WORKING PAPER

IMPROVING BRAZIL'S AGRICULTURAL PRODUCTIVITY BY TARGETING INFRASTRUCTURE

INPUT
Iniciativa para o Uso da Terra

CLIMATE POLICY INITIATIVE

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The Land Use Initiative (INPUT – Iniciativa para o Uso da Terra) is a dedicated team of specialists who work at the forefront of how to increase environmental protection and food production. INPUT engages stakeholders in Brazil's public and private sectors and maps the challenges for a better management of its natural resources. Research conducted under INPUT is generously supported by the Children's Investment Fund Foundation (CIFF) through a grant to the Climate Policy Initiative. www.inputbrasil.org

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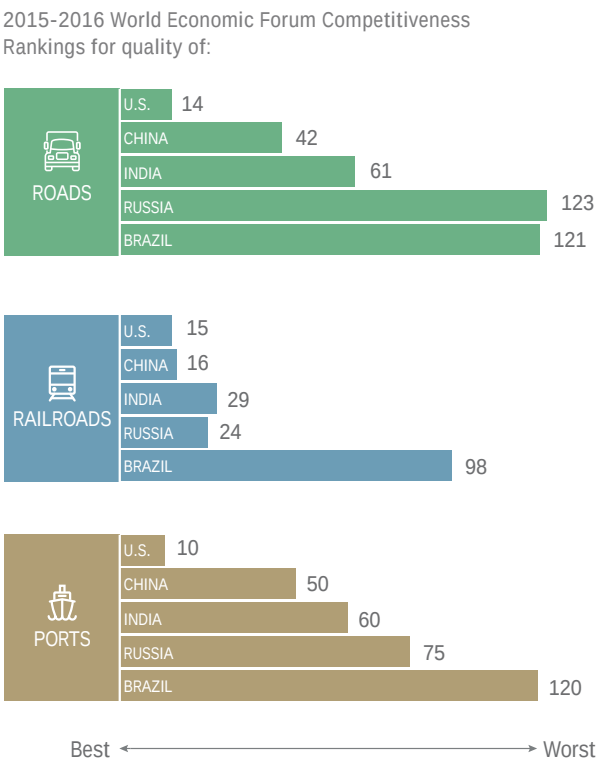
1. INTRODUCTION

Brazil seeks to protect its abundant natural resources and rainforests, while growing its agriculture sector. Past CPI work shows that meeting these goals simultaneously is possible through efficient land use and increased agricultural productivity (CPI, 2013).

Infrastructure plays a key role in agricultural productivity. Empirical evidence demonstrates that investment in physical infrastructure – irrigation, energy, telecommunication, and transportation – is essential to facilitate integration of rural areas into national and international economies, increase farmers' access to markets, attract private financial institutions to rural areas, and reduce rural poverty (Binswanger, Khander and Rosenzweig, 1993; Fan and Zhang, 2004; Pinstrup-Andersen and Shimokawa, 2007). Because of this, access or lack of access to infrastructure can alter the return on agricultural production.

Figure 1: International Comparison on Transport Infrastructure



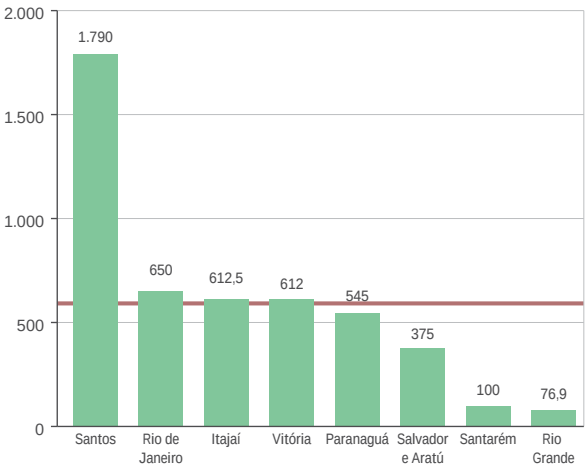
Source: Developed based on the data from WEF, 2015.

Although studies using aggregate infrastructure data fail to reveal which types of physical infrastructure have the most significant impact on agricultural productivity, a range of studies, mostly focusing on roads, have demonstrated that improved transport infrastructure has a large positive impact on agricultural productivity growth (Fan, Hazell, and Thorat, 2000), while also contributing to growth in the non-farm sector and the national economy (Fan, Zhang, and Zhang, 2002; Fan and Chan-Kang, 2005).

Despite being one of the most prominent agricultural producers in the world and an important exporter of agricultural commodities, Brazil suffers from poor transport infrastructure. The World Economic Forum (WEF) ranks it at 74th out of 140 countries (WEF, 2015), lagging behind other emerging and developed economies in roads, railways, and port infrastructure (Figure 1).

Transportation bottlenecks impose a very high cost on agricultural production, competitiveness and exports generally. Previous CPI analysis shows that carrying a ton of soybean from one of Brazil's leading soybean production municipalities to its point of

Figure 2: Vessel's Berthing Rate



Source: ANTAQ.

Figure 3: Distance to Ports

Source: SECEX (2012).
Note: The map shows the road connections from Cuiabá (MT) to the ports of Santarém (PA) and Santos (SP). Good roads connect Cuiabá to Santos in 1,600 km. From Cuiabá to Santarém, bad roads force trucks to travel 3,000 km.

export is almost three times as expensive as it is to carry the same amount of soybean over a similar distance in the United States. In addition, a lack of adequate road infrastructure keeps much of Brazil's production from being exported from its most cost-effective ports - in some cases, this represents a near twentyfold increase in costs (CPI, 2013).

To understand why transportation costs are so high in Brazil, one must look at both ports and roads. Currently, the Southeastern port of Santos is the country's main destination of grain output for export, due to good road infrastructure. However, Santos charges a vessel berthing rate 18 times greater than the vessel berthing rate at Santarém, which is located in the North, and closer to foreign consumer markets such as the U.S. and Europe (Figure 2).

Santarém is not currently used as an offloading point due to inadequate road infrastructure. Industry estimates claim that a road between Cuiabá, MT and Santarém would reduce transportation costs by 53.5% (CPI, 2013).

There is extensive agreement that Brazil does not invest enough in infrastructure. According to Frischtak and Davies (2014), from 2001-2012 investment in infrastructure was 2.16% of GDP, one percent less than estimates of what would be needed to account for depreciation of capital stock per capita. As President Dilma Rousseff said during her reelection campaign, she is "unhappy with the amount of investment in infrastructure" (Exame.com, 30/7/2014).

The congestion in Brazilian roads and southern ports – evidenced by the long lines of trucks waiting for days to unload at the ports – suggests that returns for investment in transport infrastructure are very high. Can regulation be a hurdle that prevents investment?

