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TRANSPORT PAPERS TP-30 MARCH 2010

Private Participation in the Road Sector in Brazil: Recent Evolution and Next Steps

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TRANSPORT SECTOR BOARD

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ACKNOWLEDGEMENTS

This study was undertaken at the initiative of Jose-Luis Irigoyen, Sector Manager of the Transport unit of the Latin America and Caribbean Region of the World Bank. The authors of the report are Adrien Véron, Transport Specialist, and Jacques Cellier, Consultant. The authors benefited from the guidance of Aymeric Meyer, Task-manager responsible for the interurban road transport portfolio of the World Bank in Brazil.

Assistance from the government of Brazil, especially the Ministry of Transport and the Land Transport Regulation Authority (*Agencia Nacional de Transporte Terrestres* – ANTT), is gratefully acknowledged. ANTT notably provided key access to information related to the ongoing road concessions in Brazil and the paper was enriched by constructive advice from ANTT senior management and executives.

This paper also benefited from comments and advice from several peer reviewers including Tomas Serebrisky, Jordan Schwartz and Francesco Totaro, as well as Aurelio Menendez, Jose Guilherme Reis and Yasuhiko Matsuda, and Debbie Wetzel.

During a technical workshop held in Brasilia in December 2009, a draft of this paper was presented to the main stakeholders in Brazil for discussion. At the Federal level, this workshop gathered representatives from the Ministries of Finance and Transport, the ANTT and the National Transport Infrastructure Department (*Departamento Nacional de Infra-estrututa de Transporte* – DNIT). Representatives from the States of Minas Gerais, Rio Grande do Sul and Bahia also participated in the workshop. Finally, representatives from the private sector were also present.

FOREWORD

With globalization and the constant reorganization of production and distribution chains, logistics have become a key determinant of inter-regional trade and international competitiveness. While the Brazilian overall economy has shown impressive improvement over the past decade, the country's economic growth remains hampered by high logistics costs, which still represent about 15 to 18 percent of GDP. This is well above those of China and India and nearly twice the 9 percent average cost in OECD countries.

High logistics costs stem in part from the way the transport sector is organized, a situation largely inherited from the past marked by years of low investment in transport infrastructure and a focus on the roads subsector. As a result, logistics nowadays heavily rely on the costly road transport mode, which carries some 60 percent of goods and 95 percent of passengers. Ironically, given the scarce resources allocated to the sector, the road infrastructure itself has remained in an overall poor condition until very recently, further contributing to the high cost of transport. Various initiatives have been undertaken since 2000 to improve the management of the sector, including institutional and policy reforms; a renewed long-term transport planning exercise; increased participation of the private sector through concessions and performance-based contracts; release of budget constraints notably since 2005; and the implementation of large multi-year investment programs.

Despite these efforts, further improvements in the management of the transport sector remain essential to contribute to reduce logistics costs in Brazil and foster increased economic growth. In 2007-2008, the World Bank initiated an Analytical Advisory Activity (AAA) which takes stock of the progress to-date in the management of the sector and focus on investigating ways to further improve the efficiency of public expenditures in the sector. A number of activities have been undertaken under this AAA, including technical assistance and original research into the functioning of the transport sector, resulting in the following studies: *Brazil's Experience with Performance-based Contracts in Road Rehabilitation and Maintenance; Private Participation in the Road Sector in Brazil;* and *An Appraisal Framework for Transport Investments.*

The present paper, *Private Participation in the Road Sector in Brazil: Recent Evolution and Next Steps*, investigates and details Brazil's successful experience with public-private partnerships (PPPs) for the management of the road infrastructure and explores approaches for future improvements in Brazil's PPP program. It is our hope that this paper will contribute to the vibrant discussion among Brazil's policymakers, advisors, financiers and private sector partners on how best to reduce the cost of logistics, increase trade and bolster economic opportunity for all Brazilians.

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ABSTRACT

Today, Brazil has the second longest highway network under private concessions in the world. This paper analyzes Brazil's experience under the two first phases of the federal road concession program, and highlights some of the program's strengths and areas for further development.[1] Despite the unfolding world financial and economic crisis, the potential for further private participation in the sector appears very good. This paper essentially argues that it may be time for Brazil to revamp its current models for private participation in the sector, which may soon reach their limit in terms of being able to meet efficiently the needs of a growing economy. In summary, Brazil could: (i) diversify its toll road model to allow for more innovative public-private partnership[2] structures, (ii) update its toll regulatory and contractual framework to overcome some of the design problems that have led to relatively inefficient tolling, (iii) consolidate the institutional framework for road concessions to give a stabilized basis for further developments, (iv) develop a policy framework adapted to the current Brazilian environment, taking into account the need to ensure harmonized levels of service and tolls across the country, and (v) adapt the sector financing framework to the rising capacity of private markets.

[1] The paper does not cover performance-based public contracts (the so-called *CREMA* contracts), which were reviewed under a separate paper entitled *Performance Based Contracts in the Road Sector, Brazil experience.*

[2] The term "public private partnership" in this report refers to any type of partnership between the public sector and a private firm, and is not limited to the definition in Law 11.079 of 2004 (Law of PPPs).

OVERVIEW

1. Toll roads concessioning has not followed a straightforward path in Brazil. After the emergence of the concession model in 1993, a quick expansion followed. The program then paused during ten years, until 2007-2008 where a new expansion phase of the sector was initiated both by the Federal and State levels of government. In 2008 toll roads covered about 12,000 km, an extension that could potentially double in the medium run if the governments' plans materialize. Most of the main roads in Brazil would then be operated as private concessions which, in turn, lead to good road performance, something vital to the economy. This paper aims at contributing to the ensuing policy discussion this situation would generate. It presents a limited evaluation of the experience to date under the federal road network concession program, which represents about a third of the Brazilian tolled network. The paper argues that while the program has essentially met its goals, its implementation revealed a series of weaknesses in the concession model, set in place in the 1990s and basically used until today. To get the best of private participation in the sector, Brazil would need to create or revise its sector policies and tools, as well as the institutional, regulatory and financing frameworks.

GOOD DEVELOPMENT PROSPECTS FOR THE SECTOR

2. Inexistent in 1990, the Brazilian highway network managed under concession contracts covers today more than 12,000 km, only second in length to China's road network under concession.[3] The private sector has achieved the goals of the program - consistently delivering quality services to the users. Rate of deadly accidents was halved in ten years on tolled routes[4] while it has overall slightly increased on the federal network over the same period. In 2007, 22 of the 23 best quality roads in Brazil were tolled highways.[5] The private sector invested R$ 1.2 billion per year between 2002 and 2006, about 12 percent of total investment in the sector during the same period, a period marked by a severe fiscal adjustment which constrained public spending.[6] As a consequence, while the quality of the rest of the network severely worsened between 1998 and 2006, tolled highways maintained an adequate level of service.[7]

3. Fifteen years after the beginning of the first concessions, the regulatory models put in place initially were maintained and consolidated, notably at the Federal level and in the Sao Paulo State. The initial period proved painful. In several states, governments repeatedly attempted to unilaterally cut tariffs or even undertake expropriation. Many juridical remedies were initiated by civil society, leading sometimes to the cancellation of concessions or the impossibility to operate toll plaza. However, the frequency of such events strongly decreased in the last five years, and economic-financial terms for the concessionaire were upheld by the courts. Particularly, management of the first round of the federal government program (about 1,480 km) by the now-extinct DNER between 1995 and 2002 and currently by the Land Transport Regulatory Agency (ANTT) proved strong, with no contract being substantially renegotiated: the many revisions – mostly increases or adjustments to much too detailed initial investment programs – were realized within the contractual framework that had been set up initially.[8] Regulatory governance appeared reasonable, with ANTT's performance in line with the Brazilian infrastructure regulators' average, and substantially higher than comparable Asian peers.[9]

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[3] A partial survey made in 2005 by the Chinese National Audit Office, identified a toll road network of 133,100 km, 25 percent of which was managed through concessions (usually under state-owned companies). Chinese National Audit Office (2005).
[4] Sernam (2007)
[5] CNT (2007)
[6] ABCR (2006)
[7] CNT (2003) and World Bank (2005)
[8] Large contract restructuring occurred in several state programs such as in Parana or Rio Grande do Sul – one concession had to be transferred to the federal level. In general terms, renegotiation "occurs when the original contract and financial impact of a concession contract is significantly altered and such changes were not the result of contingencies spelled out in the contract." Cf. Guasch (2004).
[9] See in particular Correa & Al. (2006)

Table 1. Toll road network under private concessions

	Road network under concession	***Private investments as % of total sector investments***
Brazil	12,361 km	**12% (2000-2006)**
1st phase Federal concessions (1995)	1,482 km	
2nd phase Federal concessions (2007)	2,601 km	
Sao Paulo[10]	3,470 km	
Rio Grande do Sul	1,759 km	
Parana	2,495 km	
Other governments	506 km	
Argentina	8,536 km	
Mexico	~ 6,000 km	
France	8,444 km	**14.5% (2007)**
Spain	3,378 km	
Italy	5,654 km	
China	> 31,200 km	**~ 10% (1995-2004)**

Source: Sernam (2007), ABCR (2006), IBTTA website, ASECAP (2007), World Bank (2007), French Ministry of Sustainable Development (2008), Chinese National Audit Office and World Bank calculations.

4. With an end to the heavy investments phase, the concession companies under the first phase of concessions began, and continue today, to generate an increasing amount of revenues. This led to a consolidation of the sector as several groups (CCR, OHL, Ecorodovias, TPI, Bertin-Equipav) actively sought expansion fields, either through secondary market purchases or new projects, some successfully raising capital through stock exchange listing.

5. Stable regulatory practices, balanced contracts, numerous players, availability of capital at relatively low cost, and predictable cash-flows, all contribute to increasing competition, and to reducing the costs and tolls that regulatory agencies seek to obtain. As a result, tolls obtained in late 2007 through the auctions of a second phase of federal concessions (about 2,600 km) were low if compared globally – about R$ 2c/km, ten times below European levels, and five times below the existing rates in Brazil. Similar competition levels[11] would be expected from further developments, if the long-term impacts of the 2008 financial crisis on the Brazilian macroeconomic environment remained limited.[12]

RATIONALE FOR REFORM: MAIN MESSAGES

6. ***Brazil will have to further tap into private capital to address its infrastructure needs***. The need for Brazil to increase its investments to improve its economic and social performance is well documented.[13] The Brazilian infrastructure stock remains low compared to comparable countries such as Mexico and Chile, especially in the transport sector.[14] Close to two decades of below necessary levels of investment led to precarious road surface conditions and congestion, while over-reliance of the economy on the road mode exacerbated negative impacts. Faster country development will keep pushing up household equipment rates as well as trade, leading transport demand growth to exceed economic expansion rates in the medium run. To ensure that the transport sector can act as a lever for economic growth instead of as a bottleneck, federal investment would need to be fulfilled; current needs were evaluated at about R$ 16.5 billion per year by the 2007 National Logistic and Transport

[10] State of Sao Paulo auctioned an additional 1,763 km of highways in November 2008, to be quickly implemented.
[11] In average 7 to 14 bids have been received under the 2007 round of concessions
[12] Concessions bid in November 2008 by the State of Sao Paulo appear a sign that the appetite of the private sector had remained unharmed, as discounts from 6 to 55 percent were obtained on the administration's maximum price.
[13] See for instance World Bank (2007).
[14] World Economic Forum 2007. Brazil ranked behind Chile and Mexico in terms of infrastructure and second to last in the road sector.

Plan (PNLT) – twice the current budgets and eight times the budgets prevailing five years ago. Bridging the gap will require, among others, a heavy mobilization of toll roads financing. Recognizing this, the federal administration announced plans to proceed soon with two additional phases of concessions, for an additional 4,700 km of highways. Parallel developments are planned or under way in the States of Sao Paulo (1,763 km) and Minas Gerais (up to 7,000 km). Overall, the extension of the privately managed network could quickly double, making a large contribution to economic development, if the framework for private participation proves strong enough.

7. ***Private participation models in use are not optimal in the current road sector environment.*** The current concession model in use was created in the 1990s, in a very different macroeconomic context which led to limiting the scope of private involvement. In the 1990s, fiscal constrains pushed the public sector to try to find ways to reduce public expenditures – including maintenance of assets. The public resources for private concessions were impractical under the 1995 Concession Law, which also introduced a series of detailed prescriptions predetermining many contractual clauses. High capital costs led to concessions which mainly focused on operation and maintenance of existing road itineraries, including many urban segments. Low development of new technologies in the 1990s led to inefficient and open toll systems[15] in which many users can use segments of the highway without paying tolls. Accordingly, tolls are currently paid by a portion of all users and these toll revenues finance mainly administrative expenditures: 80 percent of revenues of the first phase concession and two thirds of revenues from the second phase concession are used to finance road administration, basic operating expenses, toll collection, remuneration of capital or taxes, and only 20—40 percent to road works (mainly rehabilitation) or road services.

8. Today the sector's environment offers quite a different picture: budget allocations to the sector are at a fifteen year high, private markets offer low-cost alternatives, inexpensive tolling technologies are widely available, and traffic demand justifies investments in construction works – not just maintenance. However, concession models in use have been only marginally adjusted. The government strategy to avoid concessions with heavy investments to, inter alia, keep toll levels low should notably be questioned. This strains taxpayers and reduces the level of efficiency of public expenditures. Indeed, among financing instruments, tolling is probably more pro-poor than public taxes which are relatively regressive in Brazil. New ways to conciliate high investment needs with affordable tolls, however, could be implemented through established instruments outlined in the Law of 2004 public-private partnerships[16] (PPP), in which a less rigid legal framework opens the way for public financial contributions as well as longer contract horizons; however, such a model has not yet been successfully applied in the sector, with possibly the exception of the state PPP for the MG-050.

9. ***Weaknesses in the initial design and approach to regulation in the first phase federal concessions has led to high tolls relative to the level of services provided today.*** Even though no major restructuring occurred, the experience of the first phase of federal road concessions is not clear cut. In the past 13 years (out of 25 year contracts), frequent investment program modifications took place, leading to sizeable increases which were compensated under DNER management by hefty tariff increases of an average 40 percent, up to 124 percent. Thanks to efforts of the ANTT, which took over the management in 2002, tariffs were since contained in real terms, but initial increases could not be reverted. Furthermore, contract regulation has suffered from being fully anchored in the initial commercial proposals of the concessionaire: unit costs, financial rates or traffic forecasts offered at the bidding time have to be used by the ANTT without market-based updates throughout the concession. Initial conditions are therefore preserved during 25 years, preventing users from benefiting from productivity gains or reduced capital costs. While significant upside possibilities were clearly necessary in the 1990s to attract private capital, and could only materialize over the life of the concession, a certain degree of flexibility could nevertheless have been introduced in the contracts to account for the evolving environment. The inertia appears to be responsible for up to 75 percent of the five fold difference between the older concessions and the current tolls on federal highways. Detailed regulatory data show that 2008 costs for toll computation are much higher for the old

[15] Users are charged a flat-rate toll which is not determined by the distance traveled or number of exits passed. It is possible to exit the toll road before the toll plaza, use other streets to bypass it, and then re-enter the highway on the other side of the toll plaza and therefore use the toll road without paying.

[16] As several other countries, Brazil differentiates "concessions," *id est* private investments which are fully financed by tolls and are regulated by a 1995 concession law, from "public private partnerships," which can also be financed by tolls but necessarily incorporate public contributions and are regulated by the 2004 PPP law.

concessions than for the new ones: twice for financial costs and four times for physical and administration expenditures.

10. ***Highly competitive auction for the second phase of federal concessions might require a shift in regulation.*** The success of the government in delivering in 2007 a record-fast[17] and highly competitive tendering (7 to 13 offers per concession) for the second phase of federal concessions might yield a mixed outcome in the long-term. The auction process, based on the lowest toll offered, secured very low tolls, up to 65 percent discounts from base government forecasts. While this is good news for the users, this could put at risk the concessions and might ultimately prove costly to the taxpayer. Unlikely low returns to capital or extremely high traffic forecasts apparently expected by the concessionaires might be symptomatic of low-balling strategies. The materialization of less optimistic traffic –levels more in line with the government's initial forecasts for instance – could then put at risk financial viability. The way ANTT regulates these contracts will likely require adaptation to the new context: low returns on capital upheld by rules built into the contracts might de facto provide incentives to concessionaires of the second phase to gradually solicit reductions in their investment programs.

11. ***The institutional framework could be consolidated to ensure a healthy long-term development of the program.*** Interventions by many actors without clear distribution of responsibilities and frequent evolution of practices compounded by a lack of consensus on the principles for private involvement, a difficult fiscal situation, and a risky environment for the private sector, were some of the reasons which generated a 10 year delay in the second phase of concessions. This program was originally planned for 1997 but was only implemented in 2007 as responsibility for program management and approval was disputed, political uncertainties on the exact scope of the desired private participation created interruptions, and the technical documentation underpinning the second phase was repeatedly evaluated as incomplete. More recently: (i) in 2007, a pilot PPP project (BR 116-324) initially prepared by the Ministry of Planning was transferred to the ANTT, and (ii) in 2008, Casa Civil requested the Brazilian National Development Bank (BNDES) to prepare a new phase of concessions. The inter-ministerial Council for Integration of Transport Policies (CONIT), mandated by the 2001 transport restructuring law but only created in 2008, could prove a good instrument for stabilizing practices and approving the key sector policies.

12. ***Tolling principles in use do not contribute to an efficient tariff policy***. Current tolling principles generate important economic inefficiencies and inequities, with regard to the difference in tolls between regions and between itineraries, the repartition of concession costs between long and short distance users, as well as between vehicle types. In the absence of an overarching policy approach, tolls have been set as outputs of the tendering process, on a project by project approach. This resulted in a high level of disparity, locked in for 25 years, as tolls were based on surface conditions, financial costs, and competition levels that prevailed at bid time. Given the implicit target of full cost recovery, tolls differ strongly from marginal costs. Moreover, this logic appears relatively regressive: while the most highly trafficked highways can generate low tariffs, the roads with less transit or in poorer regions are de facto excluded from being candidates for concessions. Differences between full and marginal costs also distort competition between itineraries in areas where several alternatives are available: in the State of Sao Paulo, kilometric costs on highways vary by a 1 to 6 range, without obvious differences in the service to the user. The open toll system itself is a source of inequity that reduces social acceptability of tolling. For a user living close to a new toll plaza, the introduction of a concession can generate an uncompensated loss; on the other hand, many users transiting in between plazas do not pay tolls. As a result, the costs of the concessions might actually be borne by only a fraction of users, mostly the long-haul traffic, as urban traffic remains in great proportion toll-free. An inefficient tolling structure, uncommon by world standards, penalizes further the most efficient trucks, and consequently, internal trade.

13. ***BNDES role in the sector could be reviewed to increase space for private participation***. Reflecting the good position of the Brazilian economy until 2008, private capital markets have been increasingly active in the toll road sector, taking a larger share of toll sector finance, through the granting of debentures for refinancing projects and developing a secondary equity market. However, despite this greater availability of private financing, most initial concession debt financing has so far been realized through the BNDES. The institution espouses two implicit

[17] 4 months between request for bids and contract award and 2 additional months to contract signature.

mandates in the road sector: (i) provide finance where the private markets cannot offer sufficiently favorable terms, and (ii) reduce financial costs to enhance affordability of tariffs, through subsidized rates. However, those mandates could be reconsidered in light of the new sector environment. If the long-term impacts of the financial crisis of 2008 on the sector remained limited, the rapid increase of national infrastructure investments could push requests for BNDES funds beyond the institution's financing capacity. BNDES would increasingly have to turn down requests and, naturally, result in a smaller share of total sector financing.[18] Moreover, international experience converges to say that subsidized financing is ill-suited to achieve an affordability policy goal.

STRATEGY FOR REFORM: POLICY RECOMMENDATIONS

14. ***Diversify the tolling instruments***. To reap more benefits from private participation in the sector, Brazil could rethink its instruments. Private participation could be oriented towards greenfield highways, parallel to existing roads, at maximum capacity or incorporated into major duplication works. If needed, higher tolls would then be more socially acceptable if alternative itineraries existed. In parallel, progressing towards adjusting user contributions in line with their effective use of the network, through closed-system highways for instance, would make tolling more equitable as well as increase the scope of resources available. Instead of working on a project by project basis, strong revenue-generating capacity of some segments could be used either to finance the development of concession highway networks through corporate-finance schemes, or to finance the maintenance of local networks as contemplated in the State of Sao Paulo. Brazil could create a cross-subsidy mechanism to develop PPPs in poorer regions, for example through a pooling of tolls. Such an instrument for regional development policy should be transparent, competitive and based on a careful analysis of the viability of new concessions. Dilution of traffic risks could also reduce costs, for instance through adoption of a pilot program to use corporate finance instead of only project finance,[19] or through the development of specific financial instruments. When necessary and to ensure a market appetite for riskier concessions, the public sector could implement new intervention tools, such as traffic guarantees or direct payments, while maintaining strong monitoring of possible contingent liabilities. Many of these evolutions could be realized within the PPP framework.

15. ***Update the toll road regulatory and contractual framework***. Current contract and tendering practices could be revised in new concessions to take into account the experience of the two first phases. Revising the current concession award criteria to reduce the risk of low-balling appears to be a priority.[20] A larger transfer of the construction risk to the private sector appears to be positive as it enables the concessionaire to optimize its road maintenance program, allowing lower long-term costs, as seen in the second phase bid results. However, additional iterations appear to be necessary, for example, through better definitions of rules for asset condition at contract end. This note suggests additional iterations for the allocation of traffic and financial risks, as well as revisions or clarifications on penalty, termination and amortization rules. Some measures could be implemented by the ANTT within the current legal framework while others might require legal adaptations. Measures targeted at promoting a more business-oriented behavior from the concessionaire, through user discount programs or commercial enterprising of the roadway, might be part of the latter adaptation required.

16. Furthermore, to better control and harmonize price escalation, this note suggests attempting to reduce the frequency of investment program revisions – probably to a five year occurrence, except for substantial modifications. This may be achieved by relying less on the initial commercial proposals for toll revisions and rate updates, and more on increasing incentives to concessionaires to match investments with effective demand. Regulation setting could increasingly take into account real commercial prices, financial costs or competitor's productivity gains, bringing the sector closer to a traditional price-cap utility regulation scheme and further from a pure contract based regulation. It should be underlined that any evolution must maintain the delicate balance between incentives. Modifications ought to be introduced with caution and consultation – and probably only for new contracts – as the clarity and stability of regulation bring sizeable long-term gains by themselves.

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[18] Cf. World Bank (2008)
[19] Cf. World Bank (2004) for a discussion of corporate finance in the Indian case.
[20] For additional discussion, see Estache, Romero & Strong (2000), WB Institute

17. ***Consolidate the institutional framework for road concessions.*** The government could consider: (a) clearly defining the respective responsibilities of the central and transport ministries, ANTT, and BNDES in developing and implementing the PPP program; (b) undertaking the formulation of the policies discussed in section 1 of this report for consideration and decision by the CONIT, in accordance with the process established under the recent Presidential Decree no. 6.550 of August 27, 2008; (c) streamlining the review process for PPPs, delegating the formal approval of future concessions from the National Privatization Council (CND) to the CONIT; (d) authorizing the Ministry of Transport (MT) and providing the necessary resources and incentives to recruit and train professional staff and managers to gradually develop a group of competent and motivated staff in the areas of transport policies, planning and program monitoring and evaluation; (e) through MT and the CONIT, and in close cooperation with the Forum of State Secretaries of Transport, formulating a comprehensive and viable strategy for decentralizing the management of the road network, and seeking congress approval of an agreed proposal for a new PNV law; and (f) facilitating the recruitment and retention of qualified staff by the regulatory agencies, including ANTT, and ensuring that agency directors and managers are selected on the basis of technical and managerial competency, and independent from political and private interests.

18. ***Develop a policy framework adapted to the new environment***. The Ministry of Transport, with technical support from ANTT and the National Transport Infrastructure Department (DNIT), could formulate clear policies regarding guaranteed service levels to road users on the federal network. They could provide the necessary guidelines in order to have consistent concessionaire or contractor obligations and performance standards. Service levels related to road surface and capacity may be differentiated on the basis of two-lane highway versus dual carriageway, and depending on whether they are tolled or not. The objective of a policy for a parallel toll would be to define efficient and equitable toll rates, as consistent as possible across the network, and coherent with the service levels offered. Another objective would be to specify how affordability for poorer users and in the less developed regions can be ensured. Such policies would be supported by road user opinion surveys which would assess user preferences and willingness to pay for such services levels. Regarding tolling technology, the Ministry of Transport could promote an exchange program with the participation of concessionaires in order to establish a strategy to develop efficient and equitable tolling systems.

