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Filling the Gap: Infrastructure Investment in Brazil

by Mercedes Garcia-Escribano, Carlos Goes, and Izabela Karpowicz

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Abstract

Infrastructure bottlenecks have been identified as a key obstacle to growth affecting productivity and market efficiency, and hindering domestic integration and export performance. This paper assesses the state of Brazil's infrastructure, in light of past investment trends and various quality and quantity indicators. Brazil's infrastructure stock and its quality rank low in relation to that of comparator countries, chosen amongst main export competitors. We provide evidence that infrastructure affects domestic integration by analyzing price convergence of tradable goods across major cities. The government's concession program will narrow part of the infrastructure gap, however, governance reforms will be crucial to improving investment efficiency.

JEL Classification Numbers: H54, N76, C33

Keywords: Infrastructure, Public Investment, Domestic Market Integration

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I. INTRODUCTION

Developing an economic strategy to scale up infrastructure investment requires establishing the link between infrastructure provisions and growth, determining the infrastructure gap, and identifying financing and optimal provisioning. Areas where Brazil's competitiveness has lagged include, but are not limited to, education, innovation, governance, and justice. Yet, inadequate infrastructure is increasingly identified as the key bottleneck behind low productivity, stagnating export performance, insufficient domestic market integration, and weak growth potential. Market segmentation caused by divergence in relative prices can have potentially severe social and macroeconomic implications. Income inequality may also increase with market segmentation, as low income producers in rural areas are adversely impacted by difficulties accessing large consumer markets. Several years of underinvestment in infrastructure have contributed to reducing potential growth. It has been estimated that inefficiencies due to inadequate infrastructure subtract 10−15 percent from the country's GDP (Credit Suisse, 2013).[2]

To underscore Brazil's need for greater investment in infrastructure, we attempt to throw some light on Brazil's infrastructure gaps. Infrastructure investment is often seen as a strategy to promote internal integration and export competitiveness. Following this logic, we first look at how infrastructure affects domestic integration by analyzing price convergence across major cities. Second, using quantity and quality indicators, we look closely at infrastructure gaps across sectors against Brazil's current income levels and against infrastructure levels and quality of Brazil's competitors in its export markets. We then document historical infrastructure investment trends in Brazil, and describe the authorities' concessions program in light of the most pressing infrastructure needs. Finally, we discuss policies that could help close the infrastructure gap.

II. HOW WELL INTEGRATED IS THE BRAZILIAN DOMESTIC MARKET?

We assess market segmentation in Brazil by analyzing convergence of prices across major metropolitan areas. We use the dataset constructed by Góes and Matheson (2015), to look for evidence of domestic market segmentation by exploring convergence of prices of tradable goods between large metropolitan areas and Sao Paulo, which is used as reference city.[3] The objective is to assess whether infrastructure adequacy could help explain the domestic integration through the study of prices and travel times between cities.

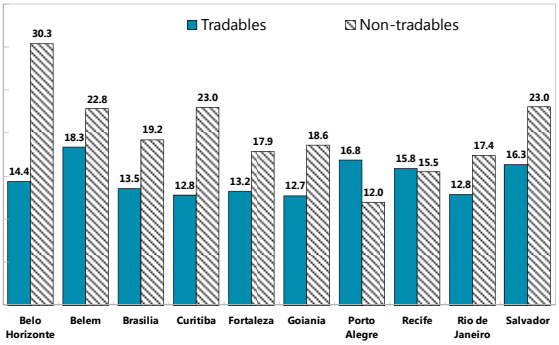
We take monthly price indices for 51 products across 10 metro areas over the past 14 years, and test for panel unit root using the methodology developed by Im, Pesaran, and Shin (2003). Intuitively, we are testing for the law of one price (LOOP): if goods markets are well integrated, the difference between the log of price levels (p_{it}) for tradable products in different i cities

[2]According to Credit Suisse (2013), most of the R$1 trillion investment gap is infrastructure related. Underinvestment is especially notable in greenfield projects as brownfield projects were granted to the private sector through concessions. Airports, ports, and rail are the most constrained sectors.

[3] The original works studies convergence to the national mean.