If there seems to be general agreement that transport infrastructure is lacking, what is the hurdle that prevents investment? In this paper, we investigate how the regulation of this market may be to blame. In Brazil, as elsewhere, successful investment and operation of transport infrastructure depends on the cooperation of the public and private sectors [Box 1 reviews the reasons why both the sides should play an

important role]. A typical arrangement where this cooperation is at work is in a concession[1] or franchise, where the government auctions the rights to build and/or operate an existing asset. In this paper we investigate the role of recent changes in the regulation of transport infrastructure in three sectors: highways, railways, and ports. While the specifics are different in each sector, we argue that a general trend towards regulation across all three sectors seeks to reduce eventual profits for the concessionaire while compensating with hidden subsidies to foster participation. We argue that even when these subsidies are large enough to allow for new concessions to be awarded, the regulatory changes hurt the quality of expansion of transport infrastructure, as they worsen the incentives to select the best projects, make projects more costly, erode the incentives of private concessionaires, and lead to more complex and less efficient relations between concessionaires and regulators.

The rest of the paper is organized as follows: In Section 2 we review the recent trends in all three transport infrastructure sectors—highways, railways, and ports. Section 3 discusses the specifics of how regulation has changed for highway concessions. Section 4 analyses the new railway regulatory framework. Section 5 addresses the evolution of port regulation. Section 6 presents our conclusions and Section 7, their implications for the agricultural sector in Brazil.

1 Bringing the private sector into the transport market can be accomplished in many ways: outsourcing, management contracts, leases, franchises, concessions, divestitures by license or sale, and private supply and operation. In the case of concessions (including leasing, franchising and BOT arrangements) a more limited set of instruments are involved, and governments retain the ultimate ownership of assets and/or the right to supply, and transfer at least some part of the commercial risk of providing and/or operating the assets to a private concessionaire (Shaw et al., 1996).

BOX 1: THE ROLES OF THE PRIVATE AND PUBLIC SECTORS

Why is the private sector needed?

Commentators have typically pointed out that the main reason why governments throughout Latin America came to seek private investment in infrastructure is lack *of public financial resources*. In Brazil, the law of fiscal responsibility restricts the government's ability to spend directly on infrastructure, but the government has been willing to provide ample funding through indirect means, such as subsidized lending by public banks and investing by pension funds from state enterprises. Therefore public funding is available, but becomes an issue in that those indirect arrangements require the participation and modify the incentives of private actors.

The more serious impediments for relying solely on the public sector are *inefficiencies* in execution, both in terms of building and running infrastructure, and *inefficiencies in*

BOX 1 (CONT.)

planning, as exemplified by the initial choice of projects in the Investment Program in Logistics (Programa de Investimento em Logística – PIL). PIL is a massive, 20-year investment plan for transport infrastructure unveiled in 2012, originally predicting investments of BRL 42 billion in highways and BRL 91 billion in railways. It proposed the construction of three new railways along the coast of Brazil that do not provide sufficient economic benefits since they cannot compete for freight with ships, but did not include a railway linking the port of Santarém to the soybean production area in Mato Grosso.

Ideally, the regulatory framework provides incentives to the private sector to screen infrastructure projects and pick the ones that are socially desirable. That concern would lead us to different conclusions than the ones found in the literature, as we tend to favor arrangements that make private contractors and operators accountable for their choices. That also changes the way one ought to evaluate the success of the regulatory framework: with poor planning, it is socially efficient that some roads projects are not undertaken.

Why is the public sector needed?

The business of providing transport infrastructure has several features that make provision solely by the private sector problematic (Gomez-Ibanez, 2003). A first concern is that these markets are typically natural monopolies, due to large economies of scale. One typically should expect the government to intervene as a price regulator unless there is sufficient evidence that users can choose across different providers.

A second reason for government participation is in the provision of right-of-way for the construction of new roads. Without eminent domain powers, it may be extremely costly for the private sector to develop new road projects, although this is not the case for ports.

A third reason for government intervention is the fact that infrastructure use may generate unintended consequences on those who do not use it, or externalities on non-users. The availability of transport infrastructure has the potential to have a sizable impact on local economic development, but the major beneficiaries are users who can be made to pay through service fees and tolls.

Of course, transport infrastructure construction and use can have a major impact on the environment (see Box 2). Since Brazil has rather stringent environmental regulations and licensing framework already in place, the institutional tools to control that type of externality, or unintended consequence, already exist, and public sector involvement in construction and operation is not needed for this reason alone.

BOX 2: THE RELATIONSHIP BETWEEN INFRASTRUCTURE AND DEFORESTATION

In the past, highway development in Brazil has been associated with large-scale deforestation and the exploitation of other natural resources to support new, extensive agriculture through logging companies' activities and land clearing (Panayotou and Sungsuwan, 1994; Chomitz and Grey, 1996; Cropper et al., 1997; Angelsen and Kaimowitz, 1999).

Previous analysis from CPI (2013) suggests that it is not infrastructure itself that causes deforestation, but rather the development of infrastructure that is not accompanied by adequate environmental monitoring and law enforcement. The case of the Brazilian Amazon fits this description. The government encouraged the occupation of the forest, but did not promote the establishment of basic local institutions. During the occupation, environmental laws were not enforced – in fact, many were not even created until many years later. The relationship observed between infrastructure and deforestation in the Brazilian Amazon is therefore historical, not necessarily intrinsic.

While the advent of basic infrastructure brought by the flow of occupants may have indirectly contributed to deforestation by facilitating penetration into the forest and helping consolidate local urbanization, the relationship between infrastructure and deforestation is, in fact, ambiguous. On the one hand, empirical evidence (including Amazon-based) attests to the positive correlation between the two (Reis and Margulis, 1991; Reis and Guzmán, 1994; Andersen, 1996; Pfaff, 1999). On the other hand, evidence also shows that the demand for the preservation of natural resources increases with increasing levels of national income (Antle and Heidebrink, 1995; Foster and Rosenzweig, 2003), and high income is typically associated with more infrastructure. Additionally, infrastructure appears to be correlated with higher productivity in Brazilian agricultural production, which should allow producers to expand production without expanding into forestland.

Infrastructure can actually be intrinsically good to meet economic growth goals and environmental conservation goals simultaneously, as long as it is implemented alongside solid environmental monitoring and law enforcement.

2. RECENT TRENDS IN REGULATION OF TRANSPORT INFRASTRUCTURE IN BRAZIL

All three transport infrastructure sectors studied in this paper have experienced important recent changes in the regulation. While the specifics and the practical implications of the changes in each sector differ, the underlying logic is similar. In this section, we sketch a critical discussion of this general trend, and derive some conclusions that apply to all sectors. In the following sections, we discuss the specifics of how regulation has changed in each sector, and what has been the impact on investment and operation.

The major driver of recent changes seems to be a desire to prevent existing concessionaires from obtaining eventual, or ex-post, economic profits. The way this is done varies; in some cases, new rules are introduced to make tariffs adjust to changes in costs and demand, in other cases, changes are made that attempt to introduce competition and erode local monopoly power.

To compensate for the fact that these changes (and the prospect of future opportunistic behavior by regulators) discourage new investment, the government has also been introducing new subsidized funding (see Box 3). Even when the combined effect of these two policies keeps investors interested, the change in the mix of incentives can have dramatic effects on the efficiency of the investment and on the quality of the operation of transport infrastructure.

