 exchange rate).³⁴ Parlature (2000, p. 302) also notes that:

“In a number of cases, partner companies have provided all the necessary capital (equity) to finance new investment projects. In other cases, the new concessionaires have planned financial operations, which often still depend on loans requested from, but not yet granted by private and/or public financial institutions, both domestic and foreign.”

This indicates that, as in other sectors, the establishment of proper finance

33. In addition to these sales, the sector has seen the sale of Manaus Saneamento, in 2000, for US\$ 106 million, and the sale of minority stakes in Sabesp and Sanepar, the Cesb in São Paulo and Paraná, respectively.

34. Parlature (2000) observes that most of the population served by private operators is in the State of São Paulo (1.7 million people and US\$ 234 million in projected investments); followed by Rio de Janeiro (1.4 million people and US\$ 559 million in investments); and Paraná (110,000 people and US\$ 50 million in investments). Moreover, while municipalities in Rio de Janeiro opted for full concessions, those in São Paulo granted only partial concessions, and, in some cases, licenses for specific functions. Partial concessions have mainly involved sewage treatment plants. According to Parlature (2000), the strategy reflected: a) the influence of the state's Public Prosecution Office, which demanded official action to be taken regarding the lack of sewage treatment; b) the fear of losing full control of services on account of their political value; and c) the presumption that new owners would resolve other service problems. It might have also been the case that municipalities have decided to keep control of water distribution services, for which consumers show a higher willingness to pay and from whom revenues should, therefore, be easier to collect [Margulis et al. (2002)].

mechanisms is a separate problem in the way of boosting investment in W&S. The sector also experienced sequencing problems, with privatization moving ahead before the establishment of a new regulatory framework. In particular, concessions were awarded much before the sector's regulatory agency National Water Agency — Agência Nacional de Águas (ANA) was established, in 2001, and given the responsibility to regulate and manage water sources. Moreover, as had happened in the electricity sector, ANA was created prior to the establishment of a new regulatory model to give the broad guidelines for the sector's regulation — discussion of a National Water Law stalled in Congress — and without a clear assignment of responsibilities to the many institutions, at different government levels, that share overlapping mandates over the sector (different ministries and sector associations).

Despite the failure to implement sweeping reforms, in at least three instances progress has been made in the nineties:

[1] There have been improvements in the performance of some Cesb, including two which were being prepared for privatization (Embasa and Compesa) and some that had their restructuring process supported by the World Bank (Sabesp, Casan, Sanesul, and also Embasa).

[2] Tariffs were raised to a threshold similar to that observed in other countries, also helping to recover the sector's investment capacity and increasing the sector's attractiveness to private investors.

[3] In the local states and municipalities that created regulatory agencies in the nineties, these tend to cover all utility sectors, putting the W&S sector under some form of supervision and regulation, which had been mostly absent in the past.

The challenge in the W&S sector resembles to some extent that of the electricity sector. Full public sector ownership does not seem to be a feasible alternative, despite the progress made in improving the performance of the Cesb, for there just is not sufficient investment capacity, not the least due to fiscal constraints. So it is essential to make progress in establishing a sound regulatory framework. Approving a new National Water Law, and possibly a constitutional amendment clarifying to whom belongs the power to make concessions in metropolitan areas, is essential. Meanwhile, it would be worth checking how the existing private concessions and their regulatory institutions are performing. Finally, adequate financing instruments need to be created.

6 FINAL OBSERVATIONS

In only five years (1996-2000) the state has greatly reduced its participation in infrastructure sectors. Thus, private investors now control the telecom and railway sectors, the country's largest ports, some of the main highways, two-thirds of the distribution and a fifth of the generation of electricity, together with a small but non-negligible share of sewage and water services. Underscoring this massive transfer of ownership and control was a process of regulatory reform whose design, implementation and results only recently began to be assessed. This paper tried to contribute to this assessment effort, discussing regulatory reform in four infrastructure sectors — telecom, electric energy, transportation and water and

sanitation — and analyzing how successful this reform has been in reversing the process of deterioration, in physical capital and efficiency, experienced by these sectors since the 1980s.

An assessment of the regulatory reform process in these sectors should start by stressing the many commonalities among them. These start with the common features of the institutional arrangements that allowed them to greatly expand from the fifties to the mid-eighties: *a*) an institution, usually the sector ministry, sometimes a sector holding SOE, was responsible for planning and selecting investment projects; *b*) SOEs carried out commercial and investment activities, usually enjoying a monopoly over their markets; and *c*) sizable volumes of sectorally earmarked funds — the National Telecommunications Fund (FNT), the Tax for the Improvement of Ports (TMP), the FRN, the FGTS, etc. — were made available, providing stable, low-cost finance to the investment activities of SOEs. Planning, cooperation and market sharing were the norm, in an environment in which “engineeringly” maximizing the use of capital, and not total surplus, was the main objective. Infrastructure SOEs also benefited from the tariff hikes and greater administrative autonomy implemented in the late sixties, and from the sovereign guarantees that allowed them to borrow at a relatively low cost in foreign markets.