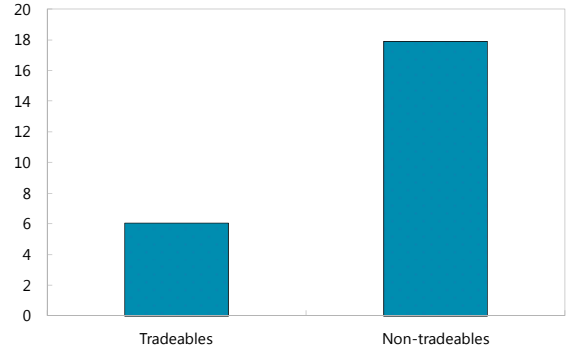
example, the average half-life of tradables price convergence is 12.8 months, while in Belem it is 18.3 months. Around 90 percent of price convergence occurs over 3 years (Figure 1). For all products that satisfy the LOOP, price convergence is considerably slower for non-tradable products (Figure 2). The average half-life of non-tradable price convergence is 20 months, whereas the half life of tradable price convergence is 14 months.

Figure 1. Brazil: Metro-Area CPI Divergence Half-Lives
(in months)



Source: Auhtors' estimates.

Figure 2. Domestic Integration: tradeables and non-tradeables
(percent of ADF coefficients that are greater or equal to 1)



Source: Authors' estimates.

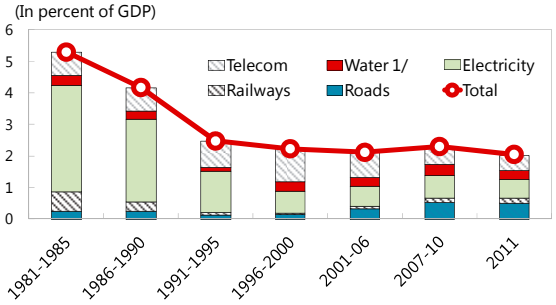
Price convergence in Brazil is also slower than in comparator countries. International evidence using similar empirical approaches, also applied to monthly CPI data, points to significantly lower half-lives of price convergence in other countries. The average half-life of convergence for China between 1993 and 2003 (Li and Huang, 2006) was 2.4 months, and the half-life for Canada between 1978 and 1994 was 5 months (Fan and Wei, 2006). The results for both countries suggest that more than 90 percent of relative price shocks dissipate within 18 months, much faster than in the case of Brazil (Figure 3).[4]

Robustness checks have confirmed slow price convergence and evidence of market segmentation in Brazil. Góes and Matheson (2015) extended this analysis adopting a method proposed by Levin, Lin and Chu's (2002) and using the national average, rather than São Paulo, as the reference price in the cointegration analysis. The results are consistent with ours, with somewhat more non-tradables failing to satisfy LOOP, while the estimated average half-life of tradable products price convergence is slightly higher (16 months).

[4] Using the aforementioned half-lives (h), we derive the autoregressive term as $|\rho| = \exp(ln(0.5)/h)$ and plot their respective response functions.

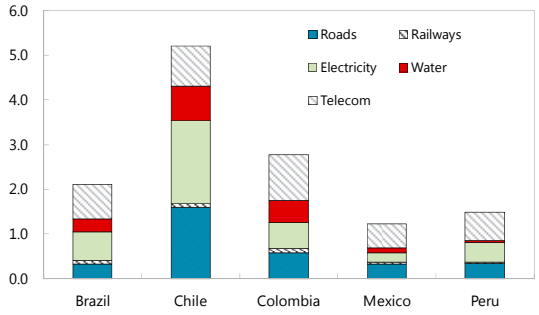
reflecting the participation of the private sector under the concessions scheme. By contrast, Chile has invested more in roads and distribution/supply of water and sanitation.

Figure 10. Brazil: Infrastructure Investment
(In percent of GDP)



Sources: The chart shows data till 2006 from Calderón and Servén, 2010; and for the period 2007-2011 from Frischtak, 2013. Differences across data bases are negligible. 1/ Includes also infrastructure investment in ports and airports.

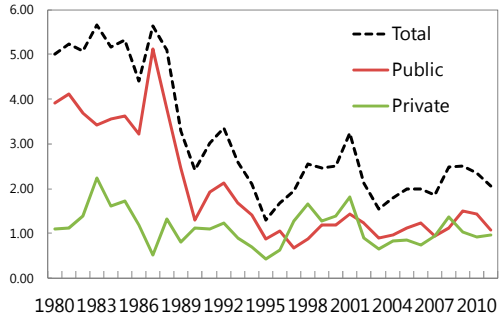
Figure 11. LA5: Infrastructure Investment, average 2001-06
(In percent of GDP)



Sources: Calderón and Servén, 2010.