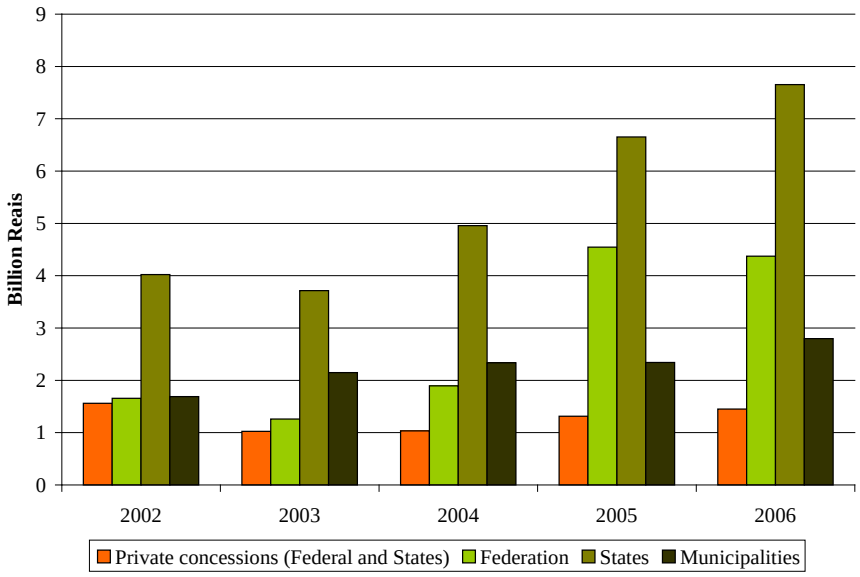
19. Advantages could be considerable if these policies were coordinated with state governments to ensure consistent pricing signals and development of an efficient truck fleet configuration. Strengthening cooperation with the Forum of the Secretaries of Transport might lead to an effective coordination mechanism, as with the European Conference of Ministers of Transport. A general framework to harmonize tolls could be established, paralleling the Eurovignette Directive which defines general principles at the EU level for setting tolls for heavy vehicles.

20. ***Adapt financing sources to the evolution in the capital markets.*** Rather than decrease the number of projects in which it is involved, BNDES could increase its leverage, through reduced co-financing ratios and/or riskier instruments, such as subordinate debt. BNDES would then act as a catalyst, with the objective to make financially feasible a larger number of projects, and develop new private markets. BNDES financing would become essentially 'additional', in order to generate maximum efficiencies. This could be a good opportunity to rethink the structure and objectives of the ***Federal PPP guarantee fund***, established in 2004 and yet to be implemented, with the purpose of exploring new financial markets and in the country context considering Brazil's investment grade obtained in 2008. Re-centering BNDES financing role would not imply disregarding affordability for poorer users. Yet, this issue could be treated more effectively with specific instruments which would target specific user groups.

INTRODUCTION

1. In 1995, amidst a severe fiscal crisis, the Brazilian government launched a federal toll road concession program, targeted at ensuring the quality of the main road corridors in a time when public money had become scarce. The states followed suit, and the size of the highway network managed under private concessions at the federal and state levels expanded quickly to reach 9,700 km by the end of the 1990s. With relatively stable levels of investments, road quality under private management was adequate even during the fiscal crisis, enabling improved road safety and reduced transport costs, while the rest of the network degraded up until 2006.

Figure 1. Road investments by level of government 2000-2006



Source: ABCR, Federal Treasury Department and authors' estimates

2. Public acceptance of concessions remained limited during a long time. Local opposition to toll existing itineraries was often relayed in the political or judicial spheres, and at times led to the restructuring of several projects pressed by creeping expropriation threats. However, in most cases, administrations and tribunals reaffirmed the contracts' validity and maintained their initial economic-financial equilibriums. In 2007, despite initial affordability concerns, the federal government launched a new phase of concessions (2,600 km). Several modifications to the tendering and contractual frameworks were designed to allow for stronger competition and greater devolution of operational management to the private sector. The competitive process resulted in extremely high discounts, with tolls around R$0.02-0.03/km, five times below tolls on existing comparable highways, and amongst the lowest globally.

3. Currently, both federal and several state-level governments are preparing for new concession and PPP programs in the road sector in order to bridge the so-called Brazilian infrastructure gap. The federal administration announced plans to proceed with two additional phases of concessions in 2009, for an additional 4,700 km of highways. Parallel developments are expected in the States of Sao Paulo (1,760 km) and potentially Minas Gerais (estimates 7,000 km). If macroeconomic conditions following the financial crisis of 2008 returned to previous observed levels,[21] the extension of the privately managed network could quickly double. Contrary to past trends, where private and public investments were considered as mutually exclusive, governments have simultaneously launched concessions as well as large public investments programs, such as in the federal government's Growth Acceleration Plan (PAC).

[21] Cf. note on concessions attributed in 2008 in the State of Sao Paulo.

4. Experience from the first 13 years of the federal road concession program, on which this note is centred, is rich in relevant lessons (See annex I) and raises important questions such as: (i) Are the tolls of the first phase of concessions bringing value for money to the users? (ii) What caused a 10-year delay in launching the second phase of concessions? (iii) Will the second phase concessions be financially viable? (iv) Should the current concession model focused on rehabilitation and operation remain unchanged for future concessions?

5. This note reviews the main determinants of the Brazilian road concession model in light of the experience gained from the first two phases of federal concessions (see Annex II and III for a review of the two phases). It offers recommendations on the policies and tools as well as the institutional, regulatory and financing frameworks.

I. PUBLIC POLICIES

6. This section is a review of key public policy options for concessions and public-private partnerships in roads,[22] in light of Brazil's and other countries' experiences. The following issues are included: (A) scope of private participation; (B) scope of public participation; (C) service levels; and (D) tolls and tariffs.

A. Scope of Private Participation

7. Several road concession programs are being implemented in Brazil, chief among them by the Federal and the Sao Paulo State governments. Although there are some differences among them, they all follow an open toll model consisting of transferring the operation and maintenance of existing highway segments, and the execution of specified restructuring works, to private operators who must recover all of their costs from road user tolls. Two factors shaped this open tolling model. The first was the legal system's establishment of the Concession law (law 8.987) which excluded public contributions during a concession. The second was the high capital cost in Brazil when these programs were initiated which limited the size of financially-viable upfront capital investments.

8. **This open toll road concession model**, however, has a number of drawbacks. In addition to limitations on the service levels and safety linked to the numerous uncontrolled accesses to the roadway, drivers are often reluctant to pay for the use of a previously free road, especially where improvements are minimal and toll rates can be perceived as high and inequitable. The disparity of toll rates together with the inequity of the open toll system has periodically led to discontent among road user groups which ultimately raises the issue of sustainability over time, particularly in a period of rapidly increasing fuel prices (section 4).

9. The recent PPP law (law 11.079), by allowing various forms of public participation including government payments to private operators, provides opportunities for more efficient and equitable concessions. It would, in principle, allow for public private partnerships on any road, independently of its current condition, traffic level, and initial investment requirements. It would also oblige concessionaires to maintain toll rates (or no tolls) in line with users' willingness to pay, inducing coherence among concessions and service levels offered, which should result in efficient and equitable services among user categories.

10. **The main instruments** for private participation in the road sector now available are:

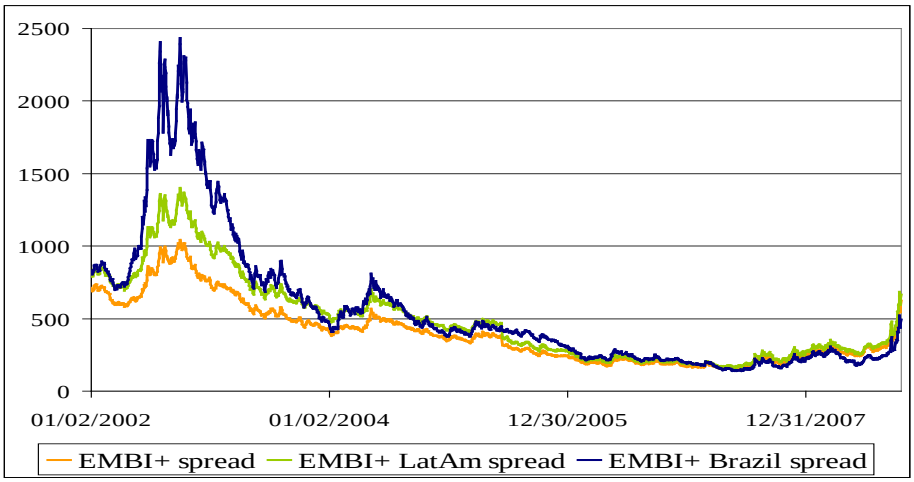
- private concessions where traffic is sufficient to generate enough revenues to cover all project expenditures
- public-private partnerships where some form of public participation is needed, in addition to tolls, to cover all project expenditures
- "administrative concessions" where tolling is not justified or practical, and public payments would be made to the private operator on the basis of specified outputs and/or service levels.

11. **New construction (greenfield) projects** and major duplication projects might become feasible as PPPs, in light of what transpired between 2004-2008. This period was characterized by the country's stable macro-economic framework, low perceived risk, and much reduced cost of capital (see graph[23]), together with a dynamic economy growing annually 3—5 percent in the medium run, a dynamic export sector, and increasing demand for transport and motorization rate (automobile fleet expanded at 7 percent/year since 2003[24]). Such a model would effectively resolve the above mentioned service level and traffic safety problems of the open toll system through controlled

[22] As several other countries, Brazil differentiates "concessions," *id est* private investments which are fully financed by tolls and are regulated by a 1995 concession law (9,074), from "public private partnerships," which can also be financed by tolls but necessarily incorporate public contributions and are regulated by the 2004 PPP law (11,079).
[23] Brazil has showed also a good resilience to the financial crisis, with the country risk (EMBI+) jumping only from 250 point to 400-450 points in the first quarter of 2009, while Latin America and other emerging country indexes reached spreads around and above 700 points.
[24] Fenabrave (2007)

accesses and better geometric and safety standards. Tolling at exits would be both efficient, due to the small number of accesses, and equitable, since payments are directly proportional to the distance travelled. Good candidate projects could parallel existing highways operating at or close to capacity, with a high proportion of urbanized or semi-urbanized segments. While the impacts of the 2008 financial crisis on the country and sector might delay some of the most ambitious plans, the long-term rationale of the greenfield option appears strong.

Figure 2. Country risk (EBMI+) 1998-2008



Source: Bloomberg

12. **Road network concessions or PPPs** may also be viable instruments. By conceding a network of various roads with different traffic volumes and characteristics, traffic risk may be somewhat reduced. In addition, capital investments can be more easily scheduled, which makes it easier to secure resources for financing of subsequent rounds of investments, even in periods of global financial strain. This advantage is even more important in the case of greenfield projects, where financing for the construction of a subsequent segment can be guaranteed by the revenues from segments already in operation. France has developed an extensive network of motorways with minimal public budget outlays on this basis (see Annex V).

13. **Cross-subsidies.** Using operating surpluses on existing tolled roads to finance the construction of new road segments is a common practice internationally. Since 1972, Japan has pooled toll resources, on the basis that: (i) traffic generated by the construction of new sections of the network benefit existing concessions, (ii) some sections could be insufficiently viable by themselves while are important at the network level, (iii) it fosters toll uniformity and the creation of linkages between user services and tolls, (iv) it reduces the need for public investments, and (v) as some regions had benefitted earlier than others from high capacity road development, it may be acceptable to use those revenues to finance the construction of other sections. Similarly, until the 2000s France followed an approach whereby the construction of new sections was awarded to existing concessionaries, which then benefitted from extensions to the concession duration.[25] Brazil, for which road network development needs are high, particularly in the poorer regions, could set up a cross-subsidizing mechanism, as an instrument of its regional development policy. International experience shows that the mechanism should be explicit, ensure competition between constructors, and be grounded in a careful project analysis.

[25] This approach ended in 2001 as it was perceived that it did not ensure explicit competition between contractors for the award of new concessions.

B. Scope of Public Sector Participation

14. Basic policy options in road projects requiring public support to attract private investors are:

- assuming or sharing the traffic risk
- direct payments to private operators
- shadow tolls

15. **Traffic risk** is a key determinant of the attractiveness of a toll road concession. The risk is lower for an existing road with a history of traffic conditions, and usually higher for a new toll road (greenfield project). Projects requiring significant capital investment during the early years may need the public sector to mitigate or even assume the traffic risk.

16. There are various forms of traffic or revenue guarantees whereby the government or a public entity is obligated to compensate the operator when actual traffic volumes are below certain pre-defined thresholds. Conversely, in the event of higher than expected traffic growth, the contract can obligate the operator to share surplus revenues with the state. The Chile program is a successful example of such revenue guarantees. Yet since revenue guarantees were optional and coupled with an obligation to share surplus revenues with the state, many bidders actually turned down the optional guarantee, and concessionaires are currently keeping substantial surplus revenues. Since such guarantees would result in contingent liabilities for the government, which are difficult to predict and to budget for, Chile developed and implemented an innovative form of minimum revenue guarantee mechanism whereby the term of the concession is adjusted so as to reach the contractual present value of toll revenues specified in the contract, as resulted from the tender. The mechanism is implemented for the Santiago – Valparaiso – Vina del Mar toll road (Box 1).

17. Some governments have preferred to assume the traffic risk entirely considering that the concessionaire, having practically no influence on traffic, is not better placed than the public sector to assume traffic risk. In those cases, payments are made directly to the private operator.

18. **Direct payments** to private operators are a widely-used method to fund privately-operated roads, whether tolled or not. Payments can be designed as a supplement to toll revenues or as a subsidy during initial construction needed to make the project financially viable. Payments can also cover all the costs of the concession, when toll revenues are recovered by the public sector, or when there are no tolls. In this latter case, the public sector assumes the traffic risk entirely. These *availability payments* are subject to the concessionaire making available certain assets in specified conditions, and can also be linked to service level and performance indicators.

19. Norway's PPP road program is one example of such model, where tolls collected by a public company are used to make availability payments to the operator subject to compliance with output-based specifications. The United Kingdom's PPP road program is an example of availability payments for no-toll road concessions. After abandoning shadow tolls, the United Kingdom has moved to a system of direct payments made from the public budget to the private operator, linked to asset availability and quality specifications, maintenance performance, and, on recent transactions, service levels specified through average traffic speeds.

Box 1. Santiago – Valparaiso – Vina del Mar Toll Road

The project included large upfront investments and complex works such as tunnels and viaducts, and the traffic risk was considered substantial. In order to mitigate the traffic risk, a minimum guaranteed revenue mechanism was proposed to bidders, which were free to accept it or not. The mechanism consisted of guaranteeing the bidders that the *total actual concession revenues* (expressed in present value, with one of two options of a fixed or a variable discount rate) would reach the *total target concession revenues* of their bid, which was the contract award criterion. The term of the concession would be adjusted, up to a maximum of 25 years, in order to reach the contractual *total target concession revenues.*

The bidding process included first a review of a technical proposal, with detailed and specific requirements, including investment budget, operation and maintenance plan, a tolling system plan, and regarding designs, the bidders were free to accept the government's engineering designs or to propose a design alternative. Only the commercial proposals of the bidders who had their technical proposals accepted were open. The lowest *total target concession revenue* bidder was awarded the contract and obligated to constitute a special purpose company with equity of at least 30 percent of project costs.

20. **Shadow tolls** are payments made by the conceding agency to the operator on the basis of actual traffic volumes and agreed toll rates. Traffic risk is not efficiently shared since low traffic risk is on the private operator and high-traffic risk is assumed by the government. Justification for shadow tolls, which were first introduced in the United Kingdom, was based on public benefits derived from the use of the road. But shadow tolls are not efficient since they do not charge users for the actual cost of road use as with explicit tolls, and therefore the efficient demand management role of an explicit toll is lost.

21. Portugal and Spain have used both real and shadow tolls to finance greenfield projects and existing highways. But governments' payment obligations under these contracts have increased so much that many concessions had or will have to be converted to user-paid tolls.

22. In order to address the above issues and opportunities, the Ministry of Transport (MT) could, with the new framework of the PPP law, formulate policies for public and private participation in roads. Such policies are essential to provide guidance to ANTT and DNIT in developing and implementing their own programs in a coherent manner, and to ensure the efficiency, equity, and sustainability of the programs.

C. Service levels

23. Concessionaires' obligations under road concession contracts in Brazil are specified through the so-called PER (*Programa de Exploracao da Rodovia)* which includes:

- A program of defined works to be carried out in accordance with a timetable; and
- Performance standards (*Padroes de desempenho)* which include the guaranteed service levels provided to road users.

24. Experience with such specifications has been mixed, in particular:

- The specified work programs and timetables have proved to be inadequate when traffic differed substantially from original projections (as generally occurs) and where urban sprawl has required unforeseen investments, especially since contracts have built-in incentives for new works. Such problems have resulted in numerous contract renegotiations which generally benefited concessionaires;
- Performance standards are defined by project engineers, case by case, in the absence of a coherent policy based on user preferences; and
- Capacity-related service level obligations are specified through US-based parameters which are neither applicable to Brazil's conditions nor enforceable.

25. This section focuses on the major service level issues which could be effectively resolved through appropriate public policy and related regulations or norms from ANTT and/or DNIT, specifically: (i) road surface; (ii) pavement structure, and (iii) road capacity

26. **Road surface** related concessionaire obligations are specified by performance standards based on the following main parameters: (i) longitudinal roughness; (ii) ruts (transversal deformations); (iii) cracks; (iv) IGG, *indice de gravidade global,* a composite index combining the frequency and severity of various surface defects (abandoned in the recent phase 2 of the program); (v) skid resistance; and (vi) absence of potholes, debris, and so on.

27. Performance standards are defined by the engineers responsible for the specific projects or programs, without clear guidelines or consideration of road user preferences. As a result, some specifications are not consistent across the network and some may not be realistic. For example, longitudinal roughness (IRI) requirements may range from 2.5 to 3.5 mm/m among similar highways. An IRI of 2.5 mm/m is neither realistic, particularly when one considers contractors' capacity for surface finishing, nor justified, particularly on a two-lane highway.

28. **Pavement structures** are not a major concern of road users, but they represent state-owned assets which are temporarily transferred to a private operator, and which must be effectively preserved so that they are returned at no loss to the state at contract end or any prior termination

date. The structural capacity of pavements is also an important determinant of future road surface condition.

29. Concession contracts under the first phase of the Federal Road Concession Program define minimum pavement structures through specific structural works at explicit future dates. There are problems with such rigid specifications: (i) actual traffic rarely follows original forecasts, therefore the specified works may no longer be justified at the time they are due; (ii) specifying technical solutions does not allow for technological improvements over time and can therefore be inefficient; and (iii) concessionaires can often demonstrate that they have better technical solutions than the ones specified in the contracts. These issues have led to many contracts renegotiations which have benefited concessionaires. There is no experience yet on this issue with recent contracts under the Program's second phase, but the obligations of a (five-year) minimum remaining pavement lifetime at the end of the concession seem both too vague and insufficient. The example of France, where the administration and the concessionaire agree on a program of rehabilitation five years before the contractual end might be a good strategy to consider.

30. The contracts also specify maximum values for pavement deflexions. Deflexions can be a good indicator of localized structural problems, but they are very sensitive to temperature and humidity, and therefore they might not be an effective indicator of the structural capacity of an entire road segment.

31. The structural capacity of pavements could be more effectively specified through minimum structural numbers for traffic-homogeneous sections. Contract specifications could also clearly define the methodology, including structural coefficients of key materials and relevant relations, in order to permit the requirement of enforceability for such obligations. Work programs currently specified as obligations under the PER would become only indicative and feasible work programs, to be used as a reference by bidders in structuring their bids. Bidders would be allowed to propose alternative solutions provided they meet the specified structural numbers. The works timetable could be adjusted in line with actual traffic on the basis of the specified relationship between structural numbers and volume of traffic.

32. **Road capacity** related concessionaire obligations are specified through (1) pre-defined capacity works to be carried out in accordance with a timetable, independent of actual traffic, and/or through (2) service level standards derived from the US Highway Capacity Manual (HCM).

33. The pre-defined capacity works have to be revised and/or postponed where and when traffic does not follow projections, which has generally been the case, resulting in contract renegotiations. Service level could not be effectively monitored and enforced since it is based upon parameters which are not easily measurable. In addition, these parameters, which were defined in the United States, where road user behaviour and highway characteristics are quite different, are not applicable to Brazil's conditions without some substantial adjustments (see Annex VI for further details).

34. The service levels could first be defined on the basis of clear and measurable indicators, for example average travel speeds on two-lane highways and average vehicle densities per lane on multi-lane highways. They could then be monitored together with traffic volumes and various highway composition characteristics, in order to develop reliable relationships between traffic and service levels applicable to Brazilian roads and conditions. After such reliable relationships are developed, concessionaire obligations regarding capacity works could be more easily specified through traffic volumes.

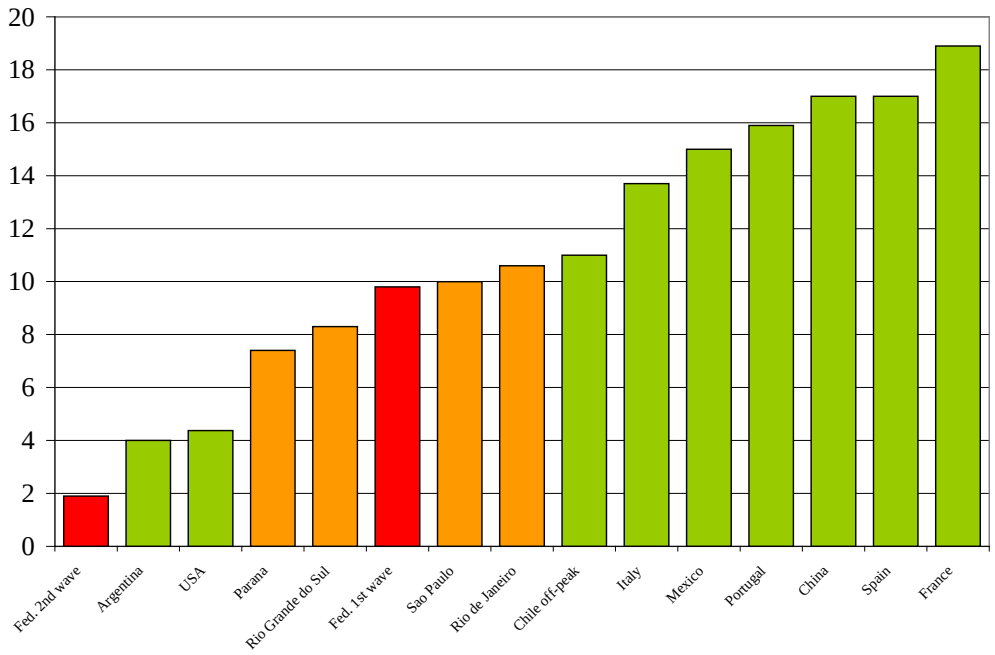
35. The Ministry of Transport, with technical support from ANTT and DNIT, could therefore formulate a clear policy regarding guaranteed service levels provided to road users. Road surface and capacity related service levels could be differentiated between two-lane and dual carriageway, and whether they are tolled on not. Such service levels would be supported by road user opinion surveys to assess user preferences and willingness to pay for such service levels (section D). Such policies would provide the necessary guidelines to ANTT and DNIT to guarantee adequate and coherent services levels across the network through consistent concessionaire or contractor obligations and performance standards.

D. Tolls

36. The Concession law restricted concession contract award criteria to the lowest user tariff or to the highest concession award value (the user tariff being specified), or to a combination of lowest tariff and highest award value. Since federal concessions were awarded to bidders offering the lowest base toll rate, the first phase contracts, awarded at a time of high capital costs and limited competition by Brazilian construction companies, resulted in substantially higher toll rates than those recently awarded under the second phase, with a much reduced cost of capital and greater competition from foreign bidders. Sao Paulo State initial concessions included more upfront capital investments and were awarded to bidders offering the highest award concession value, therefore the pre-determined toll rates were even higher.

37. With subsequent rate adjustments, phase 1 federal concession rates are now close to the rates of the Sao Paulo, Mexico or Chile concessions, which had larger initial investment obligations (see graph below, at mid-2008 exchange rates).