According to Law 8.987/95 (the “Law of Concessions”), regulators have a mandate to seek toll affordability for users. It is certainly true that toll affordability ex-ante is desirable: tariffs should not be higher than the amount needed to compensate the concessionaires for the cost of building the infrastructure and operating the service.

This can be achieved in several ways, including by awarding concessions through competitive bidding, and is roughly the framework that was used in Brazil for road and railway privatization in the nineties. Under this regime, concessionaires and users faced the same set of incentives as those found in long run average cost regulation of a natural monopoly, while avoiding the bureaucratic costs of classic regulation.

As in average cost regulation, the competition in the auction drives ex-ante economic profits to (nearly) zero without distortion of efficiency at the extensive margin, that is, the projects that will be undertaken will be those that are economically feasible. On the other hand, in order to recoup investment, the concessionaire must be allowed to run profits by exerting some degree of market power, and introducing some degree of distortion on the intensive margin, by charging a price above the marginal cost.

The basic dilemma of regulating a natural monopoly is that one of the margins must be distorted because the competitive price that makes the market operate efficiently is too low to provide appropriate returns for the concessionaire. In this case, either the concessionaire should be allowed to exert some degree of market power, or it should be subsidized.

A benign interpretation is that this is the rationale behind recent changes in regulation in Brazil. According to Coase (1945, 1946), this is a dangerous game to play, especially when the subsidies are not transparent. At the very least, under this regime there are very weak incentives to make correct decisions on the extensive margin, as the only way users and taxpayers get to judge whether a new infrastructure project is undertaken is through political action. The collective action costs here are extreme, and aggravated by the fact that these decisions are long-lived and practically irreversible. At worst, when concessionaires are allowed to be paid by the government, regulatory capture becomes more likely and more dangerous.

Other problems arise from the way the subsidies are done. Ideally, these should be done in the open, so that public scrutiny reduces the scope for malfeasance and bad choices on the extensive margin. The legal framework to do so already exists: the Law of Public-Private Partnerships (Law 11.709/2004, also referred to as Law of PPPs) establishes the possibility of sponsored concessions that allow the concessionaire to be funded with a mix of user payments and public funds. This law includes several steps for public subsidizing of sponsored concessions to ensure transparency and political accountability; for example, article 10 requires that public expenses for the project are compensated by a permanent new source of funds or a matching decrease in other expenses in order to be fiscally neutral. Unfortunately, the Law of PPPs has not yet been used in any of the federal concessions in transport infrastructure.

Another problem with the way in which subsidies are implemented is in the design of the auctions. Currently, highway concessions have been awarded as follows: The government provides subsidized funding in an amount deemed appropriate to foster participation (Law 8.987/95 requires that all participants receive the same conditions), and the concession is awarded to the investor

who offers the lowest tariff. If there is competition in the auction, excess payments at the beginning, or ex-ante economic rents, are dissipated. However, that does not mean that tariffs are related to the marginal cost: The winning tariff will instead be the one that, according to investor estimates, will generate enough revenue to cover the costs of the project above the subsidized amount. This may be above or below marginal cost, depending on the amount of subsidies, and will not lead to efficient use of the infrastructure.

In addition, there are two more, possibly more serious, sources of inefficiency. The first is that any change in regulation to reduce ex-post economic rents – especially those applying to current concessions – greatly increases the risk of delay. A major hurdle for private investment in infrastructure is that concessionaires need to rely on future revenue to pay for investments; once the investments are made, they are in a fragile position as the regulators may opportunistically expropriate them. Once the government turns this fear into a reality, the appetite for investment dries up. More subsidies are needed to compensate or the expropriation risk, and this additional expense is socially wasteful.

The second problem with an environment where ex-post economic rents are expropriated, or taken away, is that it distorts the incentives of concessionaires to perform well. If an additional investment improves the infrastructure in way that users appreciate, demand grows, and the concession profits. If the concessionaire keeps those profits, they have an incentive to invest. If it expects these profits to be expropriated, however, the concessionaire has no incentive to invest. Similarly, other types of intervention to reduce economic rents may generate operational inefficiency by denying economies of scope, or by unduly increasing the cost of regulation.

Finally, changes in regulation may introduce adverse selection for the new concessions. The theory of incentives in regulation states that if investors have a menu of choices, those which are more efficient select projects with high-powered incentives. “So, while high-powered schemes are conducive to efficiency, they also attract a priori efficient firms." (Laffont and Tirole, 2000). Here, conversely, the reduction in incentives to perform ex post leads not only to inefficiency ex post, but also adversely selects inefficient firms ex ante.

BOX 3: EVOLUTION OF BNDES FINANCING RULES FOR INFRASTRUCTURE PROJECTS

Before 2009, BNDES' main financing option for companies seeking to invest in roadways and railways was the "FINEM program" (Financiamento a Empreendimentos em Logística). The initiative was not considered very flexible, and interest rates were very high (9.6% to 10.9%, plus a risk factor credit rate of 4.18%). Since then, financing conditions have expanded in a number of ways to attract private investors, especially after the release of the Brazilian SEC (CVM) Directive 476, in 2009.

Probably the most significant regulatory change for the sector occurred when BNDES started issuing tax incentives in 2011. **Law 12.431** established guidelines for local debentures, which could only be issued by Special Purpose Entities (SPEs) in connection with specific infrastructure projects. One such guideline determined that investors would be exempt from income taxes and legal entities would have their toll reduced by 15%. All groups would also be excused of financial transaction taxes. In order to be approved, it was outlined that debentures would have to be fixed, inflation-linked or TR-indexed, with duration of more than four years, a non-call period of at least two years, and no resale commitment by the buyer. The coupons would be paid at least semi-annually, and would be negotiable only in regulated security markets. These measures intended to facilitate access to financial incentives by investors in infrastructure, but limited resources from BNDES and uncertainties about credit conditions and payment still prevented their deployment. In an attempt to address these issues, Law 12.715/12 was approved, clarifying the main concerns raised by issuers and investors.

In 2012, the Government announced the **National Plan for Transport Logistics** ("Plano Nacional de Logística"). Although the investment within the program was intended to be 100% private, 80% of its amount was to be financed by BNDES. It had a return rate of about 6.0% to 6.5%, interest rate composed of the TJLP (in 2012 set at about 5.5% per annum), plus 1.0% for railways and 1.5% for roadways. Its grace period was of three to five years. Tenor period would be 20 years for roadways and 25 years for railways. These conditions were considered very attractive for the private market, being lower than the SELIC rate (currently at 7.0% per annum).

Law 12.844, announced in 2013, altered the legislation to include debt securities (CRIs) and Receivables Investment Funds (FIDCs) as eligible instruments to raise capital for financing investments in infrastructure, granting them the same tax benefits as debentures.