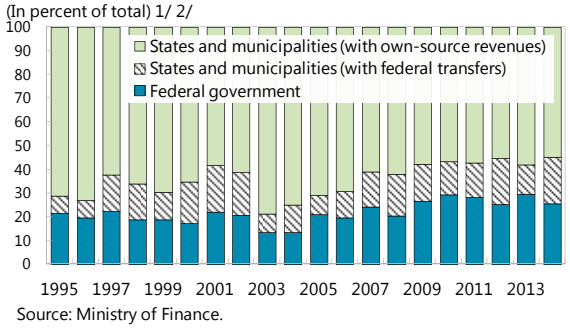
The decline in infrastructure investment in Brazil is mostly explained by a reduction in public infrastructure investment (Figure 12). The 1988 Constitution reduced the pool of federal funds available for capital expenditures as it replaced sector-specific federal taxes earmarked to energy, transport, and telecommunications with non-specific state-level ones; raised transfers to sub-national governments; and earmarked revenues to certain current public expenditures. The fiscal adjustment effort carried out from 1999 limited the available fiscal space for public investment, due to the budgetary rigidities and mandatory current primary spending. Consequently, public expenditures allocated for infrastructure investment have remained subdued since then, despite initiatives aimed at prioritizing infrastructure investment such as the *Programa de Aceleração do Crescimento* (PAC), which was launched in 2007 by the Federal government with the goal of accelerating economic growth.[9] At present, about 75 percent of total investment for the general government is being executed at the subnational level (Figure 13).

Figure 12. Brazil: Public and Private Infrastructure Investment
(In percent of GDP)



Source: The chart shows data till 2006 from Calderón and Servén, 2010; and for the period 2007-2011 from Frischtak, 2013.

Figure 13. Brazil: Public Investment by Level of Government
(In percent of total) 1/ 2/

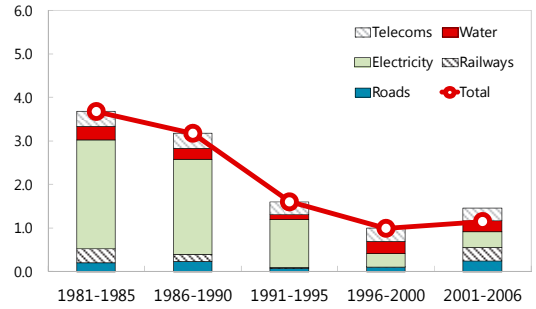


Source: Ministry of Finance.
1/ Excludes public enterprises.
2/ Investment refers to gross capital formation, and therefore, covers not only infrastructure invesment.

[9] The PAC—excluding allocations to defense, education and the *Minha Casa Minha Vida* programs—amounted 0.5 percent of GDP in 2013, up from 0.3 percent of GDP in 2007.

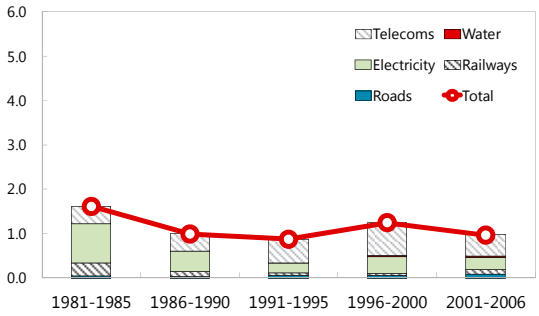
Meanwhile, private sector investment has not filled the space vacated by the public sector. During the 1990s, privatization and concessions opened up key infrastructure sectors such as telecommunications, energy, and transport to private investment, but private investments have not been sufficient to compensate for the decline in public investment (Figure 15).[10] Private participation in infrastructure in Brazil has been low in comparison with other Latin American countries, corroborating that the investment environment, including investment opportunities, and regulatory and institutional frameworks play a major role in determining overall infrastructure investment levels and therefore tackling the infrastructure gaps.

Figure 14. Brazil: Infrastructure Investment by Public Sector
(In percent of GDP)



Source: Calderón and Servén, 2010.

Figure 15. Brazil: Infrastructure Investment by Private Sector
(In percent of GDP)

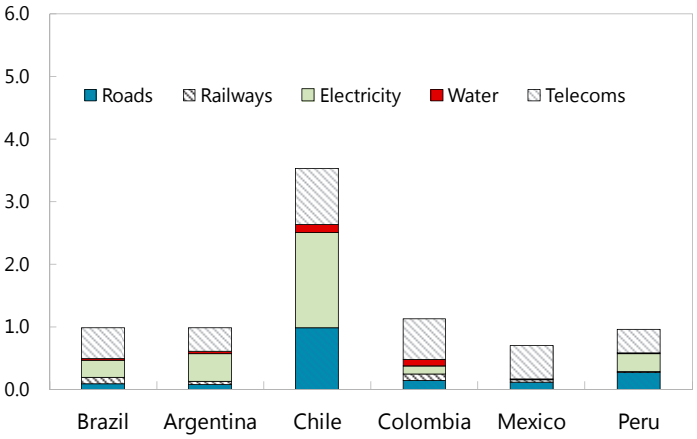


Source: Calderón and Servén, 2010.