Figure 3. Average base toll rates under various concession programs (R cent/km)



Source: ANTT, ABCR, IBTTA, World Bank (1999), private concession companies' websites and authors' calculations

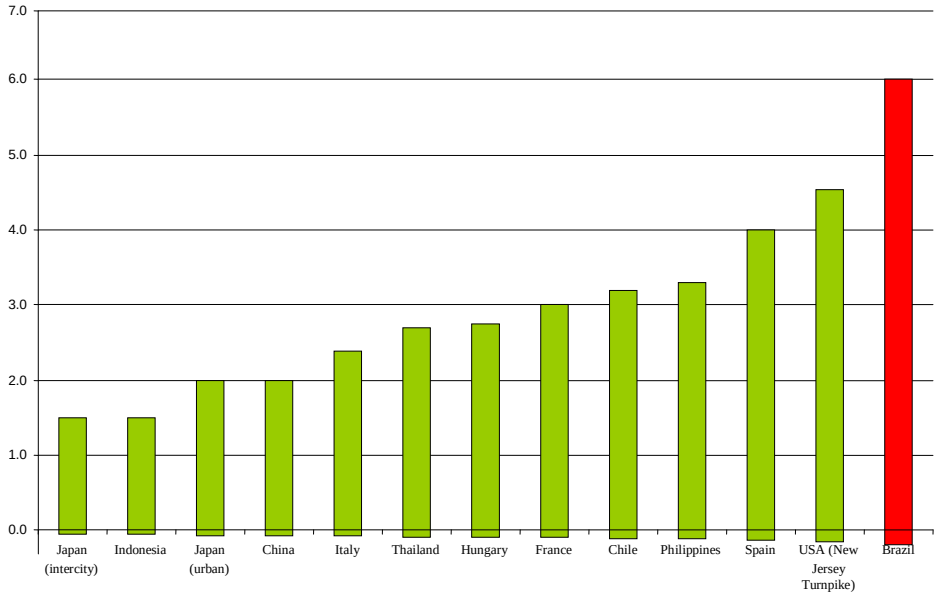
38. **The disparity between toll rates** also resulted from the widely differing road conditions at bidding. Since toll rates offered under a competitive bidding process reflect the costs of required initial rehabilitation and upgrading works, rates can be quite different among road segments. Justifying differences on rates by claiming different user benefits is weak when taking the long term perspective of achieving equity. Users of different road segments with similar service levels will, for the duration of the concessions, pay substantially different tolls which reflect the road conditions segments at the time of concession award rather than the current service levels or the cost of road use.

39. Toll rates are also affected by decisions on contract specifications, including the designs of capital works and the concessionaires' obligations for service levels. These designs and specifications are prepared by road agency engineers who generally do not consult with road users nor are the specifications discussed during the formal public consultation process. They reflect the engineers' road service ideals rather than those which users would want or prefer.

40. **The toll rate structure** is another issue. In particular, toll rates for trucks and buses are derived directly from the base toll rate for cars by a multiplier equal to the number of axles. As a result, the toll rate for a six-axle truck is six times the toll rate for a passenger car and three times the toll rate for a two-axle truck. Moreover, toll rate structure worldwide rarely exceeds a factor of 4 between larger trucks and passenger cars, and it is generally below 3 (see graph hereafter). The economic rationale for such a structure is weak on efficiency or equity grounds.

41. Efficient toll rates, leaving aside the issue of taxes paid by road users, would be determined by the long term marginal costs of road use of the various categories of vehicles. An equitable cost recovery policy may then allocate fixed costs, independent of traffic, equally to the various types of vehicles. Such a pricing policy would substantially reduce differences between toll rates of the larger, more efficient (six and seven-axle) trucks, and the smaller, less efficient (two and three axle) trucks. A toll rate analysis done during the preparation of the feasibility study for the BR-116 / BR-324 segments in Bahia led to similar conclusions.

Figure 4. Highest toll for a heavy vehicle as multiple of base toll



Source: ANTT, Quinet, Trujillo & Estache (2000) and selected concessionaires websites

42. **Toll collection systems** on open toll road concessions consist of toll plazas located on the main roadway (accesses to the road are too numerous to be controlled). In order to maintain an acceptable service level on the roadway (since most users have to stop at the toll gate for payment), and to keep system efficiency (a ratio of toll revenues net of collection costs over gross revenues) sufficiently high to justify tolling, toll plazas must be located at some distances, generally between 30 and 100 km in inter-urban areas. As a result, since all users of a given vehicle category passing through a toll plaza pay the same toll, independently of the distance driven on that road, the actual toll rate per kilometer of road use can vary widely, making such tolling systems quite inequitable. In order to avoid the problem with numerous short distance daily trips in urban areas, toll plazas have been located away from urban areas. But since concessionaires are generally also responsible for the urban sections of the highway, long distance traffic is de facto subsidizing urban traffic. These equity issues could, in principle, be substantially tackled through modern, in motion, toll collection technology.

43. **Toll affordability** is a problem for many users: according to a survey contracted by the ANTT, about 80 percent of users consider toll rates too high or much too high. This is due in part to the inequity of the open tolling system: while most local users do not have to pay tolls, some may have to pay a full rate for relatively little road use where no alternative route is available. The discontent of user groups, particularly truckers, reflects the other facet of this imbalance: those

travelling mostly long-distance are subsidizing short-distance traffic. The concessionaire could be obligated to address such issues by providing special discount rates for local users. Toll structure can also be used to reduce the rates for local buses and motorbikes, attempting to target more directly lower income population. The disparity of toll rates between short-distance and long-distance users, in part as a result of the older concession model (Federal and Sao Paulo State) on the one side and the new concessions on the other, may be more difficult to resolve. It raises the issue of sustainability of such disparate toll systems overtime, particularly in a period of rapidly increasing fuel prices.

44. The Ministry of Transport could formulate a toll policy which addresses the above-mentioned issues. An important objective would be to define efficient and equitable toll rates, as consistent as possible across the network and coherent with the service levels offered. Toll rates could, in particular, be differentiated between two-lane and dual carriageways. Such a policy should be developed based on the results of a road user survey which would attempt to identify user preferences regarding service levels and willingness to pay for such services. Regarding tolling technology, the Ministry of Transport could promote an exchange program, with the participation of concessionaires, to develop efficient and equitable tolling systems.

II. CONTRACT, TENDER AND REGULATION

45. The federal government succeeded in developing a functioning set of bidding and contract principles as well as regulation mechanisms, resulting most notably in the high competition that took place during the tendering of the second phase of concessions, as well as in record speed. However, there is room to further consolidate and improve this framework without compromising those results. This review in this section provides key options for designing contract clauses of the tender process and for regulations, in light of Brazil's and other countries' experiences. The following issues are reviewed: (i) risk allocation; (ii) contract and tender design issues; (iii) regulation issues.

46. Both tender process and contract design are described by the Concession law 8987 of 1995 and the PPP law of 2004. The Concession law prohibits public participation, restricts tariff policy to one single (base) tariff and a pre-determined tariff structure, impedes termination rules efficiently protecting investors, and largely does not promote the generation of complementary revenues. The PPP law offers more flexibility on some of these points, but it is *a priori* limited to projects that would require public financing. As the administration usually opts to define prior to tender which law would apply to the projects, and given the government's preference for contract structures that do not mobilize public money over long periods, so far no road projects have been tendered with the PPP law at the federal level. On the contrary, the government preferred to undertake the required heavy works through a classic concession tendering process, such as on the Florianopolis-Curitiba axis. Some of the following suggestions are likely to imply legal adaptations or flexible jurisprudence. Ultimately, from the sector's perspective, the inclusion of the concession law under the wider umbrella of the PPP law might be beneficial.

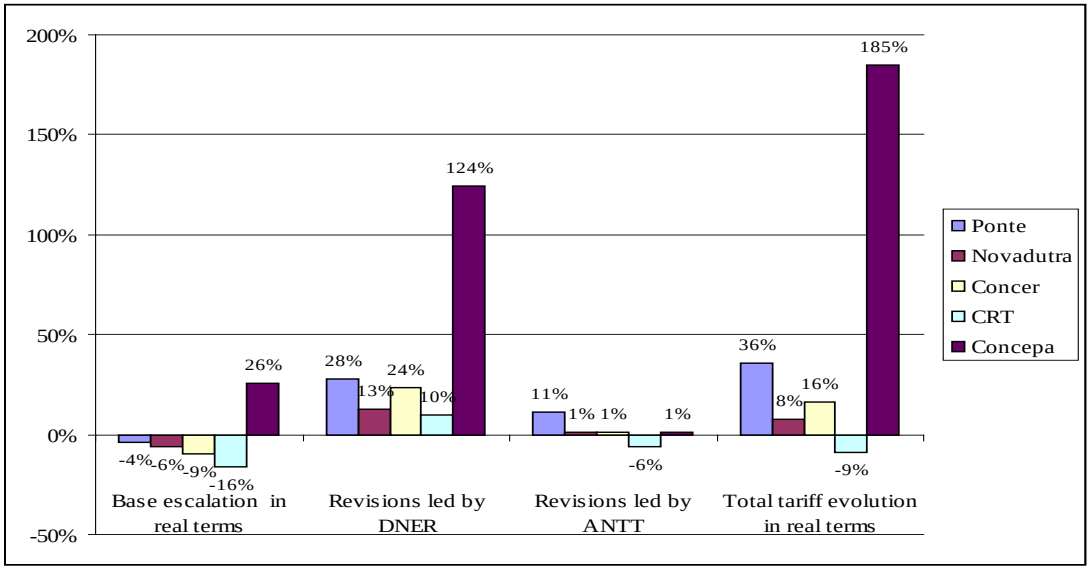
E. Risk allocation

47. Risk allocation in concessions was improved by the ANTT in the second phase of concessions, with more risks transferred to the actors who were best capable of managing them.

48. **Construction risk** was largely borne by the users in the first phase concessions, as modifications in the effective volume and input prices impacted tariffs. This led to frequent investment program revisions of the concessions (PER) and, at least while the contracts were managed by the DNER, to a higher tariff escalation than observed in the cost of traditional public works contracts (see graph below). To increase concessionaires' responsibility in the second phase of concessions, the ANTT separated works into two categories: (i) non-mandatory works that must be realized to comply with the contracts' performance targets and are within the full technical and financial responsibility of the concessionaire, and (ii) mandatory (improvement) works such as third lanes, whose timing is defined by the ANTT and whose costs are based on kilometric prices defined in the initial commercial proposition. This arrangement appears much more satisfactory in terms of risk allocation, as concessionaires have strong incentives to optimize their productivity.[26] Similar experience in France showed how a company, Cofiroute, could reduce its initial costs by gradually adapting pavement thickness to traffic levels, a move that had not been anticipated by the regulator.[27] This is likely to reduce the need for frequent investment program revisions. However, enforcing performance standards and introducing additional investments might become problematic if a disconnection between costs, initial prices and rates of returns on investments appear with time.

[26] In case of *greenfield* projects, several risks might appear out of reach for the concessionaire: (i) geologic risks for major tunnels, (ii) land acquisition and expropriation risk.
[27] See Bousquet & Fayard (2001)

Figure 5. Tariff evolution under the first round of federal concessions until 2008



Source: ANTT and authors' calculations[28]

49. Important shortcomings of the contracts stem from the fact that contract revisions are financially neutral for the federal and local governments, while users have little or no influence over the decision-making processes. Particularly, any modification of the investment program is to be paid by the users, without public financing, even though it was ordered at a government entity's discretion – the ANTT. Typically, this leads municipalities to solicit the ANTT to incorporate into contracts additional local improvement works (parallel lanes, footbridges) for which costs would be borne by long-distance users, with ANTT remaining without clear guidelines or oversight on investment selection. Contracts of the second phase of concessions introduce a new possibility for the governments to finance additional works on the road under concession – possibly with different contractors and a competitive process, as the concession law currently prohibits any monetary transfer to the concessionaire. Within this contractual framework, it could be up to the ANTT and the MT to establish the norms that would define when and how this new process should be chosen, and when it would be justified to ask the users for additional contributions. Consulting with users associations or associating them in the processes would bring increased transparency and good governance to the system.

50. **Traffic risk** is completely transferred to the concessionaire in the current framework: the public sector does not provide guarantees and tariff evolutions are always computed by the concessionaire on the basis of traffic forecasts realized before concession contract signing. This traditional allocation of risk sets a good discipline for the public – filtering white elephants, and the private side – reducing risks of low balling. However, in a context of quickly evolving oil prices, ANTT could seek to reduce concession risks (and hence financial costs) by partly exonerating concessionaires from a risk they by large cannot control. As mentioned previously, this could be realized through a concession design that extends or shortens concession terms in case of traffic evolutions. Additional efficiency gains would be ensured by the optimization of the investment program in function of observed traffic, for instance by specifying the timing of investments through actual traffic volume or service levels thresholds. This would prevent the construction of capacity works when traffic and revenues are much below forecasts. This last possibility has appeared in the new contracts for the second phase of concession; ANTT is able to modify scheduling as a function of traffic – but remains to be regulated or further incorporated in contract design.

[28] The total tariff evolution in real terms for Concepa (185 percent) correspond largely then to the start of the concession, through an updated monetary tariff package between 1994 and 1997 (around 45 percent) and another given the first revision of the Basic Toll (around 93 percent).

51. **Financial risks** are also fully transferred to the concessionaires. This common setting for road concessions is actually a specificity of the sector as regulatory trends for utilities opt for a long-term balance of rates of returns on investments with capital costs. As the history of the first phase of concessions shows, a fall in financing rates offers sizeable windfall benefits to the sponsors (estimated at about 20 percent of toll rates) that are not transferred to the users. This risk is partly asymmetric, as an increase in financing rates gives incentive to the concessionaire to reduce its losses by postponing or sizing down new investments. It is only partly manageable by the private partner: while good financial management brings some gains, market fundamentals such as country risk are by large out of reach for a private player. In new contracts, carefully designed clauses reducing financial risk transfers would probably ultimately benefit the users. To avoid changing the initial balance of the contracts or changing tolls faster than private partners can adjust their financing conditions, several paths can be chosen: (i) sharing refinancing benefits when they occur, or (ii) revising regularly (for instance maintaining constant during the first two years and then every five years) the discount rate used for analyzing tariff revisions and adjustments by maintaining a given spread with some base rate[29] instead of maintaining constant the original global rate of return. Such a mechanism could align users' interest with the concessionaires' for concessions having more than 20 year duration.

F. Tender and Contract design issues

52. **The auction process** chosen by the government for the second phase of concessions instead of the traditional bidding process in two rounds used in the first phase, proved very efficient to permit very short delays between Invitation to Bid and contract signing. In this framework, ANTT prior to the bidding carried out a public consultation on the bidding documents, the results of which influenced to a limited extent the exact project structuring. Two months after the bidding launch, BOVESPA began the tendering based on the lowest toll. The award commission then reviewed, within a few weeks, compliance of the technical offer of the best-ranked candidate before awarding the contract, while other technical offers were not opened. There was neither a negotiation period nor a prequalification process, but only a simple bid guarantee. Competition was improved further compared to the first phase: (i) by the choice to hold a simultaneous auction for 7 concessions, without open prequalification, to reduce the threat of collusion, (ii) by authorizing foreign firms to place bids, and (iii) by the possibility of bidder consortia not to include a contractor company. Additionally, the sequencing of bidding phases (financial offer first, technical second) limited the impact of judicial recourses – a critical factor in traditional tendering processes in Brazil. This process appears perfectly adapted for this kind of well-publicized, low complexity projects where preparation expenses are limited. It should be noted that more complex projects are likely to require much longer bidding times, including both prequalification and negotiation of exact contract terms.

53. **The concession award criterion** strongly influences the profile of competition.[30] The current concession law allows the use of any of the following: (i) the lowest fare, (ii) the highest award value, (iii) the best technical proposal, or (iv) a combination of these criteria. The practice at the federal level has been to use exclusively the first criterion. While focusing competition on toll rates should permit *prima facie* to obtain low tolls, international experience has also shown that it gives incentives to low balling: since, effectively, too low toll revenues put the concession company under distress which implies the concessionaire carries a high bargaining power during potential contract renegotiations. Initial gains can therefore be compromised in the medium term. To prevent this behavior, Chile introduced in the tendering of one of its toll roads a floor to the possible toll.[31] If two or more firms bid the minimum value, the winner is the firm that offers the highest payment to the government. In such a system, the ex-post incentives to renegotiate the contract are low: the financial performance of the concession is not affected by the size of the initial transfer, which is borne by the sponsors' balance sheets.

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[29] In this formula, the equilibrium of the contract would no longer be based on the internal rate of return as stated by the concessionaire, but on the sum of the discounted cash-flows over the length of the concession, with a non-uniform discount rate.

[30] See Estache & Rus (2000)

[31] Route T5 Temuco-Rio Bueno, in A. Gomez-Lobo & S. Hijinosa (1999).

54. An alternative concession award criterion to consider would be concession duration. True, previous experience in the first round of concessions in Mexico was actually very negative, but this was due to a basic flaw at conception: as concessionaires were allowed to set *both* toll rates and concession length, they elected short durations combined with very high fees, which proved unrealistic. Many unviable concessions had thus to be fully renegotiated. Such a design can be easily improved, by setting a mandatory toll rate, or by defining an acceptable toll range. An advanced design based on the lower present value of revenues is being used in Chile (see Box 1). In this last framework, the candidates place an offer on the discounted sum of revenues over the length of the concession that they expect to receive, the toll rate being set independently. During the concession, the concession length is adjusted to compensate for the observed traffic levels. With necessary adaptations, this formulation brings several benefits, including a reduction of traffic risk on the concessionaire, revision rules that do not necessarily impact toll levels, and a less controversial computation of transfers in case of an early termination of contract.

55. **Penalty rules** affect the incentives of the concessionaire to guarantee good availability of the services under the contract, both in terms of timeliness and quality level. The current framework for the first and second phases of concessions is based on a range of administrative sanctions and penalties. This reliance on a sanction/fines regime as the sole instrument for giving incentives for quality can be inefficient as it introduces during the duration of the contract an exceptional judicial process that can be both lengthy and contentious. Fully implementing this would require: (i) a strict contractual definition of performance levels and the processes to measure them as well as (ii) a good monitoring system from the ANTT with possibility of independent appeal. However, experience has been relatively mixed: while processes to measure performance lack the necessary contractual detail,[32] the government was not able to maintain adequate capacity to monitor regularly all the performance items set in the first phase of concessions.

56. To overcome such shortcomings, bonus systems or performance payment systems have often been designed to complement a sanction regime. For instance, in Spain, the new concession framework allows extending the concession by up to a year in cases of good performance. In Italy or France, good performance as measured by the regulator or by surveys is rewarded by a faster toll escalation. In a similar line, a performance framework was proposed by the ANTT for the concession of the BR116-324 system; under those conditions, toll escalation would be reduced if the concessionaire does not reach all its performance targets.

57. **Termination rules,** as an essential component of risk allocation,[33] are not sufficiently defined in the current contracts. Exact compensations are to be determined in the courts and the exact risk allocation remains unclear. In concession contracts, two termination rules hold the highest importance: (i) the compensation due in case of a public preference to terminate the contract, and (ii) the compensation due in case of low performance or incapacity of the concessionaire. As for (i), it is important to ensure that the debt providers and the holders of other obligations contracted by the concessionaire can be fully compensated, and that the sponsors can recover their costs and probably a reasonable return on their investment. This can be achieved either by aligning the compensation in case of termination by the administration with a discounted sum of revenues for the concessionaire or with a combination of discounted revenues and the assumption of contractual obligations by the administration. As for (ii), it is important to set the rules to reduce risks of low balling by the concessionaire without increasing excessively risk borne by the debt providers further from what is necessary for them to realize a thorough due diligence process, especially if there is no prequalification process. This can ensure better management of the concession and also reduce possible bias in the tendering process which presumably had pushed construction companies to overstate construction costs as well as traffic forecasts. International trends in this matter are either to use the book value of goods or a discounted sum of cash-flows as a basis for the compensation and then impose penalties. While the use of a discounted sum of cash-flows adds fairness in the tendering process and in concession management, those advantages should be balanced with the increased risks on the debt providers. Capping ex ante the discount rate as well as using real data for estimating costs, book values and future cash-flows, are essential elements of those computations. Whatever the

[32] For instance, in the second phase of concessions, it is not specified whether the roughness index should be computed as an average over the concession or over limited coherent segments, nor at what time of the year should the deflexion index be computed.

[33] See for instance a general discussion of the topic in World Bank (1998)

framework used, allowing step-in rights for the debt holders before incapacitating the concessionaire brings additional security and lower private debt costs. Lower present value auction processes (see Box 1) bring easy termination payments calculation rules – transfer is roughly equal to the present value of the revenues not yet collected less relevant operations and maintenance costs.

58. **Amortization rules** are another determinant of concession profitability and toll rates. Current rules impose: (i) a linear profile, but with different depreciation periods as a function of typical investments; and (ii) a total depreciation by concession end. This translates generally into relatively low levels of depreciation at concession start and high levels at the end, which tends to increase rates at the beginning of concession and lower them at the end. The government could explore alternative profiles with faster depreciation rates that might reduce initial capital contribution and lower financing costs. As part of the PAC, the government authorized fast depreciation schedules for selected types of investments. ANTT could assess the virtual impact of this potential measure on the recent road concessions.

59. Similarly, current amortization rules prevent the concession's direct assets (the road itself) to hold a book value for the concessionaire at the end of the concession, and consequently cannot be the object of a compensation at concession end. While this position is justified for pure asset operation and maintenance concessions, it is not when the contracts involve the construction of an infrastructure whose life-length is longer than concession horizon (for example, civil works for road duplication or urban ring, tunnels, bridges). This might hinder the development of concessions incorporating heavy infrastructure works, and especially greenfield projects. In addition, it largely impedes any sizeable investment to be introduced in the last years of a concession: impact on tolls would be disproportionate as investments would need to be recovered by concession end. To overcome those issues, it might be interesting for the government to explore both longer concession lives as well as the possibility of using residual values.[34]

60. **Business-oriented behavior** of the concessionaire can contribute to reduce base tolls and optimize the use of the road. In a common framework, the concessionaire is allowed to introduce toll discounts programs such as passes, either to attract the categories of users that are more likely to be sensitive to the toll levels, or to orient the users towards the most efficient toll collection systems. This flexibility is particularly useful for the concessionaire to adjust downwards for lower than expected traffic for some categories of users. Further flexibility can be given by regulating on the basis of average tariffs by category of vehicles instead of simply on head tariffs.[35] Coupled with incentives built in the concession contract, it can offer the concessionaire an additional flexibility to postpone congestion, such as through the creation of tariff variations in function of the time of the day. In metropolitan areas, benefits would be expressed in reduction of the overall costs of transport and delays of expansion investments. Also, flexibility could be used to raise additional initial capital – through the sale of long-term passes during construction period, constituting some user-based quasi-"equity," reducing the amount of capital to be raised. Cost of the passes would be equal to the discounted sum of future tolls expected from the user. While the contracts for the concessions of the second phase have opened the possibility for discount programs at the discretion of the companies, ANTT guidance or incentives might be necessary for the concessionaires to make full use of those new possibilities.

61. Another important factor is how much the concessionaire can benefit from the commercial exploration of the roadway. Efficient regulations can both provide incentive for the development of services and contribute to reducing the toll rates. Current Brazilian legislation imposes that additional revenues shall be used to limit toll levels. While this appears as a reasonable goal, regulation restricts de facto the development of those services and sources of revenues. As per contract definition, additional revenues are to be taken into account during the yearly contract revision to limit tariff progression, leaving only the concessionaire with the possibility to keep a fixed 15 percent share of revenues to balance its investment costs. With little benefits to expect, incentives for developing value-added services are low while incentives for dissimulation of profits are high. As a consequence, the overall level of additional revenues is limited to about 2 percent of toll revenues, to be compared

[34] The project for a bridge of the Messina Straight was considering such an arrangement.
[35] In this case, the concessionaires have flexibility to reduce tolls (for various user classes or depending on time of day or week) below a contractual ceiling.

with 14 percent for the major Italian concession company Autostrade.[36] In its last version, the concession law specified that additional revenues should be taken into account in toll revisions to reduce toll rates. This probably gives little room to introduce new contractual arrangements that would provide the right incentives to the concessionaires while allowing the users to reap part of the benefits. To develop a framework that would allow for the development of this industry while preserving the users' interests, the government could investigate introducing international experience and involve all stakeholders in a specific dialogue.

62. Dispute settlement mechanisms are particularly deficient in Brazil. On the efficiency of its dispute settlement mechanism, the World Economic Forum in 2007 ranked the country to the penultimate position in Latin America, just ahead of Venezuela. This is not a problem of lacking of framework: the first phase of concessions contracts integrated clauses for the use of two conciliatory commissions (technical and financial) as well as an arbitration tribunal according to the Brazilian law. However, experience showed that those processes were not used, as decisions could not be binding and did not rule out appeals in non-technical courts. Consequently, dispute settlement processes for federal concessions have been either informal or judicial. Reflecting this, second phase concession contracts did not include any clause on dispute settlement. For most cases, the credibility enjoyed by the most established regulators, such as ANTT or ARTESP in the State of Sao Paulo, makes the current framework sufficient. Nevertheless, to further strengthen the concession framework it may be useful to include some mechanism for potential substantial disputes, which could have negative long-term consequences for the sector. Innovations could be tested, such as introducing independent expert panels.[37] Though, without binding power, a likely outcome given Brazilian reliance on judicial processes, their value-added would not be significant.

