—Increasing the efficiency of public infrastructure delivery

Evidence-based potential efficiency gains
in public infrastructure spending
in Latin America and the Caribbean

Tomás **Serebrisky**
Ancor **Suárez-Alemán**
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IDB

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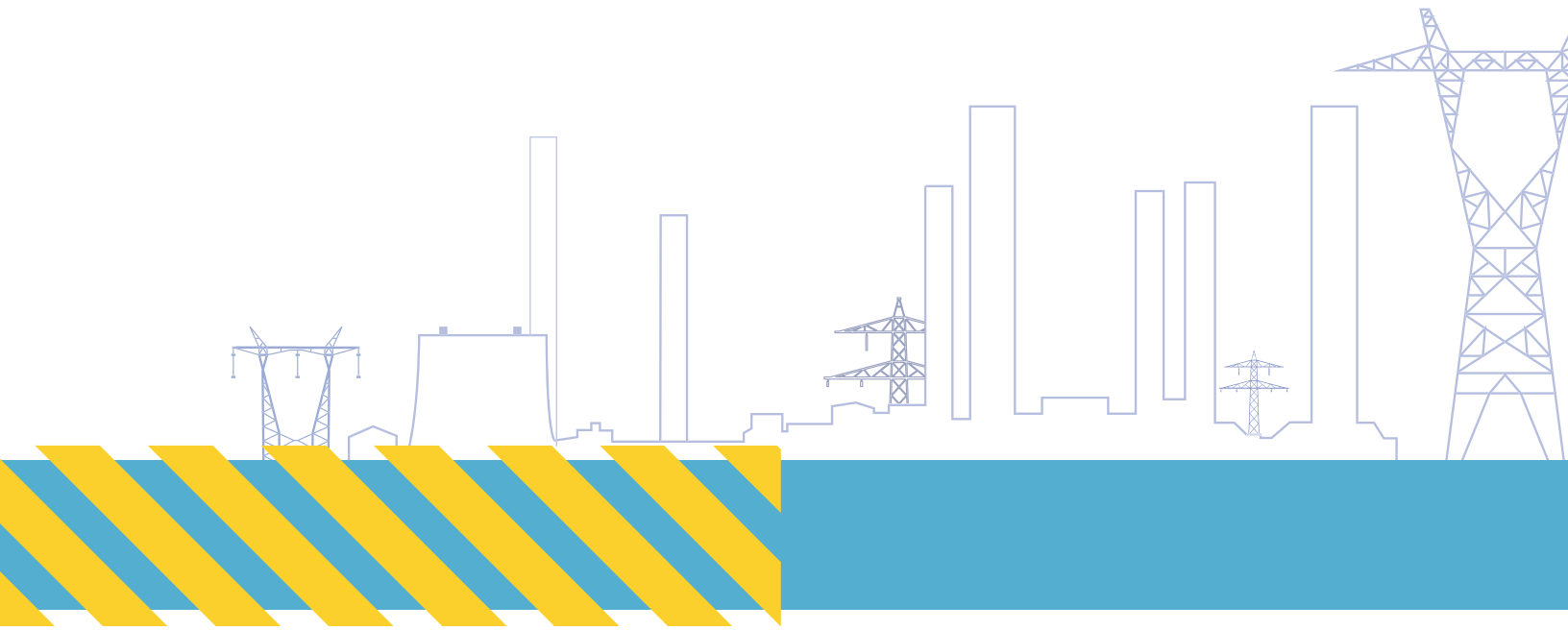

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Insufficient Investment, Inadequate Services: The Infrastructure Gap in Latin America and the Caribbean

Countries in Latin America and Caribbean (LAC) have on average invested more than 3.5 percent of their annual GDP in infrastructure since 2008. This spending peaked at 4.2 percent of GDP in 2013, falling to 3.5 percent in 2015 (Infralatam 2017). These high investment rates—twice the levels of the 1990s (Calderón and Servén 2010; CAF 2013, 2014)—reflect government decisions to alleviate bottlenecks and improve growth, policies that allow private sector participation in the infrastructure sector, and a favorable macroeconomic environment.

Despite the increases, investment in infrastructure in LAC remains low, averaging just 2.7 percent of GDP between 1992 and 2015. By contrast, investment in infrastructure accounted for 8.5 percent of GDP in China; 5 percent in India and Japan; and 4 percent in other industrial countries, such as Australia, Canada, and the Republic of Korea (IDB 2016).