IV. The Role of the Concession Program

Brazil has been pursuing opportunities for concessions with the aim of filling infrastructure gaps. The concessions can bring in private sector expertise and efficiency and also help bypass some of the challenges faced by public investment—such as contracting obstacles—and therefore speed-up the process of investment.[11] A first phase of concessions in Brazil took place during the late 1990s. Through privatization, the private sector became the main operator in telecommunications, electricity and railways. During this period, concessions were also granted

Figure 16. LA5: Infrastructure Investment by Private Sector, 2001-06
(Average, in percent of GDP)



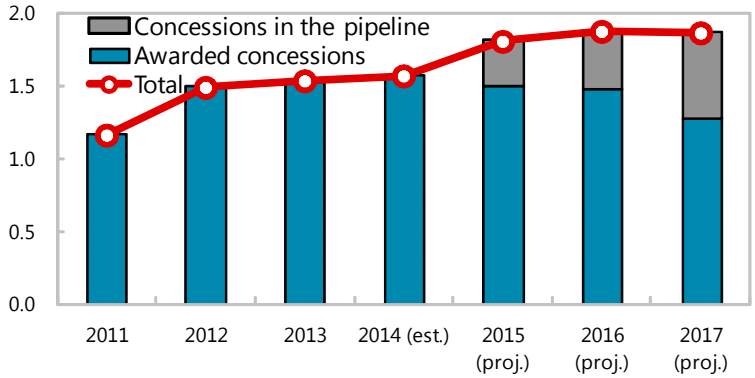
Source: Calderón and Servén, 2010.

[10] In contrast, in Chile, the private sector more than compensated for the fall in public expenditures since 1989, with a net positive impact on total investments (World Bank, 2007).

[11] Even though concessions could bring efficiency gains, there could be fiscal risks involved that should be closely monitored.

for about 5,000 km of federal roads. It is worth noting that private sector investment through concessions in the telecommunications and electricity sectors helped eliminate the infrastructure gaps and improved Brazil's ranking in these areas, as mentioned earlier in the text.

Figure 17. Brazil: Annual investments through concessions
(In percent of GDP) 1/ 2/



Source: SAE/MF, Ministry of Finance
1/ Awarded concessions and concessions in the pipeline as of end-14.
2/ Excludes investments in new railways, oil, gas and urban transportation.

The current phase of concessions was launched a few years ago and focuses on projects in critical infrastructure sectors such as roads, ports and airports. During the period 2011−14, concession projects were auctioned in the areas of transport, energy, with an associated total investment estimated at R$183.4 billion, split between airports (R$35.8 billion), ports (R$8.4 billion), roads (R$29.2 billion), urban transportation (R$6.9 billion), power generation and transmission (R$96.7 billion) and telecommunications (R$6.4 billion). Since 2013, the federal road concessions increased by 4,873 km.

The federal government plans include the awarding of projects in the areas of transportation (roads, railways, and ports), power generation and transmission, telecommunications and urban transportation, with estimated total investment of R$256 billion (*Secretaria de Acompanhamento Econômico*, 2015).[12] The concession period usually ranges from 20 to 35 years, with most of the infrastructure investments taking place during the first five years. Delays in the biddings and changes to the contracts could dilute investments over time. The infrastructure concession program could also be hampered by the probe into corruption concerning Petrobras, as several of the largest construction companies are involved in the investigation and these could see their access to funding diminished.

V. Conclusion

From the analysis of quantitative and qualitative indicators and our own econometric exercise, we find evidence of infrastructural inadequacies in Brazil. Such infrastructure gap has become a major obstacle to growth as it limits domestic integration and hinders external competitiveness. Brazil's business climate and competitiveness have been suffering in recent years from obstacles related to the complex tax system, administrative hurdles, judicial inefficiencies, red tape, inadequate regulatory framework, that have come to be known under the name "*custo Brasil*". While infrastructure bottlenecks are not considered part of this "soft" burden on business attractiveness, they are believed to be among the main constraints to raising potential growth.