G. Regulatory regime

63. **Toll evolution rules** are contractually based on the maintenance of the economic and financial equilibrium of the concession, through: (i) a revision triggered when a risk not assumed by the private sector materializes, such as a modification of the investment program; (ii) a readjustment based on a predetermined price variation index.

64. **The economic and financial equilibrium of the contract** is the base of the current concession agreements. This concept was translated into a set of operational rules that define how evolutions of the duties of the concessionaire should impact its revenues. While the candidates bid on a unique toll rate, they attach to their proposal a financial model (in real terms) containing their own traffic forecasts and investment schedule. This financial model, and especially the implied rate of return on capital (without considering the financial structure of the concession) over 25 years, become the base of the contract regulation. To reestablish the rate of return of the concession to its initial level when an event occurs which has risks supported by the public (for example, modifications of required investments or of direct taxes, and so on), the event's impact on costs and revenues is inserted into the model, holding the other parameters at the level initially set by the concessionaire (including traffic and unit costs) and allowing the tariff to shift.

65. This formulation introduces, in a transparent way, the necessary flexibility a long-term contract concession should hold. However, it presents some drawbacks in its current form and could be adjusted. Because revisions are based on commercial prices and traffic forecasts set before concession start, they cannot account for long-term evolutions of productivity, traffic, and financing costs. As such, the alignment of the incentives of the concessionaire and the needs of the users cannot be maintained in the long-run, creating situations where the concessionaire has incentives to overinvest or, on the contrary, slash investments. Concessions of the first and second phase probably exhibit such discrepancy but with opposite incentives (see Part II). Moreover, while tendering is based on a single tariff level, different combinations of costs, revenue forecasts and rate of returns requirements can justify the same tariff. Classically, a candidate has incentives to over-estimate those costs of investments where he expects additional demands and under-estimate those where a contract

[36] Half of Autostrade's complementary revenues are generated by service areas royalties, advertising and telecommunications revenues, and for the other half by improved payment systems. Autostrade (2006)
[37] PPIAF (2006)

prevents any revision. Bidders do not have full incentives to reveal their true characteristics to the agency. This situation is aggravated in cases of low competition.

66. A positive adjustment would be to introduce elements of the concession environment in its continued regulation instead of basing it on the initial commercial proposition. One path that may be explored involves revisions based on observed real traffic and current commercial cost estimates while linking returns to prevailing financing conditions averaged over a sizeable time period. The increased transaction costs implied by traffic forecasts and detailed cost impacts would suggest limiting this procedure to sizeable or multi-annual revisions. To ensure that the initial traffic risk sharing is preserved, traffic adjustments should only have a marginal impact, for instance limiting traffic volume influence to the computation of the marginal impact of additional investment requirements or specific kinds of capacity-related investments. The design of the BR/116-324 project follows this direction, as a procedure was introduced to assess the marginal effect of selected events (including additional investment requirements) based on actual traffic and market prices.

67. Experience from the first phase of concessions shows also that investment revisions have been extremely frequent, about 1 to 1.5 per year. This is partly due to the overly detailed initial investment program – which contains detailed quantitative values of all road works, and as a result is an integral part throughout the lifetime of those contracts. Administration uses those concession contracts in a similar way as in a traditional public works contract, with prices maintained for a 25 year period and payments realized by users. As for public contracts, repetitive bargaining processes and asymmetry of information weaken the position of the administration and are likely only to benefit the concessionaire.[38] For those contracts, ANTT could try to further reduce the frequency of revisions, for instance limiting investment revisions strictly to five year periods, as alluded to in the second phase of concessions.

68. **Toll adjustment rules** bring together the objectives of (i) reducing concession risks through indexation of toll rates with cost indexes; (ii) sharing the toll burden between different cohorts of users; (iii) providing incentives to the concessionaire to realize productivity gains in its operation of the road. In this light, experience from the first phase of concession has been mixed, as it appears that important productivity gains were not shared with the users. An international review reveals that there is neither consensus nor good literature to ascertain the most adaptable formulas, and that rules are usually set on a case by case basis. Escalation has been based on GDP per capita in the United States, on a mix of inflation and exchange rates in Peru, on input price inflation in the first phase of concessions, and on the consumer price index in the second phase in Brazil. In Italy, escalation is based on inflation "minus" price-cap, with the differential between inflation and escalation a function of expected productivity gains and observed service levels. In France, escalation is limited to 70 percent of inflation, but the economic conditions of the concession are periodically estimated and productivity gains are required.

69. From a microeconomic point of view, tariffs increasing faster than inflation during the concession life can be justified on the basis of rising short-term marginal congestion costs. The economic literature favors the use of long-term marginal costs instead, which adjustment is not necessarily in line with inflation.[39] From a macroeconomic point of view, fully indexing public utility prices with inflation can prove negative. During high inflation periods, price indexation can feed inflation spirals while reducing the purchasing power of those consumers whose salary adjusts on a delayed basis. As for regulating utilities, it may be preferable to define a regime based on a combination of inflation and sector productivity gains.

70. For future concessions, several paths of reform could be cautiously explored, always trying to maintain an appropriate balance of incentives for the concessionaire, at contract tendering as well as during implementation. The following proposition could be evaluated by the ANTT:

- revisions of the investment program on a five year term, based on real traffic and costs. The first revision occurring after the end of the initial rehabilitation and upgrading program,
- additional investments to be realized by the concessionaire to be based on real financial and commercial costs – for instance applying discounts initially offered in the proposal to new costs, as is the practice for addenda in public work contracts,

[38] See Guasch (2004)
[39] This depends on the type of economies of scale observed in capacity expansion investments.

- using historic nominal costs of capital (as observed or computed) in the financial monitoring spreadsheet used for tariff updates. An NPV calculation with different discount rates for different dates would replace the currently used IRR calculation.[40]
- forecast future maintenance and operation costs based on a mix of inflation and a productivity index, computed for instance, as a function of productivity gains observed in other concessions, thereby introducing a process close to a yardstick regulation. Expected productivity gains could be set on a five year term.

71. Implementing these principles would imply adjusting the current regulatory models used by the ANTT. As a test of the robustness of the new framework for future concessions, ANTT could estimate their virtual impact on the existing first and second phase concessions.

72. **Additional regulation rules** could also be introduced: (a) to limit concessionaires' incentives to excessively increase the initially set investment program, and hence the tariffs; a cap on the real tariff increase over the concession could be set, in line with the legal requirements for traditional public works (25 percent). This would partly determine when additional investments on the concession should be procured independently; (b) revenue sharing clauses could also be introduced. Caps on traffic levels could be set and when triggered would imply either a reduction of tolls or a transfer of part of the additional revenues to the public. Experience shows that such clauses are preferable to pure profit sharing clauses which suffer from their complexity,[41] (c) automatic toll adjustment during high inflation rate periods could be authorized. Current rules dictate waiting until the annual tariff readjustment, which would be severe with double digit inflation rates. For instance, in some concessions, Chile allows the concessionaires to adjust tolls in cases when the inflation index changes by more than 15 percent since the last toll revision.

[40] Variable discount rates are commonly used to value bonds, using a yield curve. Calculation would be based on an extension of the classic discount formula. For example, if r1 is the interest rate in year 1, and r2 is the interest rate in year 2, then the present value in year 0 of I2 income in year 2 is $I2/(1+r1)(1+r2)$.

[41] A. Gomes-Lobo & S.Hinojosa (2000).

III. INSTITUTIONS AND FINANCING

H. Institutional Issues

73. **The institutional framework** is still considered inadequate to effectively prepare and implement programs of public private partnerships in roads, and more generally in transport. The main institutional issues and organizational weaknesses are in the areas of policy formulation, planning, regulation and supervision, which were discussed in the preceding sections. They are mostly within the jurisdiction of the Ministry of Transport, but some lie outside. These weaknesses are responsible to a large extent for the lack of progress with concessions and other public private partnerships in the sector, lack of investments, and the resulting inadequate condition of large portions of the road network.

74. **The organizational structure of the transport administration** is mainly the result of the sector restructuring law enacted in 2001 and a subsequent Presidential decree enacted in 2003. The law, enacted several years after the first road concessions and the privatization of the railways, delineated a new institutional framework consistent with the trend towards more private involvement in the sector, and in large part with international experience. It led to the establishment of two regulatory agencies, ANTT and ANTAQ, for regulating and supervising concessions and other forms of public private partnerships in the land transport and water transport sub-sectors (though the Executive's proposal to the Congress was for only one transport agency); to the extinction of DNER and the creation of DNIT, for executing public sector programs; and to the extinction of GEIPOT, which was the policy formulation and planning arm of the Ministry.

75. The original text of the law also aimed at strengthening the sector policy formulation and planning functions through an organizational restructuring of the Ministry of Transport itself and through the creation of an inter-ministerial Council for Integration of Transport Policies (CONIT). But a Presidential veto on a number of articles of the Law relevant to the organizational restructuring of MT, which were conflicting with a broader restructuring undertaken by the new administration, and a subsequent Presidential decree enacted in 2003, resulted in unclear areas of competences and responsibilities between the Ministry and its agencies. In particular, the restructuring law was clearly attributing concession planning and procurement functions *(Planos de Outorgas)* to the agencies, while the Presidential decree attributed the same functions to a newly-created *Departamento de Outorgas* in the Ministry. A broader debate on the competences of the regulatory agencies versus the central administration emerged at that time and is still ongoing.

76. **The institutional capacity of the Ministry of Transport needs to be strengthened**. Prior to restructuring, MT was relying largely on GEIPOT's staff for policy formulation and planning. After its extinction, GEIPOT staff either transferred to the regulatory agencies or retired. The Ministry is still clearly under-staffed, and its capacity for overall policy formulation, planning and M&E could be improved. As a result, no real progress was made in these areas, with the notable exception of the recently-completed National Logistics and Transport Plan.

77. **The PPP institutional framework** which resulted from the PPP law, includes an inter-ministerial PPP Committee *(Comite Gestor de Parcerias Publico-Privadas Federais)*, responsible for approving all federal PPPs, and a PPP unit, established within the Planning Ministry, responsible for preparing pilot PPP projects and for supporting the preparation of such projects by sector ministries or agencies. In addition, all privatization transactions, including road concessions, must be approved by an inter-ministerial Privatization Council, the CND *(Conselho Nacional de Desestatizacao)*. This approval process could be cumbersome and results in substantial delays. In order to facilitate the process, the government could consider transferring the responsibility for approving roads, and possibly other transport, concession and other PPP programs and projects, to the CONIT once it becomes operational (see recommendations below).

78. **The international experience with central PPP units** has been mixed.[42] In general, the relative success of central PPP units is based on a diagnosis of the relative weaknesses of

[42] World Bank/PPIAF (2007).

governments in undertaking PPPs that the unit is designed to address specifically. Generally, those with executive power tend to be more effective than those that are purely advisory. Ineffective governments tend to have ineffective PPP units. Without high-level political support for the PPP program, a PPP unit will most likely fail. In Brazil, the PPP unit in 2006 prepared a pilot road transaction, the BR-116/BR-324 in the State of Bahia. Substantial efforts were made to directly involve all relevant sectors in the process, including MT and ANTT, through formal task forces and ad hoc consultations. But the preparation process remained perceived as being led solely by the PPP unit without high level political support or buy-in from the entities in charge of projects. Project preparation ultimately stalled among disagreements from sector entities on various elements of the proposed project design. Over the years the PPP unit gradually lost its relevance as a government-level coordination effort was engaged under the leadership of the Casa Civil.

79. **The role of BNDES** in the sector is important, not only in terms of financing (see Section B hereafter), but also in helping structure concessions. BNDES, acting as technical secretariat of the CND, coordinated the privatization of the railways in the 1990s. More recently, BNDES participated in the preparation of the above-mentioned pilot PPP in Bahia (awarded as a concession), and is now actively involved in the preparation of a new phase of federal road concessions. BNDES's contributions are essential, particularly in the areas of financial analysis and structuring of projects.

80. **The Supreme Federal Tribunal (TCU)** has been playing an increasingly large role in the sector, in its thorough review of the bidding documents for new concession programs and its close monitoring of the regulation of the existing contracts. TCU role became gradually more technical with, for example, thorough discussions with ANTT for the second phase of concessions centered on the forecasted costs (for example pavement thickness) and financing parameters (cost of capital) used in order to determine the maximum tariff values of the auctions. Both BNDES and TCU bring significant added-value at the technical level, but it should be ensured that discussions and decisions on key policy and regulatory issues remain with the sector administration.

81. **The policy formulation, planning and monitoring and evaluation functions** are, according to the law, responsibilities of the Ministries of Transport and the CONIT. The original law mandated the creation, within MT, of three Secretariats, including a Planning Secretariat, which would have assumed the planning functions of the extinct GEIPOT and would have served as a technical secretariat for the CONIT. But with the veto and subsequent Presidential decree, only two Secretariats were created within MT: the Secretariat for National Transport Policy *(Secretariat de Politica Nacional de Transportes)*, responsible for policy formulation and planning, and the Secretariat for Transport Program Management *(Secretariat de Gestao dos Programas de Transportes),* responsible for the supervision, monitoring and evaluation of public programs.

82. In order to consolidate this institutional framework, the government could consider to: (a) clearly define the responsibilities of the central and transport ministries, ANTT, and BNDES in developing and implementing PPP programs; (b) formulate, through MT, transport policies and plans, including the set of policies discussed in Section I of this report, and prepare for the decisions to be submitted to the CONIT, in accordance with the recent Presidential Decree no. 6.550 of August 27, 2008; (c) streamline the review process for PPPs at the central level, delegating the formal approval of future concessions from the National Privatization Council (CND) to the CONIT; (d) authorize MT, and provide the necessary resources and incentives, to recruit and train professional staff and managers to gradually develop a group of competent and motivated staff in the areas of transport policies, planning and program monitoring and evaluation; (e) through MT and the CONIT, and in cooperation with the Forum of State Secretaries of Transport, formulate a comprehensive and viable strategy for the decentralization of the management of the road network, and seek congressional approval for a proposed agreement of a new PNV *(Plano Nacional de Viacao)* law; and (f) facilitate the recruitment and retention of qualified staff by the regulatory agencies, including ANTT, and ensure that agency directors and managers are selected on the basis of technical and managerial competence, and independent of political and private interests.

83. **The decentralization of the management of the road network,** besides an increased participation of the private sector through PPPs, also requires transferring federal highways which are not of national interest to the jurisdictions of the states, and delegating to state administrations the management of those federal highways which could be more efficiently managed by such decentralized administrations. In spite of many attempts by the federal administration over the last 15 years, the decentralization process has not made much progress. The law of the PNV of 1973, which

identifies all the transport infrastructures which are in the federal jurisdiction, and which consequently can be allocated with funds from the federal budget, is a major legal impediment for the proposed transfers of jurisdictions. Several proposed revisions of the law to enable such transfers have stalled in the Congress, due to lack of cooperation between the federal government and the states.

84. The government could, through MT and the CONIT, and in cooperation with the Forum of State Secretaries of Transport, formulate a comprehensive and viable strategy for the decentralization of the management of the road network, which would be in the interests of the federation and the states. Such agreed strategy could then be formalized through a revised proposal for a new PNV law, which could be more easily approved by the congress if previously endorsed by state administrations. The Ministry of Transport, through its Secretariat for Transport Program Management, could then be made responsible for implementing the decentralization strategy, and for reporting progress to the CONIT.

85. Further, under such an agreed decentralization strategy, MT and State Secretariats of Transport could cooperate to first plan and then implement an efficient network of interstate toll roads, in a coordinated way. China's experience with coordinated planning and decentralized construction of a network of over 40,000 km of toll expressways over 15 years is particularly interesting (Box 2 below).

Box 2. China's Experience with Expressway Network Development

From 1990 to 2005, during the period of the 8th, 9th and 10th Five-Year Plans, China completed over 40,000 km of tolled expressways, which now constitute the National Expressway Network (NEN). This was achieved by investing over US$40 billion per year in roads, with about one third of that amount allocated to the NEN.

Many factors contributed to the rapid development of the NEN, but five key factors stand out:
- A clear long-term development plan committed through five-year programs, jointly prepared by the national and provincial governments;
- The simultaneous implementation efforts by China's provinces and mega-municipalities;
- The pooling of national and provincial government resources, through their own funds and domestic and foreign debt, and some private sector finance through various concession schemes;
- The greenfield characteristics of most expressway projects, allowing implementation with limited interference with existing networks; and
- The availability of a large pool of qualified construction firms and design engineers drawn from former major state owned enterprises to meet the unprecedented demand.

China's expressway network has been planned through the interaction of entities at the central and provincial levels, following an approach that emphasized the objective of connecting all major cities to one another. At the national level, the Ministry of Communications' Planning Department started designing the plan, with inputs from other line agencies, research institutes, and the Provincial Communications Departments (PCDs). The PCDs, having participated in the overall definition of the corridors, then define the detailed alignments and designs within the respective provincial boundaries.

Implementation of the planned expressways is the responsibility of the 27 PCDs and the traffic bureaus for the four mega cities (Beijing, Chongqing, Shanghai, and Tianjin). The provinces typically finance 66—90 percent of the capital cost, through their own budgets and debt. MOC sets policies, standards and provides investment support towards the construction cost. Once the expressways are opened, they are managed by the PCDs through an operating company or other authorized entities. The private sector provides finance on a limited scale through different types of concession schemes.

The key lessons learned for consideration in the next phases of the expressway expansion program are: (i) focus on improved demand estimation methodologies, including the impact of higher or lower toll rates on demand; and, (ii) emphasis on the analysis of a set of alternative options, including not only different alignments but also the possibilities of phased construction. The latter might be particularly important where demand estimates show a relatively long ramp-up period of low traffic volumes, and must take into account the adequate analysis of the costs of the alternative technical options. In all, these methodological approaches call for a rigorous life-cycle analysis of alternative alignments and phased options, taking into account levels of traffic demand that would vary depending on toll levels and competing parallel routes.

Source: World Bank (2007)

86. **The regulation and supervision functions** are clearly within the responsibilities of ANTT where user tolls are collected. For toll-free roads, the regulation and supervision of the so-called

administrative concessions are expected to be with DNIT (although this assumption has not yet been tested) or with state road administrations if the management of such roads is delegated.

87. **The ANTT** has, since its creation, gradually strengthened its capacity for regulating and supervising concessions and other forms of public private partnerships. ANTT was initially staffed with experienced personnel transferred from public entities that had been eliminated such as RFFSA and GEIPOT, and short-term contracted staff. Significant numbers of young staff have more recently been recruited on a permanent basis but they require intensive training to become operational. Substantial progress was made in establishing regulations, and systems of accounts and information for the regulation and supervision of the roads and rail concession contracts and permissions and authorizations for bus companies, some with assistance under Bank loans and PPIAF grants. Also, efforts were made to ensure transparency in the agency's decisions. But accounting and other information is not yet sufficiently analyzed to produce and effectively use reliable benchmarks. The ANTT successfully managed the preparation, bidding and contracting process for the second phase of federal road concessions.

88. In order to address the regulatory and supervision issues discussed in section II, ANTT could further strengthen its accounting and information systems, make better use of this information, and develop reliable benchmarks for costing works and services. Consultations with road users could be broadened through more systematic opinion surveys. In order to effectively contribute to the development of a new PPP model, consistent with the public policies to be formulated by MT as discussed in Section I, ANTT will need to build on its experience with regulating and supervision the "old" concessions and incorporate international experience. For these purposes, ANTT would have to continue building a stable group of competent, well-trained and motivated professional staff. The government could facilitate this process by revising the salary structures for regulatory staff to enable the recruitment and retention of as qualified professionals as those in the private sector. Finally, to further strengthen governance, the government could ensure that agency directors and managers are consistently selected on the basis of their technical and managerial competences, and are independent from political and private interests.

I. Financing issues

89. **Sources of capital** expanded favorably for the sector in the past ten years. At the launch of the first phase of concessions in 1995, equity was provided exclusively by construction companies, and debt by the Brazilian development bank (BNDES) – at subsidized rates – and the multinational agencies (IADB, IFC). Such financing proved adequate to support the birth of the sector, as the favorable debt financing conditions (long maturities, grace period, weak covenants) offered by the development banks allowed the sponsors to achieve high gearing (ratio 30/70) and profitability levels. With the expansion of the Brazilian capital markets, and the more favorable financing conditions, the picture changed, and emerging concessionaire groups (CCR, TPI, Ecorodovias, CRT) growingly refinanced early loans as well as acquisitions on the basis of debentures and/or public listing.

90. **BNDES infrastructure credit lines** remain very attractive for the sector. The institution has held two key and distinct mandates in the road sector: to provide finance where the private markets cannot offer favorable terms, and to reduce financial costs to enhance affordability of tariffs, through longer terms and subsidized rates. Clearly, BNDES offers very favorable loan conditions: (i) long-term loans (initially 8 and now 10 years in practice with a grace period of 2 years), (ii) that can finance up to 70 percent of initial investment expenditures (initially 60 percent), (iii) at subsidized variable rates (TJLP: 6.25 percent in early 2008) increased by limited credit spreads (total 1 percent for more secure ones to 4.8 percent for most risky ones, recently reduced by 50 base points as part of the PAC). As a comparison, the Brazilian interbank short-term refinancing rate (CDI/Selic) was set at 12.25 percent base points in early 2008, and a AAA debenture sold on average 100 points above – that is to say 600 points above BNDES levels. BNDES competitive advantage comes notably from having access to special funding sources, with low government-mandated long-term return requirements, such as the Workers Support Fund (FAP). This is not a unique feature of the sector: subsidized directed lending in Brazil, mostly channeled by the BNDES, accounted in 2006 for about one third of total long-term

lending, for a total fiscal cost estimated at 1 percent of GDP.[43] Rationale for this policy has been based historically on the lack of capacity of the private market to address the special sectors' needs.

91. **Multinational financing** lost part of the competitive advantage it was holding in the sector ten years ago: large offer of BNDES financing reduces the possibility to finance initial physical investments and currency mismatch with revenues reducing the attraction of dollar labeled loans for refinancing. As an important exception, the different framework of the tender in the Sao Paulo State partly rules out BNDES financing, as auction is based on important initial monetary payments from the sponsor to the conceding authority. As a result, for the recent auction of part of the Sao Paulo Road Ring, CCR firm has been considering contracting an IADB US$950 million loan (A/B structure) to finance its promised R$2 billion transfer to the State. However, traditional investment loans have generally stalled, with the last private-sector deals with IADB and IFC closing in the end of the 1990s, and several concessionaires (Ecovias, CCR) refinancing in advance loans from multinationals through large debenture. Since then, investments from IFC have been more leveraged, destined to finance private equity investment in major companies (AG construction group).

92. **Local financial markets** have effectively been taking a growing share of the road concession financing. Generally speaking, the amount of primary issuance (mostly bonds and stocks) on the Brazilian market multiplied four times between 2002 and 2006. In a direct reflection, all concessionaire groups (about two thirds of the existing concession portfolio in number and a much larger share in traffic and revenues) have now refinanced themselves through variable-rate debentures, mostly based on the CDI or the consumer index (IGP-M). The debt structure of the CCR, the largest Latin American toll concession company, was in 2006 made of 55 percent local debentures, BNDES financing representing only about a quarter of the liabilities. Shareholders capital structure is progressively evolving too, with a reduction of the participation of construction companies[44] and the public listing of part of the CCR and TPI groups.

93. However, this activity of local markets has so far been concentrated on toll road refinancing, while bond emission or private bank borrowing at concession start remained very limited. Results of the second phase of concessions show that all concessionaires preferentially considered borrowing from the BNDES to finance initial capital expenditure. Though, at an aggregate level, high demand for BNDES long-term financing lines is generating a growing "unmet" demand, that grew from R$8.9 to 54.7 billion between 2002 and 2006.[45] Given the forecasted high rate of increase in infrastructure investments in the coming years, it is likely that in the medium term, BNDES might not be able to address all the financing needs of the sector. It might thus be interesting for the government to review its direct lending policy and to consider orienting the BNDES toward taking the larger role of "a bridge for opening up under-funded sectors for institutional investors." Rather than decrease the number of projects in which it is involved, BNDES could aim at increasing its leverage, through reduced co-financing ratios and/or more risky instruments, such as subordinate debt. Through this, the BNDES would act as a catalyst, with objectives to make finance-able a larger number of projects, and develop new private markets. This would ensure that BNDES financing stays essentially additional, for maximum efficiency.