Also in 2013, it was reported that BNDESpar, a subsidiary branch of the bank, would be allowed to acquire shares of the main Brazilian railway and roadway concessionaires, as long as they pledged to operate on a multimodal basis. This strategy aims to enhance the capital structure of private investors, which today are still somewhat specialized, but are gradually incorporating the demand for integrated logistics.

BOX 3 (CONT.)

A huge development in the logistics sector is expected to occur soon through the EBGF ("Empresa Brasileira Gestora de Fundos Garantidores e Garantias") and the FGIE (Fundo Garantidor de Infraestrutura), with funds estimated at R$5 billion. These companies were created in 2012 by BNDES to acquire debentures in primary issuance offers and secondary market trading, with VALEC as its central pillar.

BNDES has also pushed for infrastructural improvements by pursuing special funding applied to sectors under the Brazilian Logistics Investment Program ("PIL"), with lower spreads and better conditions. The bank has proposed financing up to 70% of toll road and railways investments, and up to 65% for ports.

Generally, for all logistics projects, the minimum cost of investment is R$20 million and the interest rates vary depending on whether the company operates directly with BNDES or via an accredited financial institution. The interest rate is composed of the financial cost of the loan, a basic remuneration rate to BNDES, and the risk factor credit rate. For roadway projects, the financial cost is a maximum of 70% of the TJLP plus a minimum of 30% of the CESTA, IPCA, TS, TJ3 or TJ rates. The BNDES return rate is set at 1.5% per annum, and the risk factor credit rate varies between 1% and 4.18%. Alternatively, for investments in ports and railways, the financial cost is simply the TJLP and the bank return rate is 1.0% per annum. The rules also change for domestic companies controlled from abroad, for whom the CESTA (higher interest rate) is applied. While leverage rates of the bank are 70% for investments in ports or railways, railroads are financed up to 80% of their projects. The deadline for these payments is generally around 20 years for ports, 30 years for railways, and 25 years for highways. The bank claims that new agricultural frontiers of the Center-West have steered its priority towards the development of a modern and competitive highway network, especially through its "Proinveste" program.

3. HIGHWAYS

Federal highway concessions in Brazil are contracts where a private concessionaire receives the right to charge tolls for a fixed number of years in exchange for maintaining the road and performing a predetermined set of investments. The concessionaire is selected by auction over the base toll to be charged initially.[2] Over the life of the concession, the value of the toll is reviewed periodically through a regulatory process based on inflation of input costs, but since those adjustments are based on the base toll determined in the auction, the base toll impacts revenues over the life of the concession.

This type of arrangement has a number of features that makes it suitable for situations where the government lacks the expertise to precisely assess the costs and benefits of a given infrastructure investment. First, the same agent invests in improving and maintaining the infrastructure and profits from that investment. This bundling provides better incentives than arrangements where the procurement of construction work and running the asset are done separately (Iossa and Martimort, 2012). This arrangement also reduces the information requirements on the government side.

Second, ex-ante economic rents are dissipated through competition in the auction, without requiring the government to accurately predict the relevant costs and benefits. It also provides a crude insurance to bad planning in selecting infrastructure projects. If the cost of the project is too high compared to its social benefits, it will not be made, as investors will refuse to participate. If the project is too small compared to the socially optimal investment, the toll will be low as well. The concessionaire may have an incentive to propose more investment in that case, to the extent that it may benefit in renegotiating the toll or the term of the concession. (It is worth noting that this renegotiation may not be socially beneficial if the government lacks knowledge about the real social cost of the project.)

A largely unavoidable consequence of providing incentives is that the concessionaire becomes exposed to demand risk. Alternative schemes designed to reduce demand risk such as Least Present Value of Revenue auctions (Engel, Fisher and Galetovic, 2001) or the unbundling of construction and operation (e.g., Trujillo, 1997) also reduce investor incentives to select good projects and accurately estimate their net benefit.

2 Specific tolls for different types of users are fixed multiples of the base toll. Therefore the regulation restricts the concessionaire's ability to price discriminate, while introducing cross-subsidization in favor of trucks.

Another type of risk, of greater concern for investors in developing countries, is regulatory risk (e.g., Guasch, 2004, p. 116). If the regulatory framework works, it is expected that some projects will generate economic rents ex-post. If investors fear that the rules of the game will change, or if the rules of the game prevent them from appropriating these rents, they will not invest. In order to invest in this environment, they will require subsidies that make up for the regulatory risk. The outcome however is not the same: the financial burden of the project shifts from users to taxpayers, and the incentives to select good projects and to perform well are eroded.

Erosion of Incentives in Highway Concession Rules

Table 1 presents the list of federal highway concessions in Brazil. They are divided chronologically into three stages: the first stage with concessions auctioned in 1996-1998, the second stage in 2008-2009, and the third stage currently under way. The second and third stages are further subdivided into two and three phases, respectively.

Table 1: Federal Highway Concessions in Brazil

Stage	Phase	Highways	Concessionaire
Stage 1		BR-116/RJ/SP	NOVADUTRA
		BR-101/RJ	PONTE
		BR-040/MG/RJ	CONCER
		BR-116/RJ	CRT
		BR-290/RS	CONCEPA
		BR-116/293/392/RS	ECOSUL
Stage 2	Phase 1	BR-116/PR/SC	AUTOPISTA PLANALTO SUL
	Phase 1	BR-116/376/PRBR-101/SC	AUTOPISTA LITORAL SUL
	Phase 1	BR-116/SP/PR	AUTOPISTA RÉGIS BITTENCOURT
	Phase 1	BR-381/MG/SP	AUTOPISTA FERNÃO DIAS
	Phase 1	BR-101/RJ	AUTOPISTA FLUMINENSE
	Phase 1	BR-153/SP	TRANBRASILIANA
	Phase 1	BR-393/RJ	RODOVIA DO AÇO
	Phase 2	BR-116/324/BA e BA-526/528	VIABAHIA
Stage 3	Phase 2	BR-101/ES/BA	ECO-101
	Phase 3	BR-050/GO/MG	MGO Rodovias
	Phase 3	BR-060/153/262/DF/GO/MG	CONCEBRA
	Phase 3	BR-163/MS	MS VIA
	Phase 3	BR- 163/MT	CRO
	Phase 1	BR-040/DF/GO/MG	BR 040

The rules for new concessions have changed in several ways that restrict the scope for concessionaires to obtain ex-post economic rents (or to run economic loss). Contracts for concessions starting in the second phase of the Stage 2 include a risk matrix (matriz de risco), a list of contingencies that are deemed the responsibility of the concessionaire and those that are not. Earlier contracts did not specify a risk matrix, and risk allocation for these concessions were based on the principle that ordinary business risks such as demand fluctuations were the responsibility of the private investor.