Low and Declining Quality

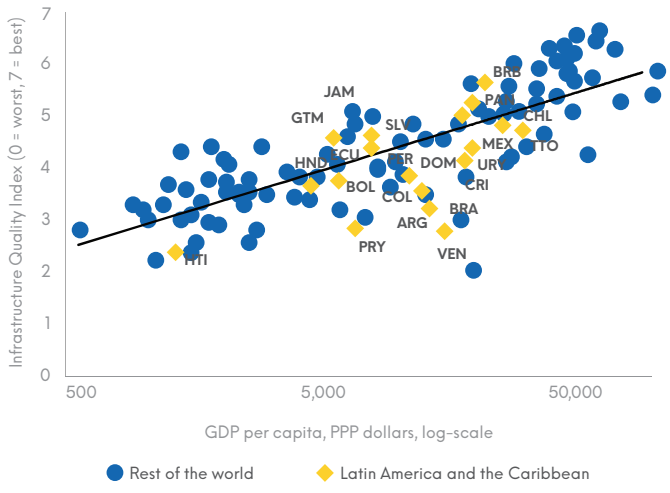
Low levels of investment in infrastructure have created a significant infrastructure gap in LAC. This gap is not an abstract concept, it comprehends the lack of physical assets, inadequate maintenance, and poor provision of infrastructure services in LAC, which explain the perception that infrastructure services in the region are of low quality. The World Economic Forum's indicator of infrastructure quality from the Global Competitiveness Report reveals that the quality of infrastructure in LAC lags that of advanced economies and high-growth Asian economies. Even more worrisome is the comparison with Sub-Saharan Africa, where quality indicators may soon match or even surpass those of LAC (Serebrisky, et al. 2015). The trend in LAC is also of concern: In 12 out of 15 LAC countries, the index declined between 2011 and 2017 (by an average of 0.45), despite investments of 3.5 percent of GDP between 2008 and 2015. These numbers are based on self-reported perceptions of quality, not the objective quality of infrastructure. But they provide a good proxy of reality.

Several studies estimate that LAC must invest about 5 percent of its GDP over the next 20–30 years to close this gap (Perrotti and Sánchez 2011; CAF 2013; Serebrisky 2014). Such investment would be equivalent to an additional $100 billion a year.

LAC does not have the infrastructure it needs or deserves given its income level (Cerra et al., 2016). Intu-

itively, one would expect a positive relationship between infrastructure quality and income level, because when countries become richer, they can afford to invest more in infrastructure—or because countries with better infrastructure services tend to increase productivity and hence economic growth (figure 1). The evidence shows that most countries in LAC score lower on infrastructure quality than one would predict given their level of income per capita. Argentina, Bolivia, Brazil, Paraguay, and Venezuela show considerably lower than expected infrastructure quality scores given their income levels. El Salvador, Guatemala, and Panama demonstrate better than predicted infrastructure quality.

Figure 1. Relationship between quality of infrastructure and per capita income

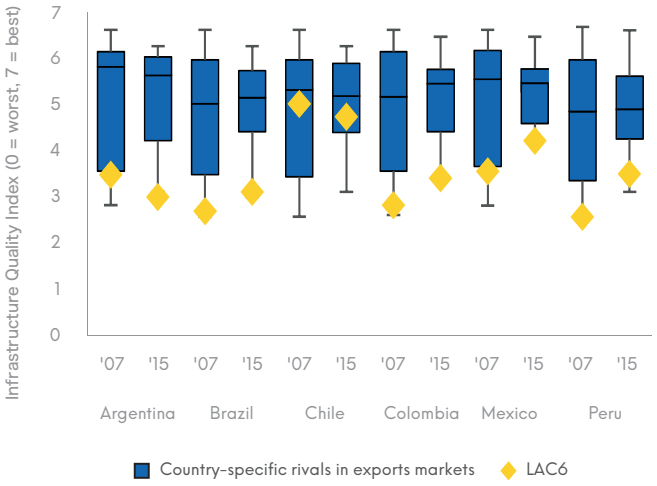


Source: Cerra et al. (2016).

The lack of infrastructure services in LAC makes it difficult for the region to compete with the rest of the world. Cerra et al. (2016) developed country-specific benchmarks for the region's six largest economies (Argentina, Brazil, Chile, Colombia, Mexico, and Peru known as LAC6), by identifying each country's top five competitors for each of its top five export products. Based on this measure, Chile is the only one of the six countries with infrastructure that competes with its trading rivals—and even Chile lost competitiveness between 2007 and 2015 (figure 2).