94. This reorientation appears also natural, in the current context, as it is unlikely that using subsidized credit for infrastructure is an efficient anti-poverty tool. On the one hand, it is unclear whether the opportunity cost on the BNDES managed funds were compensated by the reduction in toll rates obtained. To generate similar toll rates, direct subsidies through the PPP framework would probably have been more cost-effective. On the other hand, users who face affordability problems are likely to amount only to a limited share of the transit. Rather than through undiscriminating instruments, a more cost-effective way to ensure their access to transport services would be through targeted programs, for instance a discount program available to beneficiaries from already existing social safety network scheme.

95. **Catalysts for private financing** have often been used by governments to achieve higher private financing with lower or maintained public commitments. BNDES could take this role by: (i) seeking a higher leverage in the funds committed, to improve the amount of infrastructure financed per real mobilized, and (ii) developing the ability of local markets to provide for more structured

[43] World Bank (2008)
[44] FitchRatings (2008)
[45] World Bank (2008)

finance, long-term debt lines or even a retail equity market. Several paths could be explored, such as standard credit enhancers (for instance full or partial credit guarantee schemes) or equity or subordinated debt lines. The recent experience of the European Investment Bank (EIB) in this regard is interesting. The bank recently set up a billion euro fund whose purpose is to enhance the finance-ability of transport concessions in Europe. According to the sophisticated design of the instrument,[46] the EIB provides guarantees to commercial banks' stand-by credit lines (up to 10 percent of senior debt) that can be used during the ramp-up phase of demand, *id est* during the first five years after commercial operation date. If called, those credit lines function as standard subordinated debt lines, which are subrogated to the EIB in case of default. By setting up this instrument, the EIB expects to both increase the amount of financeable projects and to provide a financial value-added to the projects, reducing the cost of their debt. The EIB expects that this instrument will be financially viable and will catalyze about EUR 20 billion of private debt financing – twenty times the value of the fund. In the rest of the world, multinational donors, including the World Bank, have a varied experience in setting up and financing such structured infrastructure finance funds.

96. **Creation of a PPP guarantee fund** is considered inside the 2004 PPP law**.** This fund was designed to back-stop the payment obligations of the governments in long-term PPP projects but was not implemented, probably due to the lack of PPP projects. At that time, several aspects of its design needed to be improved, as low liquidity and relatively high volatility of the assets combined with potential problematic political governance issues were likely to limit its aggregated value for private investors. Actually, it is probable that counterpart risk decreased strongly for Brazil, which became in 2008 investment grade. Similar experience in Peru show that after investment grade had been achieved, this kind of credit-enhancer for public contributions to transport PPP projects were not necessary anymore to attract investors[47] given that public payments hold a status close enough to public debt. Creating a special PPP fund managed by the BNDES might still be useful, but probably with a very different structure and objectives, such as providing leveraged financing lines as mentioned previously.

97. **Incorporation of road users into capital structures** could facilitate social acceptability of tolls and marginally expand capital sources. This could be realized for instance through the incorporation of municipalities in the equity structure, such as what happens in France through subsidies with profit sharing clauses, or even limited shareholder participation. In addition, as mentioned in section III.B, for investment-intensive projects, the sale of long-term passes during construction period could constitute a source of user "equity."

[46] EIB (2008)
[47] IIRSA Sur, Project Finance Magazine (2007)

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ANNEXES

I. TAKING STOCK OF THE FEDERAL ROAD CONCESSION PROGRAM

A. Background and lessons learnt

1. The first phase of federal road concessions established the base for the Brazilian road concession model, and notably its regulation by contract. In many ways, this has been a success: (i) the private sector delivered to the users good quality roads while the country experienced a prolonged and rigorous fiscal adjustment program, (ii) DNER first, and then ANTT, began creating a large body of experience, regulations, and relatively clear regulatory mechanisms when none of these existed previously, and (iii) road concessions did not require renegotiation,[48] contrasting with the experience in several countries of Latin America such as Mexico, as well as some Brazilian states.

2. However, revisiting the first ten years of contract implementation, it appears also that road users did not get good value for their money as several large efficiency gains were not passed on to prices, notably the decrease in the cost of capital and also probably large productivity gains on operations. In addition, investment allocation was somewhat distorted by the conjunction of local political pressure as well as contractual mechanisms favoring over-investment. Given the nature of the regulation which is based on contract enforcement, it may not be possible to significantly reverse those trends before the contracts' end occurring between 2020 and 2025.

3. While a second phase of concessions was supposed to be launched quickly after the first phase, it suffered a ten year lag caused mainly by: (i) lack of political consensus on the role of the private sector in road management; (ii) lack of clear attribution of responsibilities in concession program planning and procurement; and (iii) non consolidated technical framework for structuring projects.

4. In designing the second phase of concessions, the government included some of the lessons from the first phase regarding bidding documents and contractual design. Choice of a simultaneous auction process without prequalification proved much swifter than traditional two step bidding processes, and less prone to collusion. Authorization of foreign bids as well as consortia without construction or engineering companies allowed for more intense competition. Contractual regulation was modified and allocated more management responsibility and risks on the concessionaire, accompanied by a stronger focus on performance standards.

5. The tendering proved a success in terms of competition, with discounts between 40 and 65 percent on the base toll, 7 to 13 bids per concession, and both national and foreign companies as winners. However, certain hypotheses made in the concessionaires' financial proposals cause uncertainty to the future of the concessions as those hypotheses strongly diverged from those made by the government. One concessionaire even included a 4 percent real rate of return on capital, well below financing costs. With probably low resources available after operation start and to service debt as well as very low guaranteed rates-of-return on new investments, concessionaires will have strong incentives to under-invest in quality and postpone mandatory investments.

6. This is bound to require ANTT to adapt its regulatory focus and methods, from supervision of road works quantities to enforcement of technical norms in project design and implementation, enforcement of performance standards during contract implementation, as well as the achievement of improved investments scheduling.

7. Efficiency of competition as well as large improvements in the economy led to kilometric tolls between 0.013R$/km to 0.03R$/km, 3 to 8 times below the levels observed on the existing concessions of the first phase and much lower than that of other countries (with the likely exception of Argentina). See Box 1.1 for summary of lessons from the concession programs.

[48] Under federal management, contract revisions were realized within their initial contractual framework. Contract restructuring occurred in State programs such as in Parana. Generally, renegotiation "occurs when the original contract and financial impact of a concession contract is significantly altered and such changes were not the result of contingencies spelled out in the contract." Cf. Guasch (2004).

Box 1.1. Selected lessons from the Brazilian federal concession programs

- *Stable and well enforced regulations reduce costs in the long-run*

More than ten years of good contract enforcement and relatively stable regulations strongly decreased the risks borne by the concessionaire. While, a priori, regulatory risk could have represented a 300bp additional capital cost for the contracts signed in the 1990s, results from the new phase hint that its perception is now very low. This could represent a reduction of tariffs for the users of up to 15 percent.[49] Several additional contract and regulation improvements, as described in this paper, are likely to reduce further contract regulation uncertainty.

- *For very long contracts, regulatory mechanisms governing tariff updates should take into account the current economic environment, and not only the conditions at contract signing*

Typical contracts used in Brazil at the federal level are based on enforcing the financial conditions described in the concessionaire's initial commercial proposal during the contract life (25 years). Experience shows that this structure fails to push the concessionaire to realize productivity gains and transfer them to the users, as well as distorts concessionaire's incentives to invest. The challenge is then to develop mechanisms that sufficiently protect the concessionaire while preserving users' interests. A multi-annual revision process of the equilibrium to account for major changes (for example, capital costs, productivity) could be the solution.

- *For "simple" projects, fast-track auctions can bring a swift and highly competitive process*

Several innovations in the competitive process were introduced by the federal government to foster competition and reduce processing times: (i) use of a simultaneous tendering without prequalification, backed by proposal and performance bonds, (ii) two phased bidding through a price auction process and then ratification of technical proposition, (iii) openness to foreign bids, (iv) openness to consortia without construction/engineering companies, (v) use of standard, non-negotiable contracts. Clearly, pre-qualification and/or two stage biddings processes remain justified for more complex or less standard projects (such as projects including large construction works) so that bidders would be ready to invest the cost of preparing reasonable bids

- *Considerable delegation of operational management responsibility to concessionaires brings additional productivity gains*

Contrary to previously launched concessions, for which all investments were specified by the administration, road rehabilitation and maintenance responsibility was fully delegated to concessionaires in the second phase. Commercial propositions by the concessionaires include 10—20 percent cost reductions through optimizing maintenance cycles. The new challenge for the agency is then to succeed in enforcing performance standards in the long-run, and, in the case of the 2nd phase of federal concessions, particularly the long-term quality of pavement structure.

- *Obtaining low tolls should not be the only focus of governments*

While the federal government designed the tendering process to obtain the lowest tolls possible, financial long-term viability of the concessions and toll harmonization should also have been of public interest. Such emphasis might have led to low balling, weakening the financial equilibrium of the concessions. In case of economic downturns, this could reduce the projects' performance for the users and eventually compromise the financing (public bank debt) of the projects or even require public take-over. Additionally, as tolls were set on a per project basis, rates for comparable routes in the country vary now by a factor of 5, potentially leading to economic inefficiencies and reduced public satisfaction with the program.

- *In the absence of a strong public capacity to structure projects, only a government-wide commitment to the concession program could allow for success*

A reduced capacity of the public administrations, compounded with a lack of political consensus on the role of the private sector, led to a 10 year halt of the toll road program. When finally the government committed itself to the program in 2007, finalization of the preparation took only 6 months. In a context of strong market appetite for toll road concessions, consolidating the government's capacity to structure projects appears as a priority.

[49] World Bank calculations. See also Estache & Strong (2000).

II. EXPERIENCE OF THE CONCESSIONS LAUNCHED IN 1995-1997 (1ST PHASE)

A. Initial Framework

Difficult macroeconomic and sector context

8. In the 1970s, the Brazilian road sector expenses represented 2 to 3 percent of GDP, mostly concentrated on the expansion of the country's trunk highway network. As the network neared completion, tax earmarking to the sector gradually discontinued in the 1980s and resources were diverted to other purposes. By 1990, the sector's priorities had shifted to the rehabilitation and maintenance of roads which were on the path to severe deterioration. The country's chronic macroeconomic instability forced the government to undergo a severe fiscal adjustment in 1994 (the *Plano Real*), and public road investment expenditures plummeted to 0.1 percent of GDP, much below what was necessary to ensure the preservation of assets.

9. In 1995, the Brazilian government decided to franchise some of its main highway corridors and launched a federal toll road concession program. As in other parts of Latin America, the country followed a "privatize first, regulate later"[50] approach. The government proceeded with: (i) the bidding in 1993 of a first phase of five concessions (880 km) on highways that had already been tolled in the past (Table 2.1), (ii) the approval of a new concession law in 1995 (Law 8,987), (iii) the selection of about 10,000 km of federal highway candidates, for either rehabilitation or upgrading concessions, (iv) a series of agreements with the states to decentralize a proportion of the federal network to be held by the states and to be managed under private concession mechanisms. The states followed this direction, and the size of the highway network managed under private concessions expanded quickly to reach 9,700 km by the end of the 1990s, 1,400 km of which under federal supervision.[51]

Table 2.1. First phase concessions under ANTT supervision

Concession	Road	Segment	Extension
NOVADUTRA	BR-116/RJ/SP	Rio de Janeiro - São Paulo	402.0 km
PONTE	BR-101/RJ	Ponte Rio / Niterói	13.2 km
CONCER	BR-040/MG/RJ	Rio de Janeiro - Juiz de Fora	179.9 km
CRT	BR-116/RJ	Rio de Janeiro – Teresópolis – Além Paraíba	142.5 km
CONCEPA	BR-290/RS	Osório - Porto Alegre	121.0 km
ECOSUL	BR-116/293/392/RS	Pólo de Pelotas	623.8 km
Total			1,482.4 km

Source: ANTT

"Brownfield" concessions

10. While public money was scarce, significant country risk translated also into high costs of capital, limiting the capacity of the private sector to undertake significant investments, and notably to build new roads. The concession model was thus, by large, imposed *de facto* by the environment:

- "brownfield" concessions, *id est* for the rehabilitation, maintenance, operation, as well as progressive upgrade to higher category roads (below freeway level) of existing highways. Major works such as road doubling or city rings were ruled out. High standards of services included free medical and mechanic emergency intervention.

[50] See Engel&Al, Privatizing highways in Latin America: is it possible to fix what went wrong? Yale University 2003
[51] In 1998, the management of a package of 623 km of highways in Rio Grande do Sul was transferred back to the Federation, following previous management attempts, by state government.

- open toll systems, whereby the users are charged a fixed amount each time they cross a toll plaza, distance of 70 to 100 km on average, but can bypass the toll plazas by entering or exiting the road through accesses between the toll plazas without being charged.
- mix of urban and interurban segments, urban segments being toll free.
- fixed-term 25 year contracts, short by international standards but in line with the reduced investment requirements and the high interest rates. Contracts signed between 1994 and 1998 are bound to end between 2019 and 2023.

Bidding and contracting principles inherited from traditional public contracts

11. The road administration (DNER) which had taken the lead in contract procurement, lacked experience with public private partnerships[52] as well as incentives to promote cost-efficient arrangements. Bids were limited to national consortia based on construction companies, and followed the national procurement law (Law 8,666). As for small civil works contracts, the main criteria for contract award was price (in this case, the base toll level to be applied to a light vehicle), subject to a technical qualification process. Given the handful of companies then able to meet requirements, competition is considered to have been low.

12. More importantly, the contracts signed in the 1990s were based on the spirit of public works contracts. They included a detailed investment plan that covers the whole length of the concession (the PER - *Programa de Exploracao da Rodovia*). Requirements span all types of expenditures, and notably the technical solutions and quantities to be implemented by the concessionaire, during 25 years. Given their overly high level of detail, they must be updated extremely frequently to take into account the highway's actual environment.

Risk sharing biased against the users

13. The main difference with a civil works public contract was actually the source of financing – necessarily through user tolls – as the concession law explicitly prohibited any public financing, and stipulated that any complementary source of benefit ought to be reverted to the user.

14. The principle to preserve the economic equilibrium was established as the basis for regulating the contract. Any modification of the investment plan impacts tariffs, through a corresponding increase or decrease, intended to maintain the long-term rate of return as planned for by the concessionaire in his initial commercial proposal (see discussion below). Traffic risk is completely carried by the concessionaire who is held responsible for his own forecasts.

15. In other words, the government and its road agency (DNER) devised in 1995 a system where it could implement and manage its investment program upon a loose budget constraint – the user paying for works decided by the DNER, through a unique long-term contractor and with prices valid for 25 years. With some variations, this type of scheme appears common in Latin America.[53]

B. Limited evaluation of the first phase of concessions until 2007

Good performance after initially difficult times

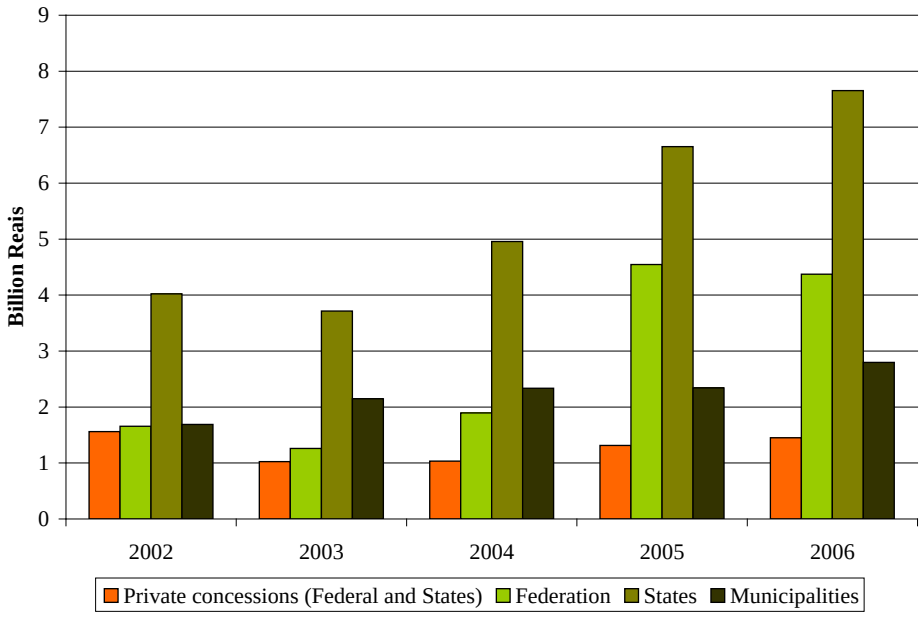
16. In fact, beginnings proved painful. Two important events occurred to delay implementation: litigation by unsuccessful bidders and unavailability of long-term private debt sources in Brazil in the 1990s. Since concessionaires were unable to secure financing, the National Development Bank (BNDES) and to a limited extent, IFC, stepped in.[54] As existing itineraries became tolled, initial public opposition was high, impacting state programs. Several state governments repeatedly attempted to unilaterally cut tariffs, and pushed for renegotiation of concession agreements through creeping expropriation threats. Many juridical remedies were initiated by civil society, leading sometimes to the

[52] A concession department was created afterwards, before being merged into the Land Transport Regulatory Agency (ANTT) in 2002.
[53] See "renegotiation without holdup: anticipating spending and infrastructure concessions" Engel&Al NBER Working papers 2006.
[54] See World Bank 1997, "Federal Highway Decentralization Project"

cancellation of concessions or the impossibility of operating toll gates. Federal concessions fared better, with no significant contract renegotiation and economic equilibriums upheld by the courts.

17. Overall the performance of contractors was good. About 10,000 km of highway were quickly transformed into good driving conditions and road standards increased substantially. Rate of deadly accidents was halved in ten years on tolled routes.[55] In 2007, 22 of the 23 best quality roads in Brazil were tolled highways.[56] The private sector invested R$1.2 billion per year between 2002 and 2006 (Figure 2.1), about 12 percent of total investment in the sector during the same period.[57] As a consequence, while the quality of the rest of the network severely worsened between 1998 and 2006 (in 2004 less than 25 percent of federal highways were in good condition), tolled highways maintained a sufficient service level.[58]

Figure 2.1 Road investments by level of government 2000-2006



Source: ABCR, Federal Treasury Department and World Bank estimates

18. The regulation of contracts evolved with the transformation of the public entities in charge of their supervision. In 2002, the road administration was terminated and its Concession Department was absorbed in the newly created Land Transport Regulatory Agency (ANTT). The ANTT then formally assumed the tasks of the supervision and regulation of the concessions, while responsibility for planning, project preparation and procurement of new phases of the program was left hostage to conflicts with the Ministry of Planning, Ministry of Transport and the newly created National Transport Infrastructure Department (DNIT). With support from the World Bank, the ANTT progressively built up a set of functioning regulations and regulatory tools and developed a culture of professionalism and preservation of stakeholder's interests. Regulatory governance appeared reasonable, with ANTT's performance in line with the Brazilian infrastructure regulators' average, and substantially higher than comparable Asian peers.[59]

19. Half way through its life, the first phase of the highway concession program has now reached a mature phase and had given rise to a strong industry. With heavy investments far behind and successful refinancing of their debts in the private markets, concession companies are now generating

[55] Sernam (2007)
[56] CNT (2007)
[57] ABCR (2006)
[58] CNT (2003) and World Bank Road Transport Project (2005)
[59] See in particular Correa & Al. (2006)

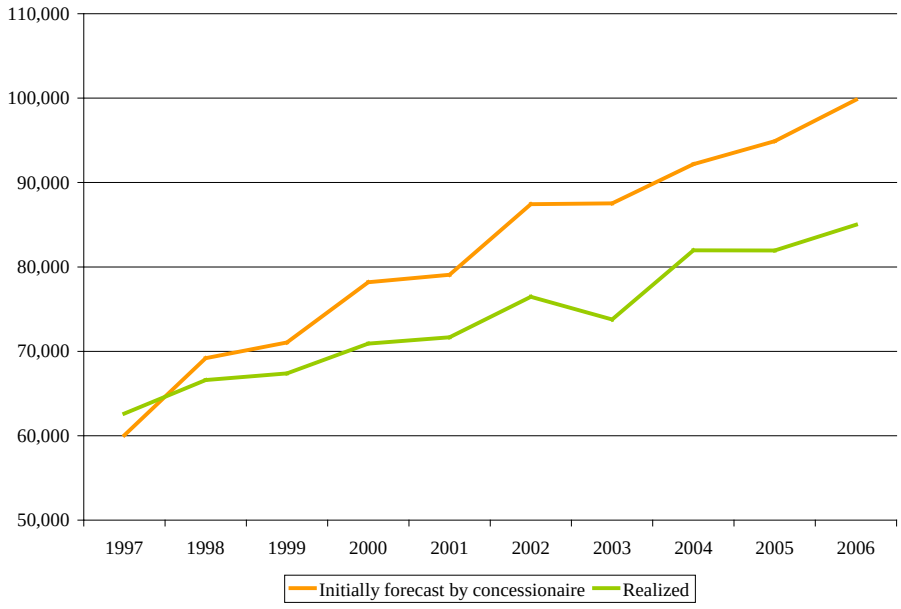
an increasing amount of cash. The sector is naturally consolidating as several groups (CCR, OHL, Ecorodovias, TPI, Bertin-Equipav) actively seek expansion fields, either through second-market purchase or new projects, some of them raising successfully capital through stock exchange listing.

Selected aspects of the regulation of the first phase federal concessions

20. This section particularly focuses on the concession of the highway linking Rio de Janeiro and Sao Paulo (*Dutra* road – *Novadutra* concession), based mostly on data made available by the ANTT, and reviews of: (i) traffic, (ii) costs, (iii) investment requirements, (iv) and estimated profitability evolutions.

21. Traffic on the Dutra road was globally in line with the concessionaire's forecasts.[60] Uncertainty regarding traffic volumes at the start was limited to the impact tolls would have on existing users. Traffic growth was slower than estimated (3.45 percent p.a. instead of 5.8 percent) resulting in 2007 in a 15 percent shortage. This is likely to be compensated by concession end, as forecasters proved overly prudent on long-term perspectives (1.5 to 2 percent p.a. instead of a likely 3 to 4 percent growth rate). Less expected was the fast growth of toll free urban and suburban traffic.

Figure 1.2. Dutra highway, traffic forecast by concessionaire vs. realized



Source: ANTT, World Bank calculations

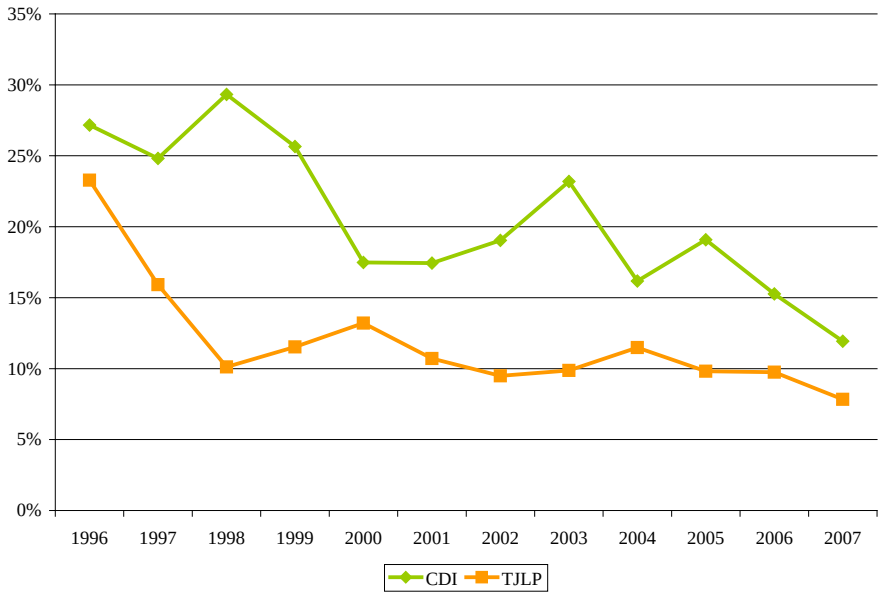
22. Data on concessionaire's operational and investment costs is limited to the initial commercial proposals and particularly their investment programs. Comparing those (which serve as a basis for the computation of price escalation) with actual costs (for instance from concessionaire's financial statements) proved impossible and does not appear to be an exercise undertaken by the regulator. A comparison of kilometric costs with data from concessions awarded in 2007 is undertaken in Annex III. D. It hints towards significant productivity gains in real terms (up to 79 percent cost difference) in operation, maintenance and administration, which can be related to some level of cost-sharing between different concessions of the same group, and to the introduction of technology improvements in tolling and road works. Capital costs were halved between the 1990s and 2008, and it is expected that concessionaires' realized windfall benefits during refinancing. The main indicators on which local financing are based[61] upon are the inter-bank interest rate (CDI), the long-term interest rate of the BNDES (TJLP) and the consumer price index (IGP-M). While each of these was high (20-30 percent at

[60] Traffic refers here to number of users paying full toll. Traffic forecasts are those specified in the concessionaire's initial commercial proposition.