As an example, risk allocation in the new contracts transfers the financial responsibility for losses in demand due to new unplanned pathways that allow traffic to avoid toll plazas from the investor to the government. This clause seems to be based on a conceptual mistake that concessionaires are entitled to enjoy monopoly rents from their assets, and erodes incentives for the concessionaire to provide high quality roadways that would be created by competition with alternative routes. In contrast, in Europe, tollways typically run in parallel with traditional roads, providing a faster, more comfortable, albeit more expensive, alternative for traveling. This arrangement not only makes tolls politically more acceptable, since nobody is forced to pay, but it also puts competitive pressure on the concessionaire: if traveling by tollway is not significantly better, the concession will not be profitable.

Another controversial contractual innovation in the second stage of the second phase is the availability discount mechanism (mecanismo de desconto de reequilíbrio). This is a trigger that reduces tolls as a punishment for failing to meet targets for investment and quality of service.

In the third stage, four additional factors are explicitly introduced to codify the process by which tolls are to be adjusted to prevent fluctuations in ex-post profits. Factor C adjusts tolls to compensate for contingencies that affect returns, such as changes in taxes[3]; factor D adjusts tolls to account for performance in meeting targets in road maintenance; factor Q adjusts tolls depending on performance on a quality index based on the number of accidents and events that keep lanes unavailable to users; and factor X adjusts tolls to periodically extract productivity gains from the concessionaire.

The general trend is clear: regulation becomes more complex as the regulator gradually takes the role of the market in providing incentives. Concessionaires become more accountable to the indicators used in the formula of factor

3 The Resources for Technological Development (RDT) are annual budgets that road concessionaires can invest in studies and researches on road engineering. The concessionaires are punished with a reduction of the tolls when these resources are not used for the purposes for which they are intended.

Q, than they are for the real quality of the roadway, which is what directly impacts demand.

As the business becomes less about satisfying users and more about satisfying regulators, the regulatory risks become stronger, and operational performance can be expected to suffer. Box 4 provides some evidence on the deteriorating performance of highway concessions under the new regime.

Ex-ante incentives for highway concessions

The outcomes of recent highway concession auctions help gauge the net effect of the changes in regulation and added subsidized funding. Most auctions went well, with adequate participation (the government celebrated the fact that winning tolls were 42-61% lower than the reserve price, but that may simply mean that reserve prices were set too high). However, there was no participation in the auction for lot 4 of phase 3 for BR-262 in the states of Espirito Santo and Minas Gerais and the auction of lot 1 for BR 101 in Bahia was postponed. In our view, this is not evidence of failure of the regulatory framework. Investors did not believe future demand in these projects would be as high as government estimates – this may very well mean that the social benefit from these projects is not high enough either.

Conversely, the apparent success of the other auctions may also be bad news; they may only indicate cases of excessive subsidizing. Indeed, if and when public funds are needed to subsidize transport infrastructure (and many highway renovation projects should pay for themselves), there are better institutional arrangements than the ones used now. The law of PPPs can be used to make the process of subsidization more transparent. Another interesting alternative would be to employ shadow tolls. In such schemes, first introduced in the UK (Bousquet and Fayard, 2001), the government pays the concessionaire in proportion to actual traffic on the highway. That has the benefit of providing incentives for the concessionaire to attract demand, and to select projects where demand will be high.

BOX 4: EVIDENCE ON THE DETERIORATION OF PERFORMANCE IN HIGHWAY CONCESSIONS IN THE NEW REGIME

Tolls on six of the seven federal highways auctioned by the Lula government in late 2007 rose more than the official rate of inflation since the signing of the concession contracts, according to the National Transportation Agency (ANTT).

Work delays related to the contractual schedule ended up generating discounts on tolls to offset users. There were, however, adjustments in the contracts that have acted in the opposite direction, increasing the tolls. The low value of the tariff was appointed by specialists at the time of auctions as foolhardy for investments.

After almost six years since the signing of the second batch of contracts for road concessions, 402 works of improvements that should have been ready were not completed.

Because of the constant delays in investments, ANTT signed in September 2013, a Term of Conduct Adjustment (TAC) with each of the eight concessionaires. A plan with a timeline for 572 works was set. The TACs were the solution that the government found to complete the delayed works in eight concession contracts that were signed in 2008, during the Lula government. They were mandatory works, but had not been fulfilled. By anticipating a more rigid model of monitoring, the TAC requires site inspection of each work, done by ANTT. Each concessionaire is required to submit monthly data on the physical progress of each action, information that is consolidated by the agency.

An assessment completed in June 2014 by ANTT pointed out that 30% of the works played by the eight highway concessionaires are delayed. A combination of outstanding issues relating to procedures for the declaration of public utility, environmental licensing, and engineering projects has delayed the execution of hundreds of road works. Through June 2014, 107 proposed works were awaiting publication of statements by government, while 99 had other disputes with environmental licensing and 77 depended on the release of the engineering projects. From the data that ANTT offers, it could be calculated that in August the works were still 30% delayed.

4. RAILWAYS

Today, railways are an efficient means of transportation for a narrow, but important, set of needs: freight of bulk goods over medium distance over land. Another key difference between roads and rail is that railways offer severe economies of scope in bundling operation and maintenance.

Railways that involve the largest economic benefits tend to involve a large degree of asset specificity, and vertical integration with main clients (usually mining companies) and ports is a common arrangement. Since the economic benefits of these projects are very concentrated, there is less need for government leadership, provided vertical integration or a similar arrangement is allowed.

Railways may also compete on the margin with roads on general freight. Long distance passenger transportation today is not profitable, and where it is provided extensively, as in Europe, it is heavily subsidized.

The regulatory framework put in place in Brazil after the privatization of the RFFSA (Rede Ferroviária Federal S.A.) in 1996 to 1999 involved concessions of railways (bundling operation and maintenance) for a term of 30 years. Concessions were auctioned on the basis of a fixed payment to the government. There was no requirement of specific works, but the concessionaires agreed to meet performance targets. There was also a regulated tariff ceiling. The framework recognized the substantial economies of scope of running railways as an integrated business, while at the same time sought to restrict abuses of local monopoly power.

Under this regime, the privatization was largely a success: not only did concessionaires meet performance targets, but productivity also increased by an estimated 8.4% per year immediately after privatization (Estache, Gonzalez and Trujillo, 2002). Furthermore,production has increased on average 5.3% per year since then (Pinheiro, 2014). This expansion was not homogeneous: private operators invested heavily on assets that provide transportation to the most profitable loads and routes, as indeed is most efficient. Lack of investment in some parts of the network, along with difficulties in regulating interconnection across different operators may have led to the major shift in regulation in 2011-12 (see Box 5 for further discussion).

Under the Rousseff government, regulators have been striving to unbundle the components of railway operation. In July 2011 the regulation applied to

existing concessions was changed to force access for independent operators to the rail network of the concessionaires; it also established new rights for users to resell capacity and even to invest directly in the tracks (ANTT Resolution 3695/2011).