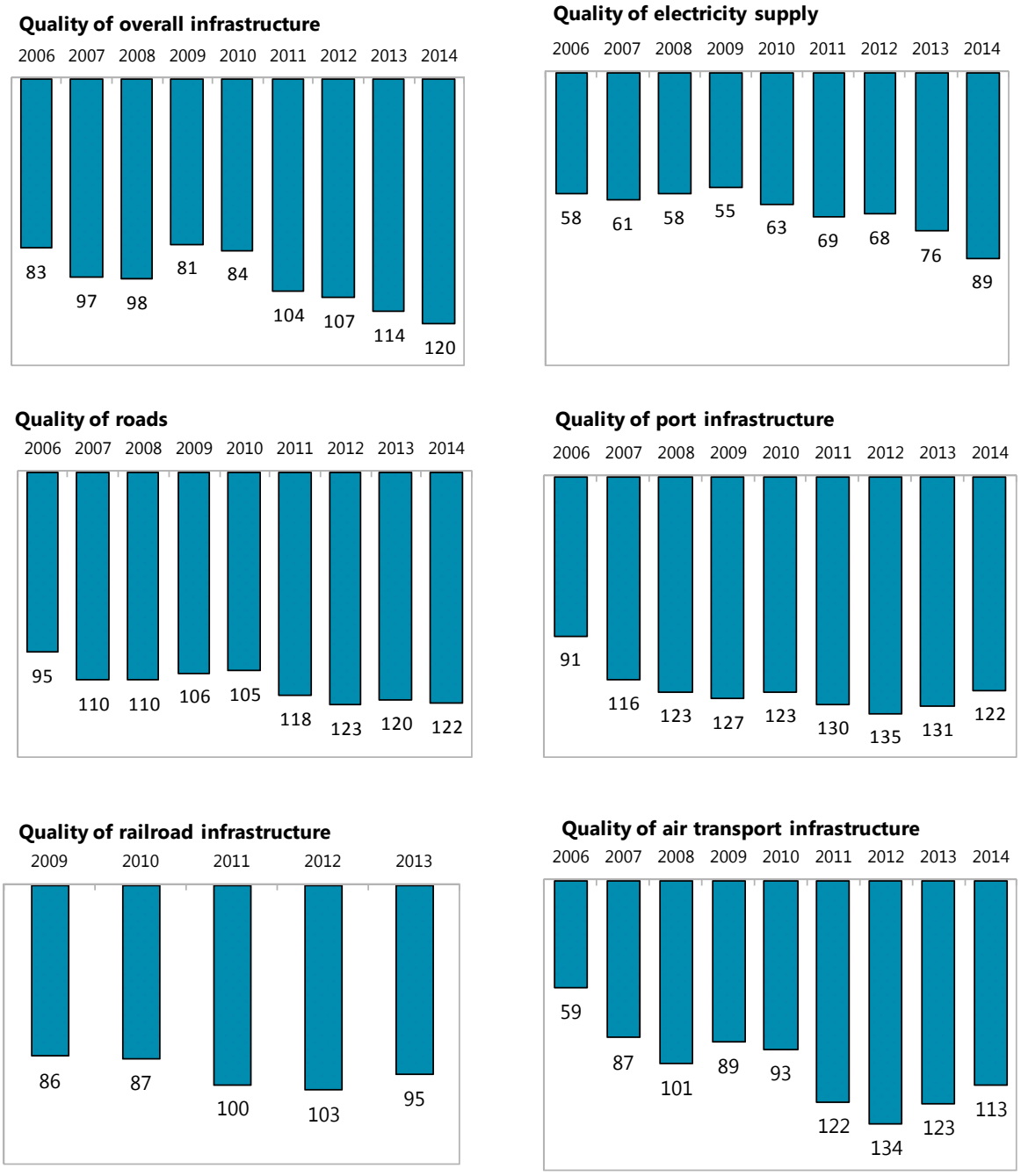
[12] The figure includes projects announced in June 2015.

Infrastructure is not adequate to support current income levels, foster regional integration, and put Brazil on a more competitive footing against rivals in main export products which include some of the advanced economies.

Filling the gap will entail increasing investment, but also stepping up other reforms. The infrastructure gap has grown over time due to low public and stagnating private investment across all sectors over the past decade. The government's concession program has the potential to step up and speed up infrastructure investment; but by itself, it may not be enough to boost potential growth significantly. Other reforms to eliminate "soft" bottlenecks, including reforms to enhance governance standards, will have to accompany efforts to fill the infrastructure gap to make the business environment more attractive to foreign and domestic investments in an environment where regional competition to attract investments is set to intensify.