[61] As such, the sponsor of the NovaDutra, CCR, has the following mix of long-term liabilities: 21 percent on BNDES loans indexed on the TJLP, 56 percent on debentures indexed for half on the IGP-M and half on the CDI. Remaining liabilities are mostly based on the CDI.

contract signing), they had fallen to 8-12 percent in 2007 and only had progressed to a limited extent by the end of 2008, amidst the global financial crisis. All indicates that, in parallel, company equity spread fell further with the decrease of regulatory, traffic and cost risks. On the basis of the concessionaire's commercial proposal and financial statements, it is possible to estimate the equity cost of the NovaDutra in 1996 at a real 24 percent. It is reasonable to assume that the cost might have dropped below 12 percent by early 2008, at the wake of the financial crisis.

Figure 2.3 Evolution of main Brazilian financing rates 1996-2007



Source: Banco Central do Brasil

Frequent investment requirement revisions…

23. In their first ten years, modifications of the initial PER have been frequent, notably for accommodating new investments. Only part of those costs translated into tariff increases, as those revisions were either partly or totally compensated by equivalent reductions or delays in the undertaking of other listed investments.

24. ANTT made regulation evolve by setting the frequency of revisions on a yearly basis, and impeding the possibility to undertake purposely "neutral" modifications of the PER (called *Adequations* by the DNER- See Table 2.2). Experience regulating the NovaDutra contract shows that the 5 revisions occurring since 2003 included modifications to about twenty item but incorporated only one major inclusion (additional lateral roads for about R$50,000,000).

Table 1.2. Number of investment program updates since contract signing

	Revisions	Adequacy (DNER)
Nova Dutra	12	7
CRT	15	5
CONCEPA	17	4
PONTE	13	10
CONCER	14	4
ECOSUL	3	?

Source: ANTT 2007

25. Two major risks were identified during the implementation of the first phase of concession: (i) the risk that political pressures by local representatives will lead to the addition or prioritization of investments that do not benefit the road users, nor are economically justified, nor are paid for by their beneficiaries – such as crosswalks (often on emergency basis for security reasons) or lateral lanes; (ii) the risk that the concessionaires might have artificially increased their unitary costs in their original

forecasts to generate increased benefits during investment revision. According to the ANTT, the entity had only limited power to manage both risks so far.

…led to high initial tariff increases

26. Tariffs evolved in the first ten years of concession under: (i) a yearly inflation computed according to a formula of sector price inflators specific to each concession (*readjustments*); (ii) *modifications* of the base tariff (*revisions*) due principally to modifications of the required investments of the concessionaires or reduction of revenues from annex activities. On average, toll levels were multiplied by 4 in ten years, a 15 percent yearly rate of increase which was about 40 percent faster than consumer price index (IGP-M) (Table 2.3). Tariff modifications under inflator yearly adjustments were responsible for about two thirds of the increase. Inflators progressed on par with inflation (Figure 2.4).

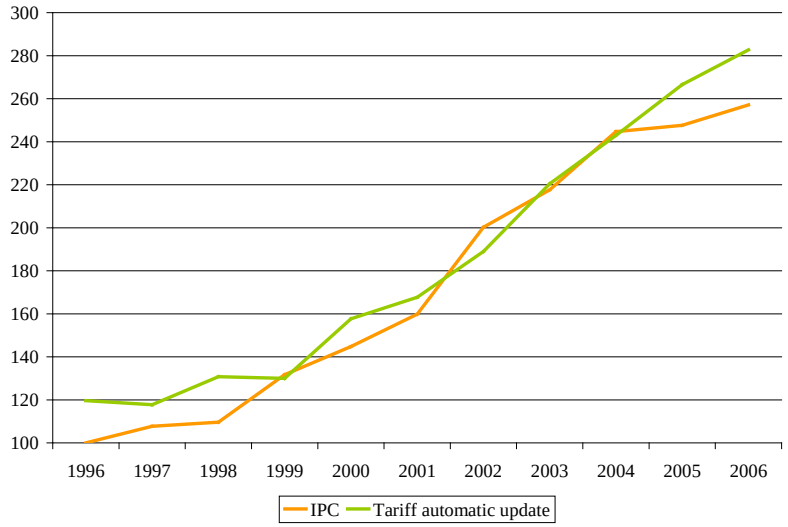
Table 2.3. Tariff evolutions under the first phase of concessions

	Contract signing date	Initial Tariff (R$)	Tariffs 2008 (R$ - ANTT website)	Inflation (IPC) since contract signing	Base escalation in real terms	Revisions led by DNER	Revisions led by ANTT	Total tariff evolution in real terms
Ponte	12/29/1994	0.78	3.5	230%	-4%	28%	11%	36%
Novadutra	10/31/1995	2.39	7.8	202%	-6%	13%	1%	8%
Concer	10/31/1995	1.91	6.7	202%	-9%	24%	1%	16%
CRT	11/22/1995	2.46	6.8	202%	-16%	10%	-6%	-9%
Concepa	03/04/1997	0.75	6	181%	26%	124%	1%	185%
Average				204%	-2%	43%	-1%	47%

Note: Base tariff for the Concepa concession was 1cR$/km at contract signing

Source: ANTT, World Bank calculations

Figure 2.4. Compared evolution of the consumer index and the tariff inflator (Dutra road)



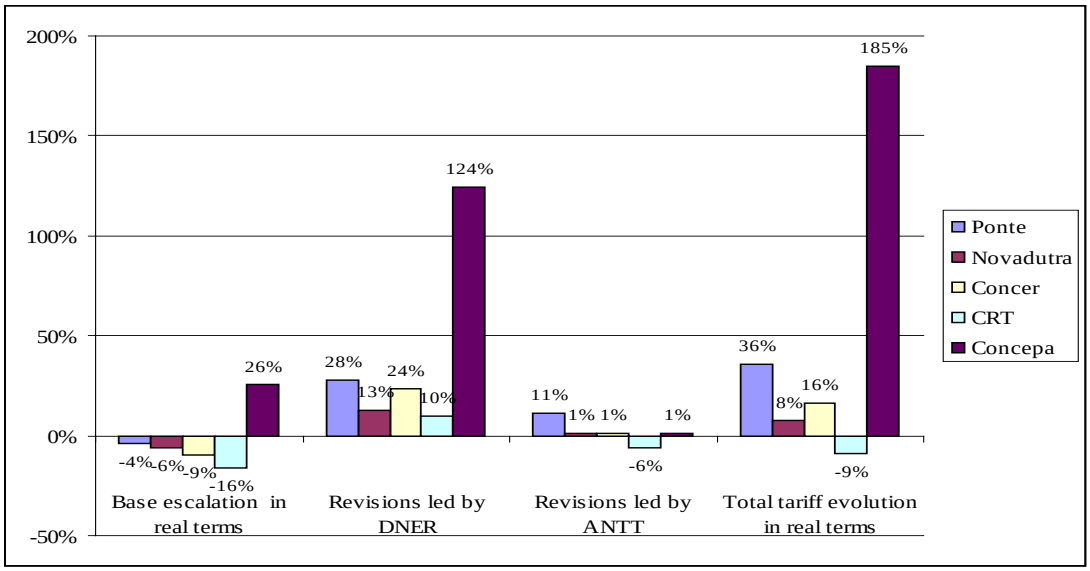
Source: ANTT, World Bank calculations

27. Real terms price increases originate from base tariff revisions (Figure 2.5). Revisions were substantial in the first years of the concession contracts, with an average 39 percent proportional increase of tariffs under DNER management. ANTT record proved much stricter, and average price escalation under *revisoes* was only 1.7 percent during the 2002-2006 period.

28. Extraordinary revenues remained limited (about 2 percent of total revenues for the NovaDutra) while reduction in tariffs were allowed to be marginal.

29. No mechanism allowed users to reap the benefits from the decrease in cost of capital nor from productivity gains.

Figure 2.5. Tariff evolutions under the first phase of federal concessions until 2008



Source: ANTT and World Bank calculations

High estimated rates of return

30. A first simulation of the rate of return of the NovaDutra concession was established in nominal terms taking into account: (i) observed and currently forecasted traffic revenues, (ii) a 1 percent yearly productivity gain on investments and operational costs, (iii) observed financing costs (with the strong hypothesis that the current debt structure of the sponsor (CCR) reflects the one of the concession), (iv) observed factor and inflation evolutions.

31. On this basis, it appears that reductions in traffic were reasonably compensated by gains in financing costs as effective returns on capital would appear around 16.3 percent.

32. Plugging into the simulation the unitary costs compatible with the ones observed for the second phase (see below) would imply a much higher rate of return on capital. A second simulation was realized, testing a 30 percent reduction in base unit costs compounded with a 3 percent annual productivity gain, applied to the data appearing in the ANTT monitoring spreadsheet, given by the concessionaire in its commercial proposition. These evolutions put base costs in 2007 at a level comparable with the results of the second phase of concessions.

Table 2.4. Simulation of financial returns on NovaDutra concession

	Contractual initial regulation parameters (real terms)	**Base simulation with low productivity gains**		**Simulation with high productivity gains**
		real terms	nominal terms	real terms
IRR on capital	17.58%	16.3%	27.0%	80%
IRR on equity	24% (estimated)	18.7%	29.5%	120%

Source: ANTT data and World Bank calculations

Conclusion

33. The first phase of federal road concessions gave the basis for the Brazilian road concession model and notably its regulation by contract. In many ways, this has been a success: (i) the private sector delivered to the users good quality roads while the country underwent a prolonged and rigorous fiscal adjustment program, (ii) DNER first, and then ANTT, created a large body of experience, regulations, and relatively clear regulatory mechanisms, and (iii) road concessions did not have to be renegotiated,[62] contrasting with the experience in several countries in Latin America such as Mexico, as well as some Brazilian states.

34. However, revisiting the first ten years of contract implementation, it appears also that road users did not get good value for their money as several large efficiency gains were not passed on to user prices, notably the decrease in the cost of capital and also probably large productivity gains in operations. In addition, investment allocation was somewhat distorted by the conjunction of local political pressure as well as contractual mechanisms favoring over-investment. Given the nature of the regulation, based on contract enforcement, it may not be possible to significantly reverse those trends before the concession contracts' ends, between 2020 and 2025.

[62] Under federal management, contract revisions were realized within their initial contractual framework. Contract restructuring occurred in state programs such as in Parana. Generally, renegotiation "occurs when the original contract and financial impact of a concession contract is significantly altered and such changes were not the result of contingencies spelled out in the contract." Cf. Guasch (2004).

III. EXPERIENCE OF THE CONCESSIONS LAUNCHED IN 2007 (2ND PHASE)

A. Main characteristics of the concessions

Concessions are mostly oriented toward operation and service rather than upgrade

35. The second phase of the federal road concessions program is composed of 7 segments ("lots") for a total of 2,600 km. It more than doubles the extension of the network under concession managed by the government, previously 1,482 km.

36. Concessions are private, set for 25 years, with costs shared by the federal government (limited to upgrades before initiation of the concession) and by part of the users through tolls. Financing risk is the responsibility of the concessionaire, but through the BNDES, the government can provide lending for up to 70 percent of investment costs. No co-financing mechanism for local investments is included.

37. Extension is in the 300-500 km range. Toll roads are of open toll systems, crossing both urban and rural areas, implying that a portion of the main roadway users (notably in urban areas) or side road users (parallel lanes) are not charged tolls. As traffic is mostly concentrated around agglomerations, concession cost is borne disproportionately by long-distance users through important cross-subsidies.

38. Bidding was realized simultaneously, after basic engineering and feasibility studies. Lowest base toll was the sole concession award criteria. To orient competition, a cap toll level was announced prior to the bidding. Concession award involves no monetary transfer to or from any public entity.

39. Toll level is the same at each toll gate, without consideration for the number of kilometers effectively traveled on the road, as in many open toll systems. Toll levels are increasing proportionally with the number of axes (a particularity of Brazil), penalizing the large trucks which are often the most efficient.

40. Concessions are brownfield with limited upgrade works. To reduce tariffs, tolls are levied only after completion of initial maintenance works (6 months – about $75,000/km). Over the first 6 contracts representing 2,400 km, 283 km are scheduled to be duplicated and 170 km are to be built (mostly urban rings), *id est* a total of 19 percent of the total extension. Total concession costs, excluding taxes and financing costs, are as follows:

Table 3.1. Breakdown of 2nd phase concession costs

	% of concession costs (excluding taxes & financial costs)
Improvements and new construction	7.5-25%
Rehabilitation and maintenance	20-33%
Operation	11-13%
User services	9-13%
Administration	11-16%
Toll collection	10-13%
Supervision, guarantees and insurances	7-8.5%

Source: ANTT, authors' calculations

41. Additional concession expenditures include: (i) *tributos* (contributions - an additional 11 percent); (ii) *impostos* (taxes - additional 15—20 percent); (iii) long-term remuneration of capital (additional 30 percent on the base of an 8.95 percent estimated WACC).

42. Long-term debt financing would mainly be provided by BNDES and/or international organizations (IDB, IFC).

Contracts allow for important flexibility

43. Traffic and financing risks are fully borne by the concessionaire (no traffic guarantee, revenue sharing, refinancing benefits sharing clauses) with no guarantee from the government or revenue sharing mechanisms. Sovereign risk (taxes - except income tax – and sector regulations) is borne by users. Construction risk is shared. Any additional revenues of the concessionaire are to be transferred in full to the user.

44. Contracts are regulated by ANTT on the basis of: (i) a strict price cap set contractually at the beginning of the concession (actually a mandatory tariff with no possibility of discounts); (ii) a guaranteed rate-of-return rule for modifications of the volumes or schedule of the investment program (PER) as defined at the beginning of the contract (Box 3.1).

45. Financial covenants of contracts are: (i) impossibility to transfer control shareholder rights during two years; (ii) control of main capital evolution decisions by ANTT; (iii) necessity to maintain a minimum capitalization. In addition, BNDES debt financing requires a 1.2 debt service coverage ratio (DSCR).

46. The concessionaire is not entitled to receive any transfer at the contractual end of the concession. Contract does not define formulas for computing compensation levels in case of cancellation of contract, which is left to the decision of the judiciary power. Thus, it probably lies somewhere between the book value of the assets and the expected revenues of the concession, minus the potential penalties and execution of the work guarantee. This absence of precise definition of end of concession payments introduces uncertainties in the allocation of concession risks between equity holders, debt holders and the conceding authority.

Box 3.1. Regulation mechanism: The economic and financial equilibrium principle

A mechanism introducing flexibility during the 25 years of the contract

- The concession contract includes obligations for the concessionaire in terms of performance standards as well as in required investments, defined in volume, quality and scheduling in the concession's investment program (PER). As part of the bids, the candidates submit an informed version of the PER that includes unit costs, as well as their own traffic forecasts taking into account their effective toll. Using a model company spreadsheet, this information is used to evaluate the projected rate of return of the concessionaire which value will serve as base for the rest of the concession.
- During project life, base toll levels can be revised to mainly take into account: (i) revisions of the investment program (PER), proposed or validated by the ANTT, (ii) additional resources received by the concessionaire, (iii) tax evolutions affecting the concession. Revisions could also occur in the case of the first phase of concessions in case of modifications of input prices and quantities. Impacts on financial equilibrium of the concession contract of such events are estimated, all other parameters supposedly set at the level proposed initially by the concessionaire (especially traffic and unit costs), and tariff is modified to maintain the rate of return of the concession at its initial level.
- As evaluations are realized on the basis of initially set parameters, and not on the basis of the observed, incentives of the contractor to optimize its productive efficiency are preserved.

A formulation with drawbacks

- As traffic, market unit costs and financing rates can widely change with time, the alignment of the incentives of the concessionaire and the needs of the user cannot be maintained in the long-run. A relative drop in interest rates or in unit prices will generate incentives for the concessionaire to over-invest, while a drop in traffic would have the opposite effect.
- As all investments are to be amortized by the end of the concession, late additions to the PER can generate a proportionally higher increase in toll levels.
- It remains unclear how this principle affects the incentives of the bidders to disclose their true offer.

B. Changes since the first phase of concessions

A more stable and promising macro and sector outlook

47. The second phase of concessions in 2007 was launched in much more favorable conditions than the first phase, 12 years before:

- Decrease of the country risk (1995: 10-15 percent, 1996: 5-10 percent to be compared with 200-250 base points in the end of 2007), containment of inflation (still 66 percent in 1996, below 5 percent since 2006)

- Creation of the ANTT in 2002, with successful experiences in consistently managing the first phase of concessions for five years, which helped reduce perceived regulatory risk.
- Good prospects for sustained growth of both GDP (4.5 percent year forecast to be compared with 2.5 percent for 1995-2004) as well as GDP per capita (about 3 percent forecast compared to 1 percent for 1995-2004) with subsequent expected increases in both households' vehicle equipment and demand for freight transport.
- Decrease in cost of debt financing through BNDES by 100 base points after implementation of PAC.

A more open and competitive bidding process

- Necessity for engineering companies to be present in the consortium relaxed: simple service provision agreement accepted.
- Participation from institutional investors, both Brazilian and foreign, clearly authorized.
- Use of the *leilao* procedure, namely permitting: (i) sequencing of bidding phases (financial offer first, technical second) for a faster process, (ii) no disclosure of competitors' names before bid opening, (iii) limitation of the possibilities for appeals (only one candidate's qualification scrutinized); (iv) realization by the efficient market exchange place *Bovespa*.
- Non serious proposals deterred by imposing: (i) a proposal guarantee, before financial opening; (ii) a performance guarantee, at contract signature.
- Increased competition in the market is apparently leading to reduced consumer prices and higher productive efficiency. Though, risk of low balling increased.

A better contractual risk management, with stronger emphasis on service levels

48. Allowance for better traffic risk management was introduced. Limited improvements in the balance between offer and demand as contract stipulates explicitly that ANTT can modify the timing and scope of capacity investments to take effective traffic into account. Yet, no regulation criterion is explicitly defined. Also, the concessionaire is given more flexibility in the location of the toll plazas (3 km radius).

49. Investment regulation was better defined: (i) non-mandatory works are those expenses that the concessionaire undertakes to reach the performance standards stipulated in the contract, such as pavement rehabilitation or user assistance. The concessionaire is free to select the technical solution that best allows him to meet those goals and develop the corresponding project, with ANTT acting to ensure quality upstream, and monitor results downstream. Those works are not subject to the economic equilibrium clause; (ii) mandatory works are those road upgrades that are included in the PER (mainly duplication, third lanes, urban rings, pedestrian footbridge as well as road intersections), and can be modified during the concession at the request of the ANTT. According to the contract, cost estimates for extensions/reductions of works shall be made according to the *global kilometric value of similar works* as included in the initial concessionaire's bid. As stated in the initial PER, those mandatory works should represent only 10—20 percent of all concessionaire expenses during the concession.

50. Limited increase in the amount of penalties for incompletion of contractual goals. Penalties have, at face value, increased tenfold, but their base unit – the concession toll level – strongly fell. As a result, while the daily penalty for a pothole remaining for more than 24 hours is R$350 to R$780 for a concession of the first phase, it increased to R$1,000 to R$2,900 in the second phase.

51. Tolls are to be readjusted on a yearly basis in line with the general consumer inflation index instead of a pool of roadwork cost indexes.

52. Better delegation and stronger monitoring of investment risks to the concessionaire is expected to lead to optimizations which should balance the increased cost of the risks for the private partner. Overall it is expected that this will reduce costs as well as reduce opportunities for contract revisions.

53. At the same time this will modify the oversight role of the ANTT, which will need to be gradually more substantial (to monitor compliance of projects with contract performance standards and national norms) rather than formal. While of relatively marginal importance during the first phase, monitoring performance standards should become an essential feature of ANTT's role, as contractors'

will face strong incentives for reducing scope of requisite and complimentary works. This might bring in a more contentious relationship.

Evolutions of required performance standards

54. Road condition monitoring is based on (i) IRI <2.7 mm/m (very low level given contractor's capacity to "finish" the works); (ii) *trincas* (cracks-absence for class 3, max 15 percent for class 2); (iii) *afundamento da trilha de roda* (sinking of surface deterioration<7mm); (iv) skid ($<50.10^{-2}$ mm/km – apparently little monitored in the first phase); (v) *degrau entre faixa direita e acostamento* (elevation between the roadway and shoulder<2.5cm); (vi) panelas (potholes-absence of excessively remedied areas), and (vii) characteristic deflexion ($< 50.10^{-2}$ mm). Dropped parameters used in first concessions include the *Indice de Gravidade Global* (IGG) and the *Valor de Serventia Atual* (VSA).

55. Highest existing service levels for medical (<15min) and mechanic (<20min) user assistance have been generalized.

56. Service level: minimum equivalent to DNIT's road level 1 (expressway = level 0), in other words HCM level C in plane or undulated areas, level D in mountain areas.

57. Performance standards are increasingly centered on road user comfort, a welcome move. The discussion should focus now: (i) for ANTT, on ways to monitor effectively performance, and especially IRI; (ii) for the government, on the regulation of the appropriate standards per volume and type of traffic.

Other contractual evolutions

58. Arbitration process clauses were dropped, given their partial incompatibility with local laws (arbitration left open the possibility of judiciary appeal), without being replaced by any equivalent process. This absence of a conciliatory (such as an expert panel) or arbitration process might become more problematic given the modified focus of the contract regulation.

C. Main lessons of the tendering process for the second concession phase

Lack of consensus on base principles and roles of institutions led to an extremely chaotic preparation process (Box 3.2)

Box 3.2. History of the preparation of the second phase of concessions

1.Road selection was approved by CND in 1997.
2.After completion of studies, first bidding documents were published in 1998 by DNER but CND required substantial modifications of bidding documents that lead to a first two years delay until new approval was given in 2000.
3.TCU suspended bidding processes in December 2000 to assess requests against tolling principles on selected roads as well as against economic appraisal studies, until August 2001.
4.Extinction of DNER and creation of ANTT in April 2002 led to new pause in the bidding process.
5.Studies being already old, MT decided to take the lead and request again from the CND a new approval of the base hypothesis of investments and tariffs levels.
6.With the change of the administration in January 2003, CND approval remained pending until MT decided to undertake new evaluation studies, in October 2003.
7.This new process led the MT (Departamento de outorgas) to complete new studies and organize a public audience in December 2004.
8.TCU required this time to analyze the studies themselves and formulated a series of questions and recommendations both on the principles and the technical hypotheses taken by the conceding authority.
9.Without clear views from the government on the timeline for the concession of those roads, during an ad-hoc meeting, government and TCU representatives decided to transfer the process to the ANTT for realizing adjustments in 2005.
10. With its new responsibilities, ANTT decided to review deeply the studies and organize new public consultations.
11. Discussions of technical studies with TCU led to modifications of technical and financial hypotheses (for example, pavement thickness, base costs, financial rates used for projections), with a view to lower the ceiling biding price. TCU authorization was given in 2006.
12. Government ordered in 2007 a new pause in the process to lower ceiling tariffs. Subsequent developments led to modification of the financial hypotheses of the studies without impacts on project design.
13. With final go-ahead signal given in the summer, bidding documents were published on August 20th 2007 and results were obtained two months later.
Source: adapted from Sernam (2007)

Strong competition appeared in the tendering process

59. Seven to fourteen propositions were received for each concession bid, an excellent level by international comparisons. Best discounts offered on cap tariff for each concession were in the 40 percent to 65 percent range, which came as a large surprise, but second and third bids came rather close (30—50 percent discounts). As a result of this positive outcome and also due to the drop in regulatory and country premiums, toll levels are bound to be at about 0.013 to 0.03R$/km for a light vehicle, and 0.05 to 0.12 R$/km for a 4 axel truck. As a comparison, those levels are about 3 to 8 times lower than the toll levels of the first phase of concessions (0.08 to 0.10R$/km) and even more compared to levels in the State of Sao Paulo (about 0.12R$/km), where this creates a clear competition between roads. When compared with world standards, those levels are set in the lowest range.

60. International opening of the bidding gave excellent results. Brazilian contractors appear the clear losers in this phase: 6 out of seven concessions were won by Spanish companies (OHL and Accionas), and only one was won by a Brazilian consortium (BRVias[63]). Both of the Spanish operators were already active in Brazil (in state concessions) and cannot be considered as newcomers.