In 2012, the government proposed a radically new regulatory framework for new railways within the PIL (Programa de Investimentos em Logística). In this regulatory framework, unbundling is complete: private concessionaires in charge of building and maintaining the tracks are no longer allowed to operate trains. To resolve the massive coordination failure risk in this framework (track contractors are afraid to invest since tracks are worthless without trains, while operators are afraid to invest since trains are worthless without tracks), the framework allocates a crucial role to Valec, a state-owned railway company, as an intermediary. Under this scheme, Valec charges operators and pay track contractors for usage independent of the actual demand. Once in place, this scheme is expected to run massive deficits; according to then president of Valec, José Eduardo Castello Branco, deficits would be upwards of four billion reais per year.

The new framework also frees the track concessionaire from any concern about the demand for the asset it is expected to build and maintain. Investors have no reason to select projects that make economic sense (in fact, under this scheme, dysfunctional projects may end up being more lucrative, since less demand leads to less maintenance costs). Once in place, the scheme also provides incentives for track operators to save on maintenance costs, which may lead to safety issues.

The co-existence of two regulatory regimes also raises concern, since existing concessions will continue to operate under the old regime, albeit under the reforms of 2011 (with regulated right of passage and interconnection). This means that the most profitable parts of the network will still be controlled by existing, vertically integrated concessionaires. Freight operators will likely have to simultaneously deal with these two regulatory frameworks when trying to reach their clients and their destinations, increasing costs and severely hindering the efficiency of the business.

Finally, even if the new regime were to be perfectly implemented, with regulators able to somehow negate the very serious incentive problems that will appear in investment and operation, any attempt at unbundling the railway industry will inevitably lead to a severe loss of efficiency, due to loss of economies of scope.

Economies of Scope between Infrastructure and Operation

Most other countries geographically similar to Brazil (United States, Canada, Russia) have integrated infrastructure and railway operation.[4] Efficient operation of railway freight transportation involves heavy investment in assets that are highly specific, both to the load being transported and the logistic chain. Consider iron ore, which needs to be moved from a very specific location, a mine, to a steel plant or a port. The use of rolling stock used is preferable to open gondola cars that require specialized facilities to load and unload. While hopper cars can also be used, they require different unloading facilities. Rolling stock can be used for other types of bulk cargo, such as coal, grain or sugar, but changing cargo types requires washing the cars, making it costly. For large-scale types of loads, such as iron ore, railways typically set compositions loaded with only ore, and return empty to the mine.

Tracks also need to "match" the rolling stock precisely. In addition to different gauges, the specifics of a railway design, such as maximum incline, dictate the types of cargo compositions that can be used. Railways designed for passenger trains have tilted curves to make trips at high speed more comfortable, but these prevent freight trains from using them, as heavy loads would lead to derailing.

There are massive economies of scope in running an integrated freight railway. Using data from freight railways in the U.S., Ivaldi and McCullough (2008) estimate efficiency gains between 20 and 40% by integrating infrastructure and operation, and gains of 70% by integrating bulk and general cargo operation. (Cantos Sánchez (2001) also reports significant cost complementarities between infrastructure and freight operation in Europe, but not for passenger operation.)

Vertical integration in freight railways is common for that very reason, and may even include ownership of the railway by the shipper. These arrangements are efficient to the extent that any alternative exposes parties to the holdup problem of investing in relationship-specific assets. These problems make the task of regulating the unbundling of railway freight under private provision of infrastructure intractable.

Unbundling with infrastructure maintained by a state-owned company is feasible, provided of course the state can be counted on to properly maintain the railways. Even with an ideal state-run railway network, substantial economies of scope are lost.

4 An important exception is Australia, where most of the railway network is managed by ARTC, a government-owned company.

If the state cannot be counted on to provide infrastructure, a simple solution exists: vertical integration, with tariff regulation to grant access to small shippers and curb the railway's monopoly power. This was in fact the original regulatory framework of the existing concessions in Brazil.

Public Reception of the New Regulatory Framework

The government's efforts to start the concession auctions of new rail lines in 2013 were hindered by questions from the private sector concerning Valec's payment risk, and by scrutiny from the Federal Court of Audits (TCU), who said that the new model had no legal basis. Although the government presented the new model as being regulated by the Law of Public-Private Partnerships - PPPs (Law 11.709/2009), in practice this law does not apply, since no public fund will be created to sponsor concessionaires. Instead, the government will assume demand risk through Valec and will not be affected by fiscal constraints.

The government responded by strengthening Valec with a BRL 15 Billion investment (Provisory Measure n. 618/2013) and proposed a new law, yet to be passed, that would turn the state owned company Valec into the EBF (Brazilian Railway Company). This new enterprise would be legally designed to buy and sell the transport capacity of the railways, and would pay the concessionaires in "receivables" guaranteed by the National Treasury, which are securities that can be accepted by banks. These bonds will be managed by a private bank.

Only one private company was interested in operating the first track offered for by Valec in August 2014, the 855km line between Anapolis (GO) and Palmas (TO). However, because the offer was conditioned on access to the port of Itaqui (MA), which could only be achieved through the use of a rail line operated by the Brazilian mining company Vale under the old model, it was ultimately not successful.

Under the current climate of fiscal austerity, it seems very unlikely that either investors or the government will proceed with a plan that involves massive public-funded deficits. It is unclear how and when the railway network will expand, at least until the current set of regulations proposed in the PIL are scrapped.

BOX 5: PERCEIVED PROBLEMS IN THE EXISTING RAILWAY REGULATORY FRAMEWORK IN BRAZIL

The Brazilian rail system was mostly transferred to the private sector in 1997 through concessions, with a framework based on the Decree 1.832 of 1996. Quickly, private investments of about R$37 billion revitalized the network and railways increased their share in the country's matrix from 15% to 25% by 2012 (Plano Nacional de Logística e Transporte – PNLT). Despite these significant achievements, the economic model utilized in the concession contracts was perceived as failing to stimulate further investments and growth in the sector. These problems were summarized by Pompermayer et al. (2012) as follows:

Interconnection – The right of one operator to move cargo through the network of another operator was not effective enough. Interconnection could be achieved by two different methods: Right of Passage (where one train from one company enters the tracks of another company to deliver its cargo) or *Mutual Traffic* (where the cargo needs to be transferred from one train to another in order to reach its destination). The 1996 framework was not effective in fostering interconnection. Deals were left to be brokered between rival companies, and were hard to come by. Arbitration by the National Transport Association (ANTT) was also not very effective. Rail companies were constrained to focus on their geographical area of operations.

General Goals – The performance evaluation of the rail tracks given in concession was based on generalized goals for each operator. This meant that, if a sector had excellent performance, it could make up for the bad performance of other low-demand sectors. In this way, large portions of the network could be left without use and maintenance and the goals would still be easily met. This led to several lines being decommissioned or left unused and the concentration of the operations and investments in the most profitable parts of the network.

5. PORTS

Today in Brazil, regulation allows private investors to open new independent port facilities (TUPs, or private usage terminals) with very few requirements. This has allowed investment in port capacity to grow, essentially bypassing the outdated regulation of public ports. As of 2013, TUPs account for 63% of country's cargo tonnage (see Table 2).