All infrastructure sectors also suffered from similar misfortunes. In the mid-seventies their tariffs began to be controlled by economic authorities and used as anti-inflationary instruments, causing a decline in real revenues and gradually eliminating their ability to self-finance their investment needs. In the early eighties earmarked sources of funds were reduced or altogether discontinued. Concomitantly, management practices began to worsen, efficiency to fall and financial health to deteriorate, reducing the creditworthiness of SOEs. Together with the fiscal constraints on spending — to which insiders preferred to adjust by cutting investment, rather than current expenditures — this led to a fall in investment and the slow expansion in output capacity, limiting the ability of SOEs to cope with the increasing demand for their services.

In all these sectors, regulatory reform had similar objectives and followed the same blueprint. The main objective was to attract private investors and give them the ability and incentives to operate efficiently and expand output capacity. The policy, regulatory and business activities in each sector were separated, with policy being ascribed to the sector ministry, regulation being trusted to an independent agency and the business activities being left with sector SOEs, which were supposed to be eventually privatized. Regulatory agencies were expected to control tariffs — subject to the rules set out in the concession contracts and the general principle of financial and economic equilibrium of the concession established in the Concessions Law — and enjoy administrative and financial independence, playing the dual role of fostering investment and efficiency while guaranteeing private investors from the risk of administrative expropriation. Competition, to the extent possible, would encourage technical and allocative efficiency, which together with adequate tariffs and the protection of an independent regulator would help the new operators to secure the capital necessary to finance the required investments.

As a rule, the concern to introduce competition was reflected in the setting up of non-monopolistic industry structures, at least on a nationwide scale, with several SOEs being separated horizontally and vertically before privatization. Examples of horizontal separation include the railroad, electricity and telecom sectors, and examples of vertical break-ups telecom and electricity. In addition, limits were imposed on the participation of individual investors in different markets, regional and national, and even on the ownership structure of some companies (such as the railroads).

The importance of good sequencing, with regulatory reform preceding privatization, was also in general recognized in all sectors, although not always followed in practice. Thus, except for telecom, reform stopped midway in all sectors and faced serious sequencing problems, with privatization often preceding the setting up of regulatory agencies, and these being established before an overarching regulatory framework had been defined for the sector. Sequencing problems reflected the importance of fiscal adjustment objectives in pushing privatization forward, both at the state and the federal level, the fact that different agencies were in charge of privatization and regulatory reform, and the resistance to change by sector insiders. Indeed, when fiscal adjustment and the weaker exchange rate put the Real Plan on sounder footing, in early 1999, the priority ascribed to privatization declined considerably, causing the reform process also to lose steam, notably in the electricity sector.

Privatization and regulatory reform succeeded in increasing productivity and investment in all sectors examined here, but from low levels, with the latter, in particular, being largely concentrated on the rehabilitation and modernization of existing facilities. The only exception was, once more, the telecom sector, in which output capacity increased annually at double digit rates after reform began. Four features of regulatory reform in the telecom, acting together, seem to have been crucial in producing this outcome: *a)* a tariff hike that ended cross-subsidies and brought telecom rates to international levels; *b)* good sequencing of reform; *c)* great and incremental stress on competition, according to a publicly known timetable; and *d)* access to finance at competitive rates. Moreover, the telecom sector had other unique features, unrelated to regulatory reform, that were also critical in fostering change and a substantial rise in investment: rapid technical progress, increased product diversity, large market growth potential and no need for complex inter-government coordination in the privatization and regulatory reform processes.

In the other infrastructure sectors, though, reform failed to produce the rise in investment necessary to achieve a substantial expansion in output capacity. Our analysis suggests that in each sector there are several reform measures that need to be undertaken:

In the transportation sector, it is necessary to deepen reforms in each sub-sector, resolving conflicts of interest and overlapping responsibilities (as in ports) and extending the network operated by private investors (as in the case of highways); strengthen the recently established regulatory agencies, guaranteeing close inter-agency coordination; and strengthen the policy, planning and coordination roles of the Ministry of Transportation, so as to foster intra- and inter-mode cooperation and

help to identify and make viable investments with significant network externalities. Moreover, in the railway sector the break up of SOEs and the restrictions imposed on cross-ownership seem to have led to an excessively fragmented industrial structure, while downstream vertical integration has fostered anti-competitive conducts and discouraged investment in expanding output capacity. Although the law provides instruments for improving this situation, a strong regulatory presence will be necessary to make that happen.

In water and sanitation, the priority should be approving the National Water Law, so that the sector can count on an overall regulatory framework, facilitating the transfer of these activities to private investors in the states and municipalities that want to do so. However, since a new law may not be approved soon, and the privatization tide seems to have receded in the new federal and state administrations, emphasis should also be given to strengthening the state water and sanitation companies (Cesb), the municipal W&S companies or authorities, and the sector regulators at the state and municipal levels.