61. As disclosed in the commercial proposals of the concessionaire, such discounts were partly permitted because of cost savings of 10—20 percent, including: (i) an optimization of the rehabilitation / maintenance cycle with more routine maintenance and less initial heavy works; (ii) strong reductions in administration costs; (iii) an optimization of user services provision through partial contracting out.

62. There is a risk that winning bidders might have been far too optimistic: (i) for OHL, by apparently forecasting traffic levels 50 to 100 percent higher than initially anticipated, with both a much higher base traffic and a more sustained long-term growth; (ii) for BRVias, by accepting a 4.1 percent unnaturally low real rate of return on equity, to be compared with 10.5 percent for OHL and 12 percent anticipated by ANTT (real rates). This apparently forces BRVias to consider refinancing its long-term debt three times to maintain its debt service cover ratio and meet its investment targets (from commercial proposals).

63. All concessions partook in project finance. Given the limited returns on capital of the project and the apparently short amortization period of the available debt lines (concessionaires did not consider more than 12 years), forecasted project gearing is constrained. Consequently, in concessionaires' proposals, equity capital would account for 35 percent to 50 percent of overall project financing.

64. All concessions achieved financial close within a few months after contract signing, refinancing their bridge loans with support from BNDES.

How much can we explain the high discounts obtained in the tendering process?

65. There is a possibility that each of the following factors might explain part of the results: (i) ANTT traffic forecasts were pessimistically too low (surveys were carried out in 2004, 4 years before concession start, and at the end of a macroeconomic crisis), (ii) benchmark unitary construction prices were too high (discounts commonly observed at contract award were not reflected given the high frequency of contract additives), (iii) private sector management brings sizeable life-cycle savings, (iv) important liquidities in the international markets and especially in the Spanish concessionaires, as well as a further decrease of country risk allowed a larger drop of the capital equity price than expected by ANTT.

66. However, the detailed proposals of the concessionaires allude that those factors cannot account by themselves for all the inconsistencies observed, especially the extremely high traffic forecasts of OHL and the low returns to capital of BRVias. In case the initial traffic forecasts of the ANTT were too firm, concessionaires would be unable to endure simultaneously their debt service and rehabilitation investments, degrading concession quality as well as negative returns on equity. Economic IRR of the Sao Paulo-Curitiba concession would barely reach 0.27 percent, and 1.2 percent

[63] Consortium composed in 3 equal proportions: *WTorre Engenheira*, a real estate engineering company, *Splice do Brasil*, a specialized telecommunication / electronic company, and *Comporte Participacoes S.A.,* a vehicle controlled by the Constantino brothers, who fully control GOL.

for the BR-153, compromising BNDES lending as well as depriving sponsors from any satisfactory returns.

Table 3.2. Results of the tendering of the second phase of concessions

Road identificatioin	BR-116/SP/PR Sao Paulo-Curitiba			BR-381/MG/SP Belo Horizonte-Sao Paulo			BR-116/376/PR - BR/101/SC Curitiba-			BR-101/RJ Div. RJ/ES - Pte Pres. Costa e Silva			BR-153/SP Divisa MG/SP-Divisa SP/PR			BR-116/PR/SC Curitiba - Divisa SC/RS		
Number of propositions received	13			14			17			7			9			9		
Winning proposition	OHL			OHL			OHL			OHL			BRVias			OHL		
Maximum tariff as specified in tender document	R$ 2.685			R$ 2.884			R$ 2.754			R$ 3.824			R$ 4.083			R$ 4.188		
Winning tariff	**R$ 1.364**			**R$ 0.997**			**R$ 1.028**			**R$ 2.258**			**R$ 2.450**			**R$ 2.540**		
Tariff reduction obtained	49.20%			65.43%			62.67%			40.95%			40.00%			39.35%		
Average base tariff (R$/km)	R$ 0.020			R$ 0.014			R$ 0.013			R$ 0.035			R$ 0.030			R$ 0.031		
	ANTT studies	**OHL**	**Dif**	**ANTT studies**	**OHL**	**Dif**	**ANTT studies**	**OHL**	**Dif**	**ANTT studies**	**OHL**	**Dif**	**ANTT studies**	**BrVias**	**Dif**	**ANTT studies**	**OHL**	**Dif**
Traffic (Millions)																		
Average daily traffic equivalent first year	40	62	**55%**	35	65	**86%**	31	65	**110%**	15	20	**33%**	9	11	**22%**	9	14	**56%**
Average daily traffic equivalent year 25	173	341	**97%**	151	350	**132%**	123	323	**163%**	62	109	**76%**	40	51	**28%**	39	78	**100%**
Toll revenues (R$ millions)																		
Year 10	306	258	**-16%**	288	199	**-31%**	239	188	**-21%**	162	137	**-15%**	108	74	**-31%**	113	110	**-3%**
Year 25	466	465	**0%**	435	350	**-20%**	340	332	**-2%**	239	247	**3%**	166	127	**-23%**	166	199	**20%**
Investiments (R$ millions)																		
Road investments	1,296	1,320	**2%**	873	627	**-28%**	869	855	**-2%**	773	670	**-13%**	443	381	**-14%**	378	374	**-1%**
Maintenance	611	394	**-36%**	824	483	**-41%**	489	350	**-28%**	262	261	**0%**	222	219	**-1%**	195	230	**18%**
Buildings	58	77	**33%**	107	99	**-7%**	54	75	**39%**	45	50	**11%**	38	19	**-50%**	49	48	**-2%**
Equipment	202	109	**-46%**	245	135	**-45%**	175	98	**-44%**	113	74	**-35%**	98	95	**-3%**	126	82	**-35%**
Total over 25 years	2,169	1,902	**-12%**	2,051	1,345	**-34%**	1,589	1,378	**-13%**	1,194	1,056	**-12%**	801	715	**-11%**	749	735	**-2%**
Operational costs (R$ millions)																		
Road maintenance	227	286	**26%**	317	345	**9%**	216	282	**31%**	111	205	**85%**	97	174	**79%**	119	233	**96%**
User services	314	328	**4%**	383	405	**6%**	255	273	**7%**	212	241	**14%**	173	161	**-7%**	207	235	**14%**
Toll collection	366	335	**-8%**	472	383	**-19%**	326	342	**5%**	246	254	**3%**	151	95	**-37%**	182	215	**18%**
Administration	483	300	**-38%**	483	306	**-37%**	483	286	**-41%**	323	248	**-23%**	254	219	**-14%**	254	229	**-10%**
Other operational costs	780	639	**-18%**	886	680	**-23%**	672	539	**-20%**	407	340	**-16%**	268	179	**-33%**	308	296	**-4%**
Total over 25 years	2,172	1,890	**-13%**	2,543	2,122	**-17%**	1,954	1,724	**-12%**	1,301	1,290	**-1%**	945	830	**-12%**	1,072	1,210	**13%**
Project economics (R$ millions)																		
Resultado liquido total apos impostos	2,270	2,038	**-10%**	1,786	1,167	**-35%**	1,570	1,260	**-20%**	1,050	870	**-17%**	666	260	**-61%**	665	658	**-1%**
Primeir ano de tesoria positiva	5	6		6	6		5	6		5	5		6	7		5	6	
Payback (eco)	14	14		15	15		14	15		15	16		16	20		15	15	
TIR (eco) real	8.95%	**8.68%**		8.95%	**8.55%**		8.95%	**8.00%**		8.95%	**8.01%**		8.95%	**4.09%**		8.95%	**8.64%**	
Project financing (R$ millions)																		
Bridge loan - Total	166			155			135			78			61			84		
Bridge loan - Real interest rate	7.7%			7.7%			7.7%			7.7%			?			7.7%		
Debt provider	BNDES			BNDES			BNDES			BNDES			BNDES / BID			BNDES		
Total initial debt	568			396			396			283			331			213		
Debt - interest rate	5.2%			5.2%			5.2%			5.2%			?			5.2%		
Debt - Spread over TJLP	3.0%			3.0%			3.0%			3.0%			?			3.0%		
Debt - Amortization period	12			11			12			12			21			11		
Total estimated necessary equity	564			252			252			197			176			159		
Payback equity	15			16			16			17			22			16		
IRR equity (real)	**10.2%**			**10.4%**			**10.2%**			**9.5%**			**4.2%**			**10.3%**		

Source: ANTT, authors' calculations

67. Uncertainties are the following: (i) are those offers viable in the long-term and if not, who will bear the consequences? And (ii) do the parameters detailed in the commercial offers reflect the true economic equilibriums of the offers? and if not why?

68. Additional factors that could explain the levels of the offers are the following:[64]

- *Winner's curse* is largely excluded for OHL as the group already manages 1,100 km of concessions in Brazil and has thus ample insider information. This remains possible for BRVias, whose sponsors do not have the same experience.
- *Low balling* risks are unclear. On the one hand, no contract of the first phase of concessions appears to have been substantially renegotiated by ANTT (not accounting for contractual revisions of the PER) and consolidation of the agency should further decrease risks. As an important caveat, as OHL will be managing now 50 percent of the Federal program and a third of the total Brazilian highways under concession, its size might make it "too big to fail" in the eyes of the government.
- *Forecasting investment reduction*. Strategic manipulation of the economic equilibrium revision clause appears possible, as incentives to decrease investments necessities will be important for all

[64] See Estache & Rus (2000), for a general discussion

of the concessionaires. Moreover, some of the concessionaires' assumptions already appear unreasonable, such as a plan for heavy pavement rehabilitation works (50 to 70 Million R$/year) in the last five years of OHL concessions.

- *Contractor sponsor interest prevailed.* Unclear risk sharing due to the absence of compensation clause in case of a concession's early termination may lead a contractor sponsor to artificially boost construction costs and projected revenues to ensure a fatter compensation by the government in case of failure (as courts are more likely to settle on the book value of assets rather than on the discounted expected cash-flows). This provision would act as an implicit government traffic risk guarantee, in which the trigger level is actually manipulated by a concessionaire's proposal. As OHL covers construction and operation activities, expected benefits from its construction activities might compound with this guarantee to reduce impacts of traffic risks on society.
- *Strategic move*. Given the strength of the competition, actors might have had strategic incentives to accept apparently high risks and low returns: (i) for existing concessionaires, optimizing in the long run use of productive factors, as first phase concessions are already halfway through their life-cycle; (ii) for international actors, to consolidate implementation on the emerging Brazilian market; (iii) for newcomers, to enter a developing market and hedge one transport mode against the other (BRVias – GOL).

69. Whatever the real rationale for those offers, in this context, challenges for ANTT will differ from first phase concessions, and include: (i) ensuring timeliness and quality of concessionaire's projects and works (especially for BRVias), (ii) efficiently monitoring traffic, concessionaire's performance and enforcing penalties when necessary, (iii) equating investments to the true necessities of demand, resisting pressures to reduce investments especially at times when large shares of operational revenues are dedicated to debt repayments, (iv) ensuring that financial closes are realized in ways that preserve the long-term concessions' interests.

70. As those concessions will be financially more fragile than the first phase of concessions, the risk of important renegotiation of contractual terms, or even a public bailout, cannot be excluded. The experience of Mexico shows how strong competition did not necessarily translate into good competition (Box 3.3).

Box 3.3. Poor Design, a Hurried Pace, and Financial Disaster: Renegotiation in Mexico's Highway Program

In 1997 the Mexican government announced that it would spend US$3.3 billion over the next 30 years to restructure the financing of 52 highways built under private concessions of toll roads in the early 1990s. This renegotiation and bailout of private operators followed a program riddled with design problems. The first was that concessions were awarded to the operators that submitted the shortest time to operate each concession—a questionable criterion by any economic principle.

The second problem was that the government provided extremely optimistic guarantees of traffic volumes, implicit insurance for construction cost overruns, and a state-run banking sector that provided loans without detailed analysis of the structure and sustainability of the projects being financed. Finally, the hurried pace of the program led to incomplete designs and specifications for road construction, and rushed engineering studies and hasty cost projections created ample opportunity for padding budgets. The resulting bids covered very short concession periods (with most running 6–12 years, although one bid was for just 18 months!), caused significant cost overruns, required high tolls to support the short concession periods, and—as should have been anticipated—culminated in economic and financial disaster. Mexico's 1994 financial crisis accelerated the problem. The government had to retake nearly 80 percent of the concessions at an estimated cost of US$7 billion to US$12 billion. In addition, questions have been raised about the transparency of the program.

Extract from Guasch (2004)

D. Comparison of tariffs from the two phases

71. While the first phase of concessions had been marked by the dominance of local construction companies, a constrained financial market, an uncertain growth outlook and an inexistent sector history, ten years later, the second phase was initiated under completely changed auspices. With existing groups looking for opportunities to invest their operating excesses in new projects, international players eager to invest in the promising Brazilian market and an efficient regulatory

framework, competition was fierce and led prices to drop. The comparison of two of the main concessions of each phase brings to light what factors, at first glance, allowed prices to drop four fold.

Nova Dutra (Rio-São Paolo) vs. Fernão Dia (Rio-Belo Horizonte)

72. The two roads show similar profiles in terms of distance and physical characteristics. It is difficult to fully compare traffic (as measured in base toll units) as the concessionaire of the Fernao Dia included in its financial forecasts traffic twice as high as the ANTT's own forecasts. On the base of the concessionaire's forecast, traffic per kilometer at concession start would be 50 percent higher on the Fernao Dia.

73. Base tariffs were set in 2007 at 7.8 R$ per toll plaza (0.098 R$/km) for the Nova Dutra and 1.36 R$ (0.019 R$/km) for the Fernao Dia, that is to say five times lower.

74. Plugging into the financial models of the new concession the values observed for the previous one at constant prices, it appears that one quarter of the tariff differential is accounted for by the difference in traffic, another quarter by the different financial conditions at contract signing, and the remaining half by the difference in investment and operation unit costs.[65]

75. Comparison with ANTT initial forecasts and with other roads concessions of the second phase brings similar lessons (see tables in Annex I). Particularly striking is the drop in concession costs by 60 to 80 percent, even using ANTT more prudent estimates.

Table3.4. Comparison of cost structure of 1st and 2nd phases concessions at constant prices Nova Dutra and Fernao Dia highways

		Dutra (ANTT 1997 data in 2007 prices)	Fernao Dia (comercial proposition of winner)	%	Fernao Dia (ANTT estimations before tendering)	%
1.	**General data**					
	Length	402	562		562	
	Length / toll gate	80	70		70	
2.	**Forecast traffic (concessionaire's data)**					
	Base toll units					
	Traffic equivalent in second year per km	162,000	244,000	51%	132,000	-19%
	Traffic equivalent in tenth year per km	246,000	385,000	57%	178,000	-28%
	Traffic equivalent in twentieth year per km	315,000	562,000	78%	245,000	-22%
3.	**Investments (concessionaire's data)**					
	R$ 2008/km/year					
	Road rehabilitation	115,000	54,000	-53%	92,000	-20%
	Improvements	97,000	19,000	-80%	25,000	-74%
	Operating necessities	60,000	24,000	-60%	29,000	-52%
	Total	**272,000**	**96,000**	**-65%**	**146,000**	**-46%**
4.	**Operational costs (concessionaire's data)**					
	R$ 2008/km/year					
	Road maintenance	132,000	25,000	-81%	22,000	-83%
	Operation and services	472,000	104,000	-78%	134,000	-72%
	including administration costs	*114,000*	*22,000*	*-81%*	*34,000*	*-70%*
	including toll collection costs	*72,000*	*27,000*	*-63%*	*34,000*	*-53%*
	Including costs of services to users	*106,000*	*29,000*	*-73%*	*27,000*	*-75%*
	Total	**604,000**	**129,000**	**-79%**	**156,000**	**-74%**
5.	**Total costs including guarantees, police and fiscalization**					
	R$ 2008/km/year	**914,000**	**247,000**	**-73%**	**327,000**	**-64%**
6.	**Economic & financial data**					
	Base tariff in 2008	**7.80**	**1.36**	**-83%**	**2.88**	**-63%**
	IRR of concession (not accounting for capital structure)	**17.58**	**8.55**	**-51%**	**8.95**	**-49%**

[65] Simulations based on the financial model developed by ANTT for monitoring purposes, using data from the commercial offers of the concessionaires.

Table 3.4. Detailed Comparison of 1st and 2nd Phase Cost Structures and Tariffs on of 1st and 2nd Phase Cost Structures and Tariffs

	First round: (Dutra) data from ANTT spreadsheet		Second round: data from commercial propositions					
	R$ 1995	R$ 2008 (actualized with contractual inflator)	BR-116/SP/PR Sao Paulo-Curitiba	BR-381/MG/SP Belo Horizonte-Sao Paulo	BR-116/376/PR - BR/101/SC Curitiba-Florianopolis	BR-101/RJ Div. RJ/ES - Pte Pres. Costa e Silva	BR-153/SP Divisa MG/SP-Divisa SP/PR	BR-116/PR/SC Curitiba - Divisa SC/RS
Road length (km)	402		401.6	562.1	382.3	320.1	321.6	412.7
A. Total costs over 25 years (millions R$)								
Investment and operation costs	2,984	8,784	3,793	3,468	3,103	2,347	1,546	1,946
Road rehabilitation, maintenance and monitoring	*844*	*2,484*	*1,128*	*1,224*	*964*	*674*	*578*	*722*
Improvements	*288*	*848*	*940*	*319*	*585*	*509*	*232*	*155*
Toll collection	*542*	*1,596*	*335*	*384*	*342*	*254*	*96*	*216*
Road operation	*316*	*929*	*348*	*415*	*318*	*243*	*154*	*240*
Fiscalization and police	*91*	*267*	*251*	*244*	*194*	*79*	*56*	*59*
User services	*462*	*1,359*	*328*	*406*	*273*	*241*	*161*	*236*
Administration	*407*	*1,199*	*379*	*406*	*362*	*299*	*239*	*277*
Guarantees and securities	*35*	*102*	*84*	*71*	*63*	*48*	*29*	*40*
Aditional costs	3,936	11,587	3,736	2,262	2,381	1,663	577	1,273
Taxes: tributos	*651*	*1,915*	*648*	*493*	*472*	*345*	*183*	*277*
Taxes: impostos	*1,351*	*3,977*	*1,049*	*601*	*649*	*447*	*134*	*338*
Capital Costs	*1,935*	*5,695*	*2,039*	*1,168*	*1,261*	*870*	*261*	*658*
Total expenses	6,921	20,371	7,529	5,730	5,484	4,009	2,124	3,219
B. Average costs per year and per kilometer (R$)								
Investment and operation costs	297,000	873,000	378,000	247,000	325,000	293,000	193,000	189,000
Road rehabilitation, maintenance and monitoring	*84,000*	*247,000*	*112,000*	*87,000*	*101,000*	*84,000*	*72,000*	*70,000*
Improvements	*29,000*	*84,000*	*94,000*	*23,000*	*61,000*	*64,000*	*29,000*	*15,000*
Toll collection	*54,000*	*159,000*	*33,000*	*27,000*	*36,000*	*32,000*	*12,000*	*21,000*
Road operation	*31,000*	*92,000*	*35,000*	*30,000*	*33,000*	*30,000*	*19,000*	*23,000*
Fiscalization and police	*9,000*	*27,000*	*25,000*	*17,000*	*20,000*	*10,000*	*7,000*	*6,000*
User services	*46,000*	*135,000*	*33,000*	*29,000*	*29,000*	*30,000*	*20,000*	*23,000*
Administration	*41,000*	*119,000*	*38,000*	*29,000*	*38,000*	*37,000*	*30,000*	*27,000*
Guarantees and securities	*3,000*	*10,000*	*8,000*	*5,000*	*7,000*	*6,000*	*4,000*	*4,000*
Aditional costs	392,000	1,154,000	373,000	161,000	249,000	208,000	72,000	124,000
Taxes: tributos	*65,000*	*191,000*	*65,000*	*35,000*	*49,000*	*43,000*	*23,000*	*27,000*
Taxes: impostos	*134,000*	*396,000*	*105,000*	*43,000*	*68,000*	*56,000*	*17,000*	*33,000*
Capital Costs	*193,000*	*567,000*	*203,000*	*83,000*	*132,000*	*109,000*	*32,000*	*64,000*
Total expenses	689,000	2,027,000	751,000	408,000	574,000	501,000	265,000	313,000
C. Repartition of concession costs								
Investment and operation costs	43%	43%	50%	61%	57%	59%	73%	60%
Road rehabilitation, maintenance and monitoring	*12%*	*12%*	*15%*	*21%*	*18%*	*17%*	*27%*	*22%*
Improvements	*4%*	*4%*	*12%*	*6%*	*11%*	*13%*	*11%*	*5%*
Toll collection	*8%*	*8%*	*4%*	*7%*	*6%*	*6%*	*5%*	*7%*
Road operation	*5%*	*5%*	*5%*	*7%*	*6%*	*6%*	*7%*	*7%*
Fiscalization and police	*1%*	*1%*	*3%*	*4%*	*4%*	*2%*	*3%*	*2%*
User services	*7%*	*7%*	*4%*	*7%*	*5%*	*6%*	*8%*	*7%*
Administration	*6%*	*6%*	*5%*	*7%*	*7%*	*7%*	*11%*	*9%*
Guarantees and securities	*1%*	*1%*	*1%*	*1%*	*1%*	*1%*	*1%*	*1%*
Aditional costs	57%	57%	50%	39%	43%	41%	27%	40%
Taxes: tributos	*9%*	*9%*	*9%*	*9%*	*9%*	*9%*	*9%*	*9%*
Taxes: impostos	*20%*	*20%*	*14%*	*10%*	*12%*	*11%*	*6%*	*11%*
Capital Costs	*28%*	*28%*	*27%*	*20%*	*23%*	*22%*	*12%*	*20%*

Table 3.4 (cont'd). Detailed Comparison of 1st and 2nd Phase Cost Structures and Tariffs on of 1st and 2nd Phase Cost Structures and Tariffs

	First round: (Dutra) data from ANTT spreadsheet		Second round: data from ANTT's indicative studies					
	R$ 1995	R$ 2008 (actualized with contractual inflator)	BR-116/SP/PR Sao Paulo-Curitiba	BR-381/MG/SP Belo Horizonte-Sao Paulo	BR-116/376/PR - BR/101/SC Curitiba-Florianopolis	BR-101/RJ Div. RJ/ES - Pte Pres. Costa e Silva	BR-153/SP Divisa MG/SP-Divisa SP/PR	BR-116/PR/SC Curitiba - Divisa SC/RS
Road length (km)	**402**		**401.6**	**562.1**	**382.3**	**320.1**	**321.6**	**412.7**
A. Total costs over 25 years (millions R$)								
Investment and operation costs	**2,984**	**8,784**	**4,342**	**4,594**	**3,543**	**2,496**	**1,747**	**1,822**
Road rehabilitation, maintenance and monitoring	*844*	*2,484*	*1,201*	*1,634*	*984*	*522*	*483*	*514*
Improvements	*288*	*848*	*951*	*402*	*607*	*636*	*291*	*191*
Toll collection	*542*	*1,596*	*366*	*472*	*326*	*247*	*151*	*183*
Road operation	*316*	*929*	*593*	*754*	*545*	*366*	*256*	*320*
Fiscalization and police	*91*	*267*	*251*	*244*	*194*	*79*	*56*	*59*
User services	*462*	*1,359*	*314*	*383*	*256*	*212*	*174*	*207*
Administration	*407*	*1,199*	*542*	*591*	*538*	*369*	*292*	*303*
Guarantees and securities	*35*	*102*	*122*	*115*	*93*	*64*	*43*	*44*
Aditional costs	**3,936**	**11,587**	**4,172**	**3,394**	**2,936**	**1,976**	**1,269**	**1,275**
Taxes: tributos	*651*	*1,915*	*733*	*688*	*558*	*385*	*260*	*267*
Taxes: impostos	*1,351*	*3,977*	*1,169*	*920*	*808*	*540*	*343*	*342*
Capital Costs	*1,935*	*5,695*	*2,271*	*1,787*	*1,571*	*1,051*	*667*	*666*
Total expenses	**6,921**	**20,371**	**8,514**	**7,988**	**6,480**	**4,472**	**3,016**	**3,097**
B. Average costs per year and per kilometer (R$)								
Investment and operation costs	**297,000**	**873,000**	**433,000**	**327,000**	**371,000**	**312,000**	**217,000**	**177,000**
Road rehabilitation, maintenance and monitoring	*84,000*	*247,000*	*120,000*	*116,000*	*103,000*	*65,000*	*60,000*	*50,000*
Improvements	*29,000*	*84,000*	*95,000*	*29,000*	*64,000*	*79,000*	*36,000*	*19,000*
Toll collection	*54,000*	*159,000*	*37,000*	*34,000*	*34,000*	*31,000*	*19,000*	*18,000*
Road operation	*31,000*	*92,000*	*59,000*	*54,000*	*57,000*	*46,000*	*32,000*	*31,000*
Fiscalization and police	*9,000*	*27,000*	*25,000*	*17,000*	*20,000*	*10,000*	*7,000*	*6,000*
User services	*46,000*	*135,000*	*31,000*	*27,000*	*27,000*	*27,000*	*22,000*	*20,000*
Administration	*41,000*	*119,000*	*54,000*	*42,000*	*56,000*	*46,000*	*36,000*	*29,000*
Guarantees and securities	*3,000*	*10,000*	*12,000*	*8,000*	*10,000*	*8,000*	*5,000*	*4,000*
Aditional costs	**392,000**	**1,154,000**	**415,000**	**241,000**	**307,000**	**247,000**	**158,000**	**124,000**
Taxes: tributos	*65,000*	*191,000*	*73,000*	*49,000*	*58,000*	*48,000*	*32,000*	*26,000*
Taxes: impostos	*134,000*	*396,000*	*116,000*	*65,000*	*85,000*	*68,000*	*43,000*	*33,000*
Capital Costs	*193,000*	*567,000*	*226,000*	*127,000*	*164,000*	*131,000*	*83,000*	*65,000*
Total expenses	**689,000**	**2,027,000**	**848,000**	**568,000**	**678,000**	**559,000**	**375,000**	**301,000**
C. Repartition of concession costs								
Investment and operation costs	**43%**	**43%**	**51%**	**58%**	**55%**	**56%**	**58%**	**59%**
Road rehabilitation, maintenance and monitoring	*12%*	*12%*	*14%*	*20%*	*15%*	*12%*	*16%*	*17%*
Improvements	*4%*	*4%*	*11%*	*5%*	*9%*	*14%*	*10%*	*6%*
Toll collection	*8%*	*8%*	*4%*	*6%*	*5%*	*6%*	*5%*	*6%*
Road operation	*5%*	*5%*	*7%*	*9%*	*8%*	*8%*	*8%*	*10%*
Fiscalization and police	*1%*	*1%*	*3%*	*3%*	*3%*	*2%*	*2%*	*2%*
User services	*7%*	*7%*	*4%*	*5%*	*4%*	*5%*	*6%*	*7%*
Administration	*6%*	*6%*	*6%*	*7%*	*8%*	*8%*	*10%*	*10%*
Guarantees and securities	*1%*	*1%*	*1%*	*1%*	*1%*	*1%*	*1%*	*1%*
Aditional costs	**57%**	**57%**	**49%**	**42%**	**45%**	**44%**	**42%**	**41%**
Taxes: tributos	*9%*	*9%*	*9%*	*9%*	*9%*	*9%*	*9%*	*9%*
Taxes: impostos	*20%*	*20%*	*14%*	*12%*	*12%*	*12%*	*11%*	*11%*
Capital Costs	*28%*	*28%*	*27%*	*22%*	*24%*	*23%*	*22%*	*22%*

IV. PUBLIC POLICY ISSUES AND OPTIONS

Introduction

1. This note is a review of public policy issues and options for public-private partnerships in roads, in light of Brazil's and other countries' experiences with road concessions. It aims to contribute to the current debate on road concessions under the new legal framework of the PPP law.