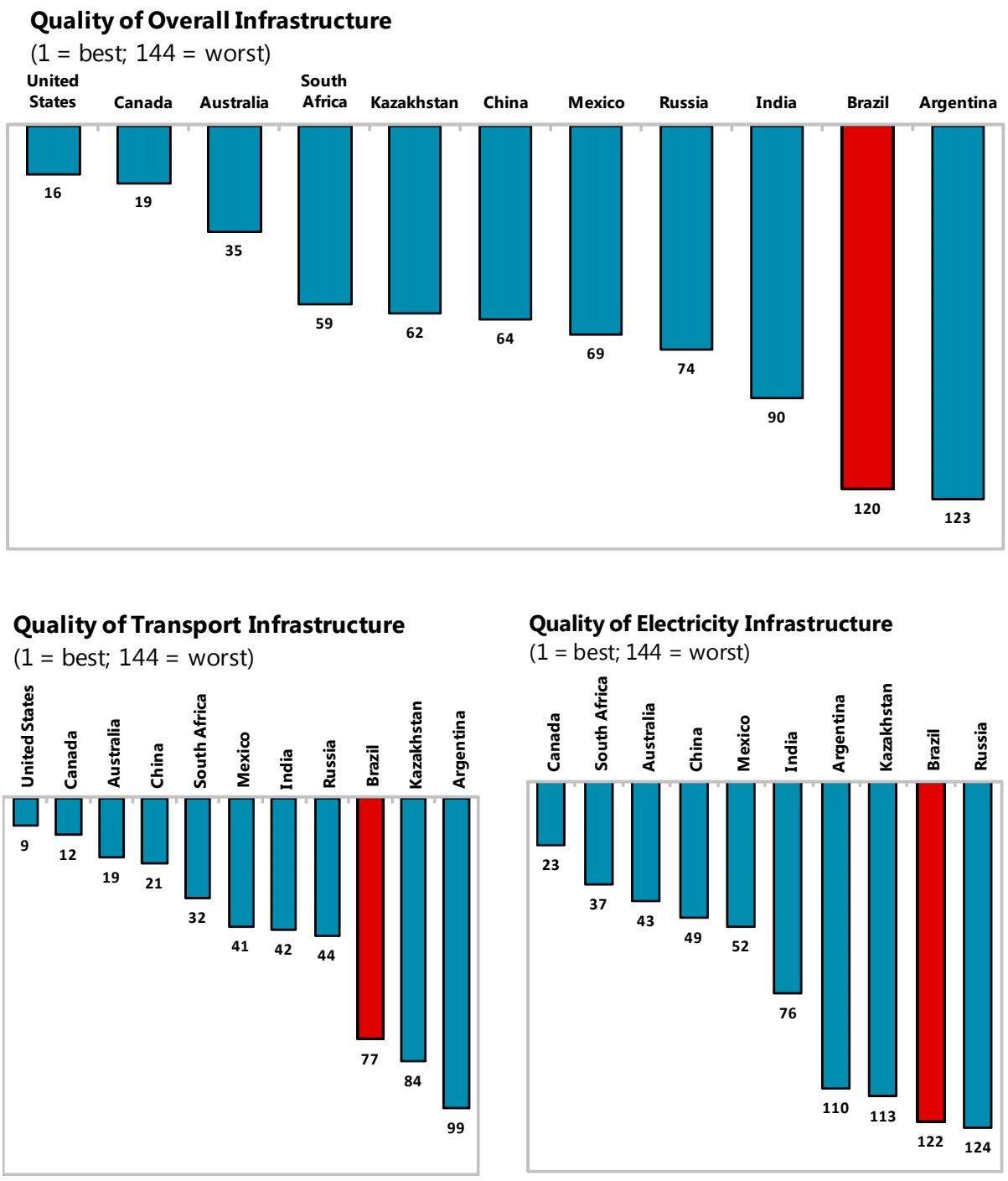
Appendix. Infrastructure Indicators

Figure A1. Brazil: Infrastructure Quality
(Rank out of 144)



Sources: World Economic Forum.