The diagnosis is clear: LAC does not invest enough in infrastructure, and the quality of its infrastructure is lower than it should be.

Figure 2. Quality of infrastructure in six Latin American countries and their export market rivals, 2007 - 2015



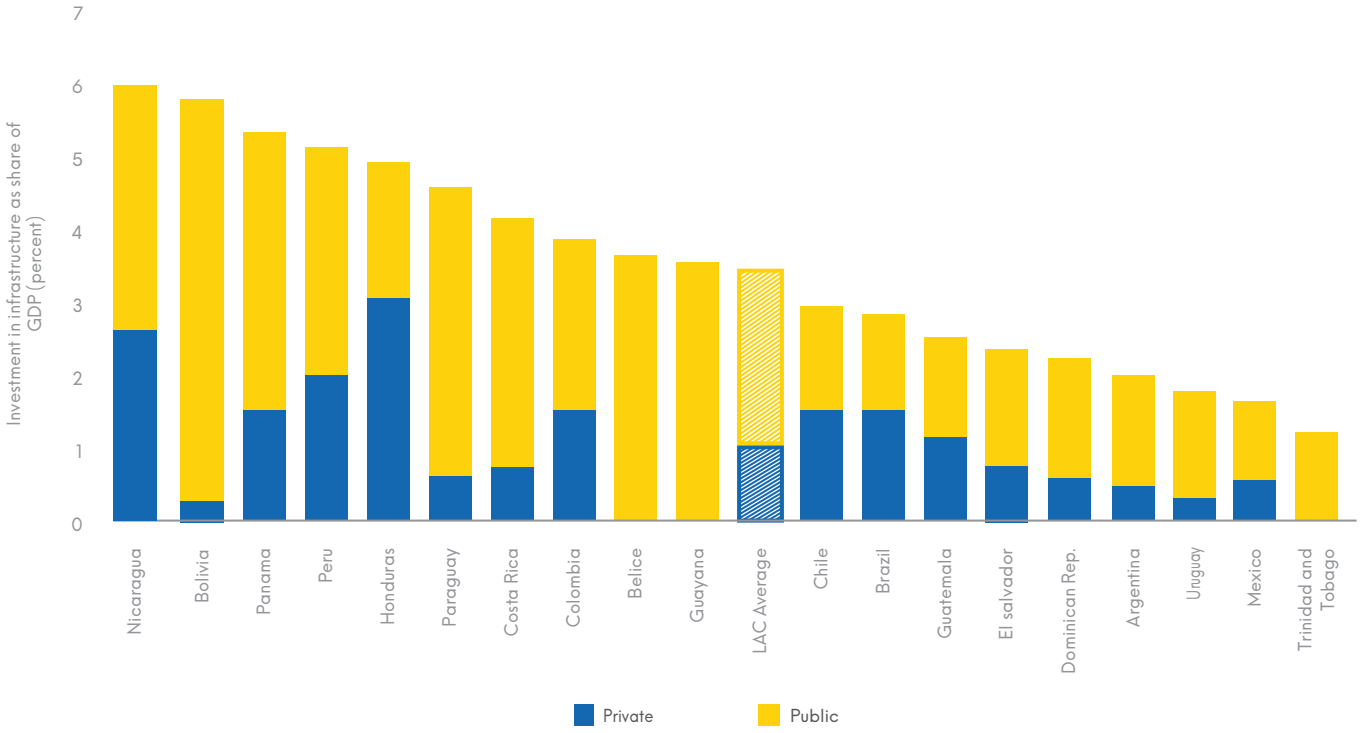
Source: Cerra et al. (2016).

The Roles of the Public and Private Sectors

Who is to blame for the low level of infrastructure investment—the public sector, the private sector, or both? Policy reforms since the mid-1990s managed to increase private sector investment from a negligible amount to 1 percent of GDP by 2015. But the public sector still accounts for more than two-thirds of total infrastructure investment (figure 3).

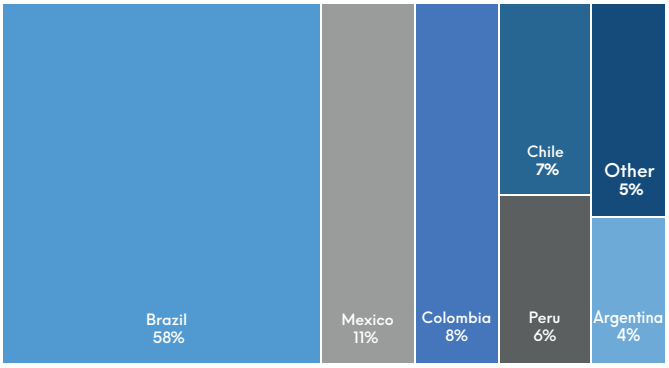
Recent private investments in infrastructure have been heterogeneous across LAC countries and sectors. They represent a large share of total investment in some of the smaller economies (Honduras, Nicaragua). In contrast, in the largest economies (Argentina, Mexico), private investment as percentage of GDP remains low. However, when private participation is measured in total US dollars invested, the largest economies account for most of the total private investment in the region (figure 4).