This is a second-best alternative to modernizing the regulation of public ports, as a reliance on investment on the extensive margin, i.e., building new ports, may lead to inefficiencies in port operation and access, and favor larger shippers. But it is certainly less of a problem than the ones faced in the other transport sectors.

Table 2: New Private Terminals by Year and a Timeline of Regulatory Changes in the Port Sector

Year	Number of requests for new TUPs	Events
1993	7	Law of Ports
1994	7	
1995	6	
1996	1	Public ports added to the list of companies to be privatized (Programa Nacional de Desestatização)
1997	6	
1998	1	
1999	2	
2000	6	
2001	2	Creation of the regulatory agency (ANTAQ)
2002	9	
2003	11	
2004	10	
2005	12	ANTAQ resolution imposes restrictions on TUPs
2006	8	
2007	7	Creation of SEP (Secretaria Especial de Portos, Ministry of Ports)
2008	4	Public ports taken out of the list of companies to be privatized; Decree 6.620
2009	7	
2010	4	
2011	6	
2012	8	MP 595 (New Law of Ports enacted provisionally)
2013	3	Law 1.2815 (New Law of Ports)
2014	12	

Source: ANTAQ.

Port Regulation in Brazil

There are three main types of port facilities in Brazil today, with widely different degrees of state intervention. First, there are public ports (portos organizados) that are state-owned enterprises. Second, there are private concessions within the public ports that provide public services (terminais de uso público com gestão privada, privately-run public use terminals). Finally, there are TUPs that may be within the area of the public port or on private land. In private concessions within the public ports, the operator leases the area from the state, while in the TUPs the operator merely needs authorization from the sector's regulatory agency, ANTAQ.

According to Guimarães (2014), the possibility of private investment outside public ports has been embedded in law since 1966, when it was put in place as a political response to congestion and inefficiency at public ports. However, investment in TUPs did not take off until after the Law of Ports (Law 8.630) of 1993. This law was only partially successful in deregulating the labor restrictions widely viewed as a major factor for the cost inefficiencies of public ports, but it had an important effect on the expansion of private investment, with TUPs dealing with third-party cargo, effectively allowing these facilities to operate as unregulated public ports and as mixed use terminals. While semantically one would assume TUPs were expected to move mostly their own cargo, the law was silent about specific proportions.

The concessionaires of public use terminals took advantage of this ambiguity to lobby for regulation that would impose restrictions on TUPs. In 2005, ANTAQ added a requirement to the authorization process that the operator must expect to move their own cargo with a volume sufficient to justify the new project. In 2008, the government enacted a decree (Decree 6.620/2008) that TUPs are to primarily move their own cargo, and move third-party cargo only in a subsidiary and eventual capacity.

Only in 2012 was the matter finally settled with the new law of ports (Provisory Measure n. 595, now Law 12.815/2013). The new law clearly established that TUPs are free to move any cargo they see fit. It also lifted any requirements on existing TUPs to comply with labor regulations pertaining public ports (see however Box 6).

The Case for Deregulation of TUPs

The economic argument for the regulation or state ownership of a port is based on the premise that it may be an essential facility. An essential facility is an asset that is necessary for a particular line of business and cannot

be reproduced. Private, unregulated ownership of an essential facility is considered problematic because it is a source of monopoly power. The owner of an essential facility controls the market, since he can drive away competitors by denying them access to the facility.

From the point of view of antitrust law, policies to prevent investment in new terminals based on limits on third-party cargo do not make sense for two reasons. First, if investors are willing to open new ports, by definition ports cannot be an essential facility, since those cannot be reproduced. Second, and more importantly, any such regulation is anticompetitive: The way an essential facility is used to gain market power is by preventing third-party users from having access to it. Pro-competitive regulation should advocate more public access to ports, not the other way around. In fact, it seems clear that restrictions on TUPs have been based on an agenda to reduce competition faced by terminals in public ports.

Benefits and Costs of Partial Deregulation

While the deregulation of TUPs in Brazil's current regulatory framework is a major step forward, it is important to emphasize that it is only a second-best solution to the inefficiencies present in public ports – the best solution being to deregulate public ports.

Some of the new terminals simply reproduce facilities that exist or that could be created more cheaply in public ports, and make economic sense only because public ports lack the capacity to invest and are operationally very inefficiently. In addition, having terminals geographically spread out increases the costs of subsidiary services such as dragging and requires more investment in port access.

Another disadvantage is that since investment in port facilities is a business with large economies of scale, this arrangement tends to favor large shippers of bulk materials. This effect can be seen in Table 3 that shows how TUPs tend to disproportionally ship more iron ore and oil, and less agricultural products and general cargo. That problem tends to be magnified by regulatory restrictions on third-party cargo; with a safer regulatory framework, one should expect to see more projects that cater to small scale shippers.

Looking ahead, the current regulatory framework seems to allow for adequate expansion of port capacity in Brazil, at least in comparison with other components of transport infrastructure. Evidently, it can be substantially improved by deregulating the public ports as well – with many TUPs providing competition, there is even less reason to treat public ports as natural monopolies and keep them in the hands of the state.

Table 3: Proportion of Cargo Types Shipped via TUP and Public Ports

	TUPs			
	2011	2012	2013	2014 (1st semester)
Bauxite	5,34%	N/D	5,20%	5,20%
Mineral coal	2,46%	N/D	2,20%	2,90%
Cellulose	1,45%	N/D	1,40%	1,40%
Fuels and mineral oils	27,57%	75,61%	27,00%	27,40%
Iron ore	48,29%	75,61%	47,30%	45,60%
Petroleum coke	1,16%	N/D	N/D	N/D
Soybean meal	1,24%	N/D	N/D	1,00%
Fertilizers	N/D	N/D	N/D	0,80%
Wood	0,94%	N/D	N/D	0,90%
Other groups	7,54%	N/D	12,60%	8,30%
Steel products	2,13%	N/D	1,80%	1,90%
Soybean	1,88%	N/D	2,50%	4,60%
TOTAL	**100,00%**	**75,61%**	**100,00%**	**100,00%**

	PUBLIC PORTS			
	2011	2012	2013	2014 (1st semester)
Sugar	8,39%	7,42%	8,20%	5,30%
Bauxite	2,33%	1,80%	N/D	N/D
Fuels and mineral oils	10,39%	10,78%	10,60%	11,80%
Soybean meal	N/D	2,46%	N/D	3,70%
Fertilizers	6,07%	6,14%	6,40%	7,00%
Containerized goods	N/D	18,46%	N/D	N/D
Corn	2,97%	6,44%	7,10%	N/D
Iron ore	17,59%	16,61%	16,00%	17,30%
Other groups	34,73%	18,02%	40,70%	27,90%
Plastics and articles thereof	2,19%	N/D	N/D	1,80%
Organic chemicals	2,74%	N/D	N/D	1,80%
Steel products	N/D	N/D	N/D	2,30%
Soybean	10,37%	9,85%	11,00%	19,40%
Wheat	2,23%	2,02%	N/D	1,70%
TOTAL	**100,00%**	**100,00%**	**100,00%**	**100,00%**

BOX 6: THE CASE OF EMBRAPORT AGAINST THE LOCAL DOCKERS UNIONS

The enactment of the New Law of the Ports (Law 12.815 of June 2013) removed many obstacles in the implementation of privately operated ports in Brazil, and sparked a wave of large private investments into one of the biggest bottlenecks in national logistics. The government has authorized twenty-six new private ports since the enactment of the new law, representing investments of almost USD 4 Billion (R$9.5 Billion).