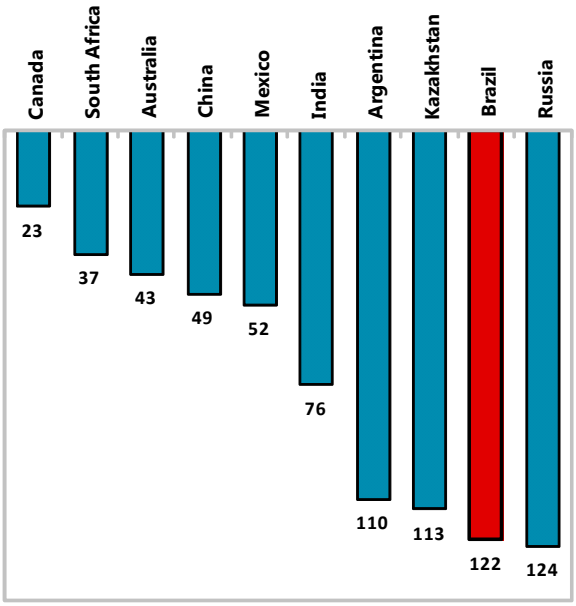
Figure A2. Infrastructure Quality in Brazil and Export Competitors, 2015



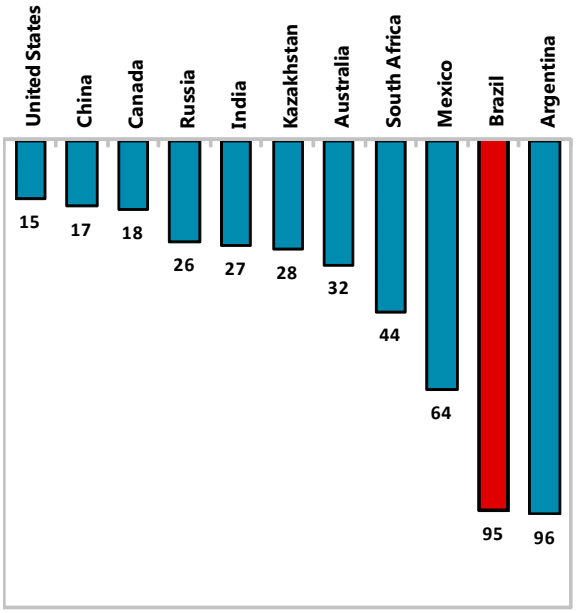
Source: World Economic Forum

Figure A2. (cont.)

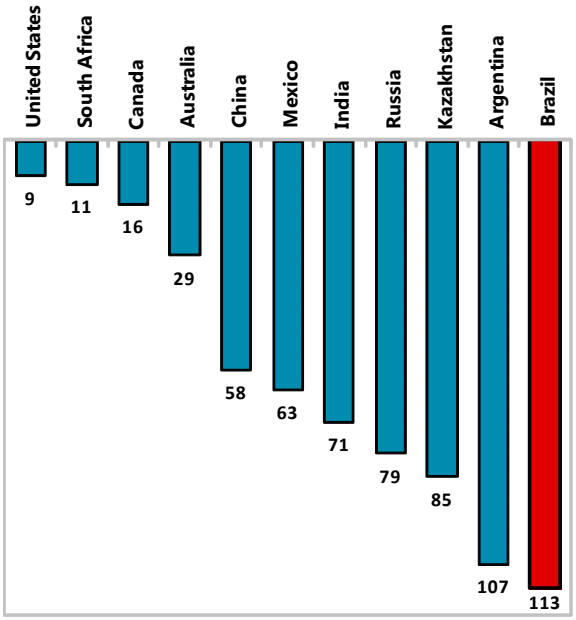
Quality of Roads Infrastructure
(1 = best; 144 = worst)



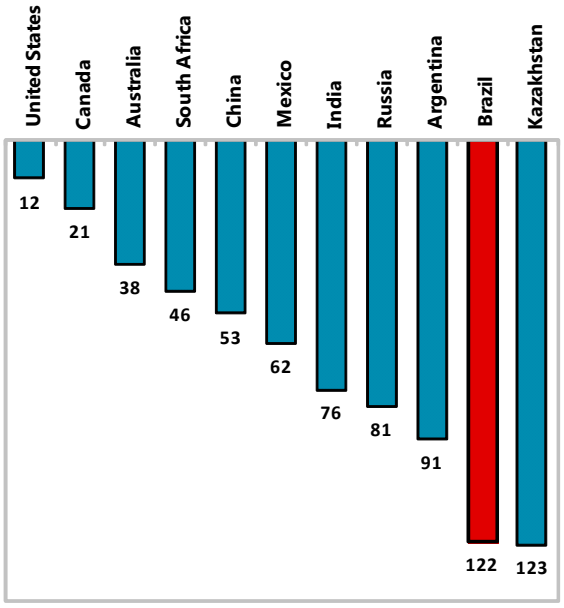
Quality of Railroad Infrastructure
(1 = best; 144 = worst)