Electricity is the most challenging case, not the least for the political sensitivity that accompanies it since the 2001 power shortage and the financial problems faced by privatized distribution companies in the following years. On economic terms, the first best option continues to be complementing the sector's privatization and regulatory reform processes. However, this option will be politically difficult to implement in the next years. Moreover, recent developments have compromised much of the credibility that such an initiative would have, further reducing its appeal in the near future. Still, the investment requirements in the sector are large, and fiscal constraints make it difficult for the state to undertake them.

So, the second best solution is, while keeping state ownership of existing companies, move fast and significantly in the creation of a regulatory environment that is able to attract private investment. More specifically, it is necessary to separate generation and transmission activities of the large state-owned power companies; provide for a tariff increase schedule that brings it to a level compatible with long-run marginal costs, while eliminating cross-subsidies; strengthen Aneel, giving it clear authority to determine tariff adjustments and regulate sector SOEs; establish a more competitive and better regulated framework in the gas sector; and improve inter-agency coordination.

There are also four issues that cut across the various infrastructure sectors. First, while great emphasis has been placed on establishing and strengthening regulation, and using privatization to improve the performance of sector SOEs, little attention was given to providing the sector ministries with capacity and instruments to carry out policy and planning activities. This has often resulted in the lack of well designed sector models that could help to structure the institutional framework in which regulation and business activities were to take place.

Second, it is necessary to foster government commitment to the new overall framework adopted for infrastructure, with the separation of policy, regulation and business activities. Moving ahead with reform in sectors that are midway into this process is a way to do this, but a more general alignment with this policy stance is

also important to generate credibility and in this way reduce the risk perception of private investors.

As part of this process, it is necessary to consolidate a new regulatory culture, strengthening and giving a more homogeneous mandate to the regulatory agencies. In particular, these need to be distinguished for the economic role they are expected to play, fostering investment, maximizing total welfare, preventing administrative expropriation, etc., and not for simply being another administrative form of executing the same functions that characterized these agencies in the pre-reform period. As noted by Nunes (2001, p. 5-6), more than a regulatory instrument, these agencies are currently perceived as a new way to organize the state, being “seen, in the recent administrative imagery, as a solution to old problems that demand actions considered to be modern and efficient. Agencies, or at least the mention of their creation, seem to carry with them the solutions never before found by the traditional bureaucracy.” This has led to a boom in the creation of new agencies, including some in sectors in which its role is far from clear, such as the movie industry — Agência Nacional de Cinema (Ancine). At the federal level, nine new agencies were established in 1996-2001, five in 2000-2001 alone. At the sub-national level, 14 new regulatory agencies were created in 1997-2001. There is still a lack, however, of an overarching regulatory framework to guide the creation and activities of these agencies.

Third, it is necessary to develop finance and risk management instruments that help making infrastructure investment, particularly in greenfield projects, more attractive. The necessary increase in annual investment in infrastructure amounts to roughly 1.5 percent of GDP, a large amount by any measure, and certainly one that cannot be financed by the public sector budget, given current fiscal restrictions, and is in excess of the financial capacity of public banks. This increment in investment is also dependent on long-term funds and characterized by risks that are high and different from those faced by standard commercial business. It is important, in this regard, not to underestimate the role of earmarked funds in allowing the expansion of infrastructure from the fifties to the eighties.

So, financial sector reform, and in particular lowering of the cost and expanding the supply of capital, seems to be a critical element in a strategy to increase private participation in infrastructure. This seems to have been a key point somewhat overlooked in the reform process. Moreover, although some of the necessary initiatives in this regard will be part of this broader, long overdue reform of financial markets, some are specific to infrastructure projects, and could probably be implemented without having to wait for a comprehensive financial market reform.

Finally, it is necessary to prepare the judiciary to deal with disputes concerning the regulation of infrastructure sectors. In recent years, the courts were asked, typically by private concessionaires, to interfere in regulatory decisions in the telecom, transportation and electricity sectors. A survey carried out by Pinheiro (2003) shows that Brazilian judges tend to consider non-economic matters when deciding about issues concerning the regulation of public utilities, and believe that they should go into the merit of the disputes — in contrast with just guaranteeing that due process was respected — even when these were the object of decisions taken

by the board of regulatory agencies. The slowness and politization of judicial decisions are elements that increase the risk of private infrastructure investment, and making the judiciary more agile, predictable and impartial would help to increase it.

Although much has been accomplished in reforming Brazilian infrastructure sectors, at least as much remains to be done. The challenges ahead are significant, politically sensitive and complex, but this should not stop the government from facing them. Certainly it is better than turning back and undoing what has been done, not the least because the public sector does not have the resources to buy back what has been sold or undertake the investments that need to be done. Nor should it attempt to do so, for there are more urgent priorities in the social area. The big risk, hence, is that the government leaves things as they stand. By far, this would be the worst option.

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