Previously, in order to receive authorization, ports that were privately used had to maintain a minimum of 50% of their movement generated by cargo from their owners. The new law scrapped this demand and now port owners are free to operate in an open market.

However, the law contains one large restriction related to the labor unions of the dock workers. The new legislation maintains the distinction between two types of ports, with different rules applied to the way they hire their dock workers:

Organized Port – Is an existing port, publicly owned and operated, or leased or granted to a private company. The dock workers are hired through a Union, called Workforce Managing Organization (Órgão Gestor de Mão de Obra – OGMO), which stipulates minimum quantities of workers for each kind of service and defines their compensation.

Non Organized Port – Is a port, privately owned and usually new, built outside the defined territory of the Organized Ports. Their dock workers can be freely hired outside of the jurisdiction of the Union and their quantities and salary are subject to market forces.

It is interesting to note that not every privately owned port is a Non Organized Port, free to hire and manage their workforce at will. Some private facilities were built in areas defined as belonging to an Organized Port, and thus have to respect their workmen hiring rules.

This situation caused a severe legal and political battle in the case of Embraport, a USD1.02 billion privately operated container seaport in Santos in the State of São Paulo. In order to keep costs down and increase productivity, the management of the port did not want to hire its workers from the OGMO pool and was forced into litigation by the two dockers unions active in the sector.

The unions claimed that, because part of Embraport was located inside the area of the old Santos Port, an Organized Port according to Law 12.815, the workforce had to be hired through the OGMO. They enacted strikes, halted the port's services and enlisted strong support from politicians linked to the labor movement. The private operators claimed that they were mostly out of the Organized Port area and could, by law, regulate their workforce as they wanted, in an interpretation that was victorious in the lower courts.

BOX 6 (CONT.)

After months of debate, both parties reached an agreement in June 2013, where Embraport agreed to split their hiring 50-50 between unionized and non unionized workers until the end of June 2014. After that date, the company would be free to hire as it wanted.

This deal happened as the private operators (lessees) of the Organized Ports were reaching the same agreement with their unions (OGMOs), backed by the government, in an effort to lower costs and increase efficiency throughout the industry.

Today, especially through better competitiveness and efficiency, privately used ports account for more than 63% of the cargo movement in Brazil, and the government believes that the new law should attract US$22.7 Billion in the next four years, boosting the country's logistics.

6. CONCLUSIONS

It is clear that Brazil must work to improve transport infrastructure. A regulatory framework where both private and public sectors cooperate is a necessary condition for investment. We argue that there have been some important changes in the regulation of transport infrastructure in all three key sectors (highways, railways, and ports) that erode incentives to invest.

This paper analyzes these changes and discusses some of their impact on infrastructure investment and operation.

Highways

Federal highway concessions in Brazil are contracts where a private concessionaire receives the right to charge tolls for a fixed number of years in exchange for maintaining the road and performing a predetermined set of investments.

Over the last several years, rules for new highway concessions have changed in several ways that restrict concessionaires' scope to change tolls based on demand or competition for roads, codifying toll changes based on new

regulation. These changes have been offset by subsidies; however, this combination is beginning to distort the market, including the participation of companies in concession auctions.

Railways

Railways that involve the largest economic benefits tend to involve a large degree of asset specificity, and vertical integration with main clients (usually mining companies) and ports is a common arrangement.

In July 2011 the regulation applied to existing concessions was changed to force access of independent operators to the rail network of the concessionaires; it also established new rights to users to resell capacity and even to invest directly in the railway track (ANTT Resolution 3.695/2011). In 2012, the government proposed a radically new regulatory framework for new railways. If this new framework is implemented, unbundling will be complete: the private concessionaires in charge of building and maintaining the tracks will no longer be allowed to operate trains. This will be departure from the integration model of most other countries geographically similar to Brazil (United States, Canada, Russia), and the new framework has already begun to erode private companies' interest and willingness to invest in railways.

Ports

The story of Brazil's ports is different, and better, than that of the highways and railways. Today in Brazil, regulation allows private investors to open new independent port facilities with very few requirements. This has allowed investment in port capacity to grow, essentially bypassing the outdated regulation of public ports.

While the deregulation of independent port facilities in Brazil is a step forward, it is only a second-best solution to the inefficiencies present in public ports – the best solution being to deregulate public ports. For example, some of the new independent terminals simply reproduce facilities that exist or that could, more cheaply be created in public ports, and make economic sense only because public ports lack the capacity to invest and are operationally very inefficient. In addition, having terminals spread out geographically increases the costs of subsidiary services such as dragging and requires more investment in port access.

7. POLICY IMPLICATIONS

This paper finds that while the specifics are different in each sector, the general trend is clear: regulation is becoming more complex as the regulator gradually replaces the market as a provider of incentives. Overall, these regulatory changes can have a negative effect on the efficiency of the investment and the quality of expansion and operation of transport infrastructure.

If investors fear a lack of stability in the regulatory framework, or if the regulatory framework prevents investors from collecting economic rents generated by some projects, they will not invest. Or, in order to invest in this environment, they will require subsidies that make up for increased regulatory risk.

Indeed, recent changes in transport regulation – and the prospect of future opportunistic behavior by regulators – have been compensated with hidden subsidies through added subsidized funding to foster participation, as demonstrated by the important increase in the releases from the Brazilian Development Bank (BNDES) for infrastructure projects. As a result, the financial burden of the project shifts from users to taxpayers.

This paper argues that even when these subsidies are large enough to keep investors interested and allow for new concessions to be awarded, the combined effect of these two policies erodes the incentives of private concessionaires to perform well and to select the best projects; makes projects more costly; and leads to more complex and less efficient relations between concessionaires and regulators.

These downsides have an impact on Brazil's economic growth, and, in particular, the productivity of its agricultural sector. Two main policy implications are:

1. The country should improve infrastructure to enhance agricultural productivity. As previous CPI work shows (CPI, 2013), access, or lack of access, to infrastructure directly impacts agricultural productivity in Brazil. Better highways, railways, and port infrastructure can impact agricultural productivity.

2. New regulation or changes to regulation of infrastructure should focus on an appropriate balance between public and private cooperation, and incentives for private infrastructure owners to continue to build and improve upon infrastructure needed by the market. This paper argues that many of Brazil's recent regulatory changes have been detrimental to infrastructure investment. Following the examples of geographically similar countries to Brazil – such as the U.S., Europe, and Canada – providing incentives to private infrastructure that more directly align with market needs may unlock more investment and allow for infrastructure improvements.

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