2. All Public Private Partnerships in Brazil were, until recently, awarded within the framework of the Concession Law of 1995. This law specifically forbids direct public subsidies. Road concessions have therefore been restricted to projects which could be made viable from user toll revenues. Because of the high cost of capital in Brazil, and low average per capita income, the only viable model was to concession existing highways for rehabilitation and maintenance, and where feasible, for some minimum upgrading. Road users have by and large been satisfied with the improved maintenance condition of those highways, but they have consistently complained about the inequitable toll system and the high toll rates on those previously free highways (see Part I.A of the report).

3. The PPP law was approved in 2006 to allow for private participation in projects which, in order to turn them financially attractive, would require some form of public sector participation, including possible direct government subsidies. This new legal framework, together with the reduced cost of capital and increased motorization rates, has several important implications for the government's strategy in the sector.

4. First, the scope for private participation could now be extended to less-trafficked roads where revenues from user tolls would not be sufficient to cover all the concession costs, or even to roads where tolling would not be efficient and therefore not be collected.

5. Second, the scope of projects could now be broadened, up to the construction of new, high standard, access controlled expressway (greenfield project) which, under certain conditions, might be more efficient and equitable than the tolling and widening of an existing highway (brownfield project).

6. Third, the scope of public participation could now be expanded from sharing in some risks, particularly the key traffic or revenue risk over which a private concessionaire has little or no control, to various forms of direct or indirect payments to the private operator, if and as needed, to turn economically-feasible projects attractive to private investors.

Scope of Private Participation

7. The scope of the first phase of the federal road concession program was limited to five high-traffic sections, which did not need major upgrading works, and which had been previously tolled by DNER. The selection helped minimize traffic risk at a time of uncertain economic prospects.

8. The second phase of the program, which was bided and contracted in 2007, had actually been defined in the mid-1990s shortly after the successful bidding of the first phase. Its scope consisted of six major interstate highway sections totalling about 2,400 km, with substantial capacity investment needs. But because of the high cost of private capital at that time, the government decided to undertake the main capacity works, including duplication of important sections, under standard public works contracts financed through multilateral (IDB) loans.

9. Another major problem resulting from these two phases of road concessions awarded under the Concession law is the disparity and inequity of toll rates. Since the award criterion was the lowest base toll rate, first phase contracts awarded at a time of very high cost of capital and a relatively limited competition among Brazilian contractors have resulted in much higher toll rates than those recently awarded under phase 2, with a much reduced cost of capital and real competition from foreign bidders. This situation raises the issue of the sustainability over time of such disparate toll rates (see Part I D of the main text for a review of the toll rate issues).

10. The new legal framework of the PPP law would in principle allow the government to establish public private partnerships on any road, independently of its current condition, traffic level, and investment requirements, and to maintain toll rates (or no tolls) in line with users' willingness to pay,

coherent among concessions and service levels offered, and that would be efficient and equitable among user categories. For this purpose, three types of instruments are now available.

11. First, private concession contracts could continue to be awarded under the framework of the Concession law where traffic is sufficient to raise enough toll revenues to cover all the capital and current expenditures needed under the project.

12. Second, public private partnership contracts could be awarded under the framework of the PPP law, where some form of public participation would be needed, in addition to tolls, to cover all project expenditures.

13. Third, public-private partnership contracts could also be awarded under the framework of the PPP law, where tolling is not an efficient alternative and would not be implemented, and public payments would be made to the private partner on the basis of pre-defined outputs, which can include a combination of asset availability and performance indicators. This form of contract could replace the existing form of performance/output-based public contracts (the so-called CREMA – rehabilitation and maintenance contracts) where a contract duration of more than five years would be suitable.

14. In view of these new opportunities, the Ministry of Transport could develop a PPP roads strategy which would define clear objectives for a PPP program in the sector, including the conditions under which the above instruments would be used. For this purpose, MT could first formulate coherent policies regarding service levels and toll rates, consistent with user stated preferences and willingness to pay for such services (see Part I and Annex III). It could also define minimum traffic volumes below which tolling (possibly depending on technology) would be considered inefficient. A multi-year PPP program could then be drafted on this basis, in order to provide guidance to ANTT and DNIT in developing and implementing their own programs in a coherent manner.

Scope of Projects

15. In the first phase of the program, again due to the very high cost of capital at that time, concessionaire obligations were essentially limited to the rehabilitation and maintenance of the existing road. The only noticeable exception had been some (marginal) capacity expansion works included in the contract for the very high traffic (Rio – Sao Paulo) Dutra highway.

16. In the second phase of the program, after major capacity investments were made under traditional public works contracts, concessionaires' obligations were also essentially limited to rehabilitation and maintenance, with upgrading works representing only 7.5 to 25 percent of total project costs (see Annex III).

17. This open toll road concession model, which minimizes investment costs (by improving an existing highway) and therefore average toll rates, is generally efficient (depending on traffic growth and urbanization rates) compared to the construction of a new, access-controlled (greenfield) toll road. But it also has drawbacks, particularly with regard to equity, service levels and safety, in particular:

- a reluctance of users to pay for a previously free road, especially where improvements are minimal;
- reduced traffic speed and service level, particularly in urban areas, due to conflicts with local traffic and pedestrians;
- inadequate traffic safety due to numerous, uncontrolled accesses to the roadway;
- traffic disruptions during upgrading and widening works, which can be excessive on sections operated at or close to congestion, and
- unfair toll payments, poorly related to the amount of road use (see below).

18. Tolls on open toll road concessions must be collected at toll plazas located on the main roadway (accesses to the road are too numerous to be controlled). In order to maintain an acceptable service level on the roadway (since most users have to stop at the toll gate for payment), and to keep the efficiency of the toll system (a ratio of toll revenues net of collection costs over gross revenues) sufficiently high to justify tolling, toll plazas must be located at some distances, generally between 30 and 100 km. As a result, since all users of a given vehicle category passing through the toll plaza pay the same toll, independently of the distance driven on that road, the actual toll rate per km of road

use can vary widely, making such tolling system very inequitable. In order to avoid the problem with the numerous short distance daily trips in urban areas, toll plazas have been located away from urban areas. But since concessionaires are generally also responsible for the urban sections of the highway, long distance traffic is de facto subsidizing urban traffic. These equity issues can, in principle, be substantially resolved through modern, in motion, toll collection technology.

19. **Greenfield projects,** consisting of building new highways, expressways or motorways, possibly parallel to an existing congested highway, through a BOT type of concession, may be an effective alternative, under certain conditions, to an open toll road concession. The above mentioned service level and safety problems are effectively resolved through controlled accesses and better geometric and safety standards. And tolling at exits is both efficient, due to the small number of accesses, and equitable, since payments are directly proportional to the distance travelled.

20. The feasibility of such greenfield projects in Brazil still needs to be assessed, in light of the new situation (very different from the period when the first two phases of the federal concession program were conceived), characterized by the country's stable macroeconomic framework, favourably perceived risks and capital flows, and much reduced cost of capital, together with a dynamic economy and export sector, and increasing demand for transport and motorization rate.

21. Good candidate projects could parallel existing highways operating at or close to capacity, with a high proportion of urbanized or semi-urbanized segment.

22. As a reference, the high-standard 2x2 lane motorways currently built in France in flat or rolling terrain have an average construction cost of about 4 million euros per km. Traffic volumes in the first years are on the order of 5 to 6,000 vehicles per day per lane. Toll rates for passenger cars are about 8 to 10 euro cents per km, but these rates still reflect the compensation mechanisms which were in place until recently for cross-subsidizing the construction of higher cost segments.

23. A new toll road can be built in stages, in line with traffic growth, in order to improve return on investment. For example, only one carriageway can be built at first, and initially operated as a two-lane, high standard highway. The new highway can then be doubled when needed, or, under certain conditions, the old, parallel highway can be improved to higher standards and serve as a second carriageway. The government of Colombia is currently studying such alternatives for the upgrading of the (Bogota – Santa Marta) Ruta del Sol highway to motorway standards.

24. **Regional road networks** may also be a viable alternative. By conceding a network of existing roads with different traffic volumes and characteristics, the traffic risk may be somewhat reduced. Second, large capital investments can be more easily staggered than on an individual road segment, which can make it easier to secure financing for subsequent rounds of investments. This advantage is even more important in the case of greenfield projects, where financing for the construction of a subsequent segment can be "guaranteed" by the revenues from segments already in operation. France has developed an extensive network of motorways with minimal government budget outlays on this basis (Box 4.1).

Box 4.1. France's regional motorway networks

A national network of high standard toll motorways was built in France, with minimal contributions from the government budget. Concessions for regional networks were awarded in the 1950s to five mixed public companies (Societes d'Economie Mixte, SEM). Four more concessions were awarded in the early 1970s to private operators formed by public works companies and banks. But following the 1973 energy crisis, three private operators had to be restructured as SEMs and only one (Cofiroute) remained fully private. A public financial institution (Caisse Nationale des Autoroutes, CNA), was established to secure finances for the SEMs, issuing debt securities on financial markets.

In the early 1980s, the government established a revenue transfer mechanism among SEMs, managed by Autoroutes de France (ADF), which allowed sustaining the concessions affected by the energy crisis with toll revenues from more profitable SEMs. Also, the regional network concessions allowed the SEMs to secure financing for new network segments with the guarantee of future incomes from segments already in operation, which facilitated new construction programs.

More recently, however, the revenue transfer mechanism and the "piggybacking" of new segments on ongoing operations were discontinued to allow for more commercially-oriented operation of the SEMs and competitive bidding processes for new segments. The capital of the SEMs was gradually open to the public and in 2006 a major proportion of SEMs remaining publicly-owned shares were sold to private French and foreign operators.

Scope of Public Participation

25. The basic policy options for public participation in (economically-feasible) road projects which require some public support to make them attractive to private investors are:

- assumption or sharing in the traffic risk
- direct payments to the private operator
- shadow tolls

26. **Traffic risk** is a key determinant of the attractiveness of a toll road concession. The traffic risk is generally lower in a concession for an existing road, with a history of traffic. It is usually high for a new toll road, greenfield project. There are many examples of such projects or even programs which have collapsed and/or needed substantial restructuring when traffic has grown below projections (first program in Mexico, M5 in Hungary, and so on).

27. Projects requiring significant capital investment in the initial years of the concession may need some public sector participation in assuming all or part of the traffic risk. It can be achieved in the form of traffic or revenue guarantees whereby the government or a public entity would be obligated to compensate the operator if and when actual traffic volumes are below certain pre-defined thresholds. Conversely, in the event of higher than expected traffic growth, the contract can obligate the operator to share surplus revenues with the government. The Chile program is a good, successful example of such revenue guarantees.

28. Since such guarantees result in contingent liabilities for the government, which are difficult to predict and to budget for, Chile developed and implemented an innovative form of minimum revenue guarantee mechanism whereby the term of the concession is adjusted so as to reach the contractual present value of toll revenues of the winning bid.

29. Some governments have preferred to assume the traffic risk entirely considering that the concessionaire has practically no influence over traffic and therefore is not better placed than the public sector to assume traffic risk. Transferring traffic risk to a private operator cannot actually be justified on economic efficiency grounds. In those cases, the concession contracts have been based on some forms of direct payments to the private operator.

30. **Direct payments** by the conceding government or public agency to the private operator are a widely-used method to fund privately-operated roads, whether tolled or not. In the case of a toll road, the payments can be designed as a supplement to toll revenues collected by the operator, needed to make it financially viable. But the payments can also be designed to cover all the costs of the concession, toll revenues being recovered by the public agency. In this latter case, the conceding agency assumes the traffic risk entirely. These payments are generally called *availability payments* since they are subject to the concessionaire making available to road users certain assets in well defined conditions. But availability payments can also be linked to service level and performance indicators.

31. Norway's PPP road program is a good example of such model. Tolls are collected by a public company and revenues are transferred to the National Road Agency. The availability payments are then made by the Agency to the operator subject to compliance with output-based specifications related to both asset availability and levels of service.

32. The United Kingdom's PPP road program is a good example of availability payments for no-toll road concessions. After abandoning shadow tolls, the United Kingdom has moved to a system of direct payments made from the public budget to the private operator, linked to asset availability and quality specifications, and maintenance performance, independently of traffic volumes. On more recent transactions such as the Darrington – Dishforth A1 segment, service levels specifications have been incorporated in the form of minimum traffic speeds.

33. **Shadow tolls** are payments made by the conceding agency to the operator on the basis of actual traffic volumes and agreed toll rates. As a result, the allocation of traffic risk is not efficient: the risk of lower traffic is transferred to the private operator and the risk of higher traffic is assumed by the government. First introduced in the United Kingdom, the justification for shadow tolls was based on the public benefits derived from the use of the road. But one can argue that shadow tolls are not

efficient since they do not charge users for the actual cost of road use as direct toll charges do for example, and therefore the demand management function of an explicit toll is lost.

34. Portugal and Spain have used both actual and shadow tolls to finance greenfield projects and improvements of existing highways. But the governments' payment obligations under these contracts have increased so much that many concessions had or will have to be converted to user-paid tolls.

V. SERVICE LEVELS

Introduction

1. Concessionaires' obligations under road concession contracts in Brazil are specified through the so-called PER (*Programa de Exploracao da Rodovia)* which includes:

    - A program of pre-defined works and services to be carried out in accordance with a given timetable over the duration of the contract; and
    - Performance standards (*Padroes de desempenho)* which generally try to reflect the services levels to be guaranteed to road users.

2. Experience with these specifications has been mixed; in particular:

    - The specified programs of works and/or timetables have proved to be inadequate when traffic differs substantially from original forecasts (as it generally happens), where urbanization (and *prefeitos)* require unforeseen investments, or where more effective technical solutions than those included in the PER are available; such problems have resulted in numerous contract renegotiations which generally have benefited concessionaires;
    - Performance standards are defined by project engineers, case by case, in the absence of a coherent policy based on user preferences; and
    - Capacity-related service level obligations are specified through US-based parameters which are neither applicable to Brazil's conditions nor enforceable.

3. This note does not exhaust the issues related to service levels. It focuses on the major issues which could be effectively addressed through appropriate government policy and related regulations or norms by ANTT and/or DNIT. The note is structured into three major topics:

    - Road surface
    - Pavement structure
    - Road Capacity

Road Surface

4. Concessionaire or contractor obligations related to road surface are generally specified by performance standards based on the following main parameters, which are to be measured in accordance with DNIT norms:

    - Longitudinal roughness (Norm DNIT)
    - Transversal (lateral) deformations (Norms DNIT 006/2003-PRO and DNIT 007/2003-PRO)
    - IGG, *indice de gravidade global,* a composite index combining the frequency and severity of various surface defects (Norm DNIT 006/2003-PRO)
    - Skid resistance (*Manual de Restauração de Pavimentos Asfálticos, 2006, do DNIT*, ASTM E.303 – *Surface Frictional Properties Using the British Pendulum Tester*)
    - Absence of potholes, debris, and so on.

5. Experience with monitoring these parameters has been mixed.

    - Longitudinal roughness is a good indicator of driving comfort, which can be measured quickly, but the reliability of measurements depends on an effective calibration of the equipment used, which is not always performed well;
    - Transversal deformations are another important indicator of driving comfort and safety, which can be measured effectively;
    - IGG, by combining a number of parameters, attempts to provide a comprehensive assessment of road surface condition. But some heavily-weighted parameters within IGG like cracks are more representative of structural problems than driving comfort and safety, which reduces the value of IGG as a road surface indicator. And the quantity of measurements involved makes it a costly parameter.
    - Skid resistance has not been consistently monitored as yet.

6. Another issue is that concessionaire obligations vis-à-vis these parameters have been defined by project engineers in the course of preparing the PERs of the specific projects or programs, without clear guidelines or consideration of road user preferences. As a result, some specifications are not consistent across the network and some may not be realistic. For example, longitudinal roughness requirements (IRI) may range from 2.5 to 3.5 mm/m among similar highways. An IRI of 2.5 mm/m is neither realistic, particularly when one considers contractors' capacity for surface finishing, nor justified, particularly on a dual-lane highway.

7. The Ministry of Transport, with technical support from ANTT and DNIT, could therefore formulate a clear policy regarding the levels of service to be guaranteed to road users. Road surface related levels of services could be differentiated on two-lane versus dualized highways and depending on whether they are tolled on not. The definition of such service levels would be supported by the results of road user opinion surveys which would assess user preferences and willingness to pay for such services levels (see Policy Note on tolls). Such policy would provide the necessary guidelines to ANTT and DNIT to guarantee adequate and consistent services levels across the network through consistent concessionaire or contractor obligations and performance parameters.

Pavement Structure

8. Although road users are not directly concerned with pavement structures, the structural capacity of pavements, being an important determinant of road surface condition, should be clearly specified in concession contracts and effectively monitored.

9. Current concession contracts, through the PERs, specify actual minimum pavement structures. In particular, concessionaires are obligated to carry out specific structural works, for example an asphalt concrete layer of a minimum specified thickness at a specified future date. These obligations are defined on the basis of the PER traffic forecasts and on the project engineer preferences for certain technical solutions. There are several problems with such rigid specifications of pavement structure works. First, actual traffic rarely follows original forecasts, therefore opening the door for renegotiation of such obligations. Second, specifying technical solutions does not allow for technological improvements overtime and can therefore be inefficient. Third, experience has shown that concessionaires generally can demonstrate that they have a better solution than the one prescribed in the PER, which again leads to some form of contract renegotiations.

10. The PERs also specify maximum values for deflexions. Deflexions can be a good indicator of localized structural problems, but they are very sensitive to temperature and humidity, and therefore cannot be an effective indicator of the structural capacity of an entire road segment.

11. The Structural Number (SN), which is the main parameter used for pavement dimensioning under the widely-accepted AASHTO methodology, is a good indicator of the structural capacity of a given pavement. It is defined as:

$$SN = \sum a_i D_i$$

where: ai is the structural coefficient of the material used for pavement layer i; and
Di is layer i thickness in inches.

12. The structural number can also be adjusted into the SNC to take into account the support contribution of sub-soil through its CBR.

13. The structural coefficients for the various types of materials used in pavements are known. They can be adjusted for specific conditions, if needed, through their elasticity modules and the relationships established in AASHTO's pavement dimensioning manual of 1993. Finally, the structural coefficient of a used asphalt concrete layer can also be derived from its IGG through empirical relationships developed in Brazil.

14. The Ministry of Transport, with technical support from ANTT and DNIT, could therefore review the feasibility of using the Structural Number to specify the structural capacity of pavements under PPP contracts. In addition to clearly specifying minimum structural numbers for homogeneous sections, depending on traffic, contract specifications should also clearly define the methodology,

including structural coefficients of key materials and relevant relationships, to make such obligations enforceable.

15. If such parametric specifications are possible, the works programs and related timetables defined under the project feasibility studies, rather than the obligations under the PER, would then be considered only indicative and feasible work programs, to be used as a reference by bidders in establishing their bids. But bidders would be allowed to propose alternative solutions provided that they meet the specified structural numbers. The timetable for the works could be adjusted in line with actual traffic, on the basis of the relationship between the structural number and volume of traffic.

Road Capacity

16. Concessionaire obligations regarding road capacity are specified either through (1) pre-defined capacity works to be carried out in accordance with a timetable, independent of actual traffic, or through (2) service level standards generally defined with reference to the service levels of the Highway Capacity Manual (HCM), or through (3) both pre-defined works and timetables, and service levels standards.

17. These obligations have raised a number of issues. In particular, pre-defined capacity works had to be revised and/or postponed where traffic did not follow projections, which has generally been the case. These changes have led to numerous renegotiations of contracts, probably benefiting concessionaires. The service level standards could not be effectively monitored and enforced since they are based upon parameters which are not easily measurable. In addition, these parameters, which were defined in the United States, where road user behaviour and highway characteristics are quite different, are not applicable to Brazil conditions without some substantial adjustments.

18. Under the HCM methodology, the service level on a two-lane highway is determined through a combination of two parameters: the Average Travel Speed (ATS) of vehicles, and the Percent Time Spent Following (PTSF) another vehicle.

Table 5.1. Service Level Criteria

Level of Service Criteria for a Two-Lane Highway		
LOS	PTSF	ATS
A	≤ 35	> 90
B	> 35-50	> 80-90
C	> 50-65	> 70-80
D	> 65-80	> 60-70
E	> 80	≤ 60

Source: Highway Capacity Manual, 2000
Note: Under level F, traffic exceeds capacity

19. The two parameters are functions of traffic volumes and of some traffic and road characteristics, in particular regarding passing restrictions. The paved shoulders of highways and the driving custom of facilitating passing by faster vehicles in Brazil invalidate these US-based relationships under Brazil conditions. This is particularly important for the PTSF parameter, which, in most cases, is the determining factor of the service level in the HCM methodology.

20. The Ministry of Transport, with support from ANTT and DNIT, could develop a policy on the service levels to be guaranteed to road users. The service levels should first be defined on the basis of clear and measurable indicators, which could be average travel speeds on two-lane highways and average vehicle densities per lane on multi-lane highways. The service levels could also be established with the help of appropriate surveys of road user opinions and willingness to pay for various services levels (see Policy Note on Tolls). In particular, better service levels would be guaranteed on toll highways.

21. Service levels should also be monitored together with traffic volumes and composition on highways of various characteristics in order to develop reliable relationships between traffic and service levels, applicable to Brazil's road and driving conditions. After such reliable relationships are developed, concessionaire obligations regarding capacity works could be more easily specified through traffic volumes.