Quality of Air Transport Infrastructure
(1 = best; 144 = worst)



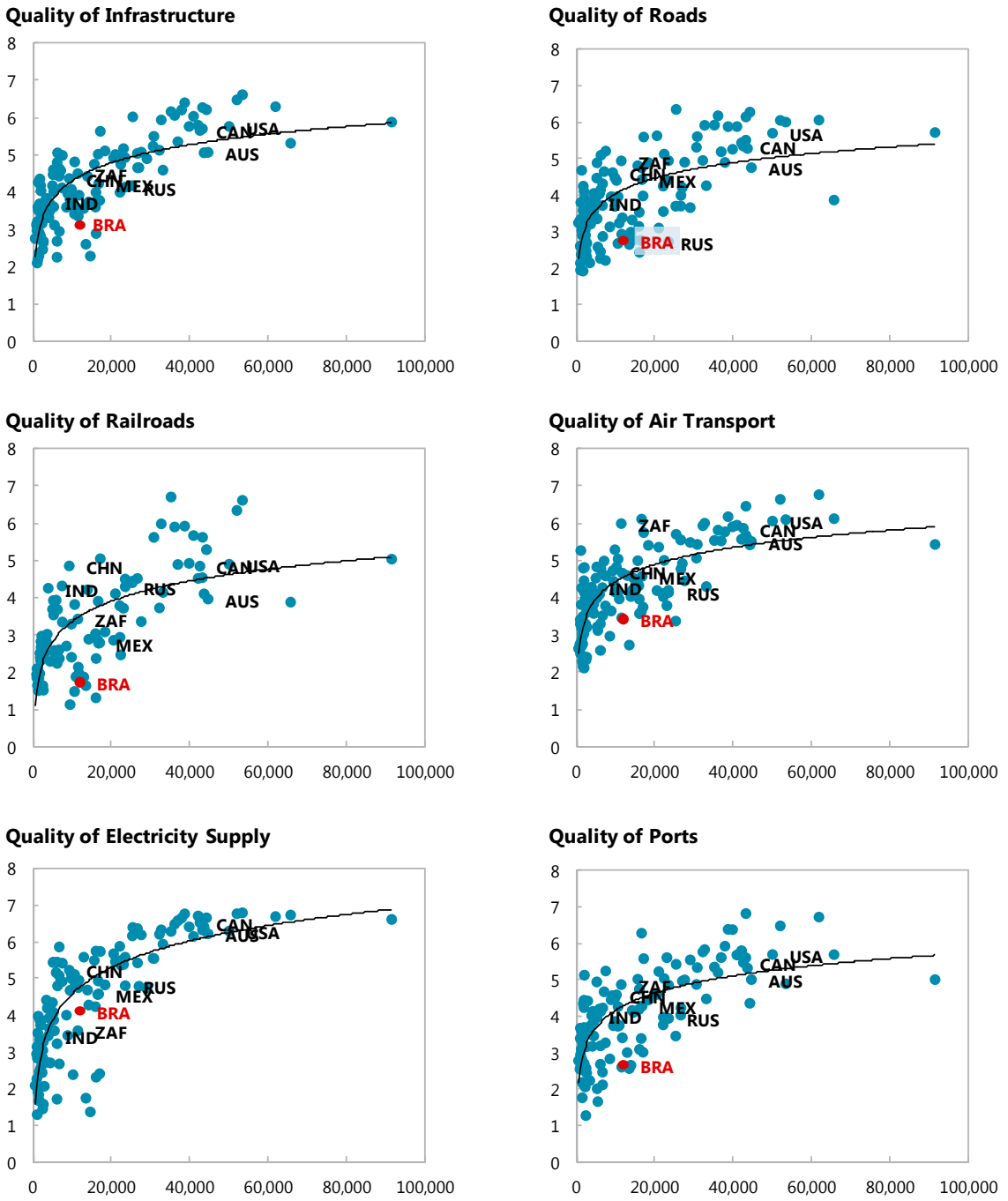
Quality of Port Infrastructure
(1 = best; 144 = worst)



Source: World Economic Forum

Figure A3. Infrastructure Quality and Income

(y-axis: quality of infrastructure, 2014, 10 = best; x-axis: GDP per capita, PPP dollars, 2012)



Sources: World Bank WDI; and WEF; and Fund staff estimates.

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