Figure 3. Average public and private investment in infrastructure as share of GDP in selected countries, 2008–2015



Source: Infralatam 2017.

Figure 4. Share of total private investment in Latin America and the Caribbean by country, 2008–2015



Source: PPI database (2017)

More can be done to mobilize private investment in infrastructure, through a wide range of policies supported by multilateral development banks in the region.[1] But even in the most optimistic scenarios, the public sector is expected to remain the primary funding source of infrastructure in the region.

The public sector is important not only because of its large share of total investment but also because infrastructure investment has characteristics of a public good, with strong externalities and network effects. Electricity generation plants require an efficient transmission and distribution network to use their full capacity, and urban transport systems need trunk routes and feeders to provide access to jobs and housing. If infrastructure development is not adequately planned, the efficiency of the services provided by infrastructure assets will be limited. The public sector thus has an important role to play in planning infrastructure. In addition, global agreements like the Paris Accord and the Sustainable Development Goals require governments to plan better in order to develop infrastructure assets that are resilient and can meet mitigation targets.

[1] See "Principles of MDB's Strategy for Crowding-In Private Sector Finance for Growth and Sustainable Development," May 2017 (https://library.pppknowledgelab.org/documents/4700).

The Unpromising Outlook for Infrastructure Spending and the Need for Greater Efficiency

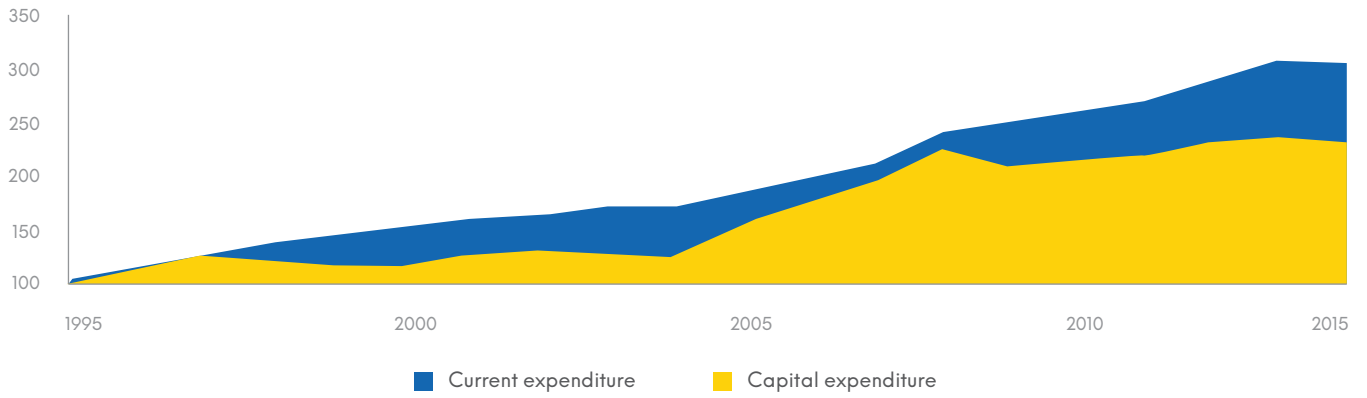
Both public and private investment in LAC has increased in recent years. Can this trend continue? History suggests that the likely answer is no. Lower growth and more difficult macroeconomic prospects in LAC (IDB 2016) threaten to halt the recovery of public infrastructure investment that started in 2005. In fact, it is likely that public investment in infrastructure will suffer significant cuts. Ardanaz and Izquierdo (2016) show that capital expenditures are procyclical in Latin America, meaning that they decline when growth slows. Carranza, Daude, and Melguizo (2014) estimate that between 1987 and 1992—a period of financial and fiscal crises in LAC—one-third of the improvement in fiscal accounts came at the expense of lower investment in infrastructure.

At least after 1995, current expenditures grew almost without interruption; capital expenditures were more volatile (figure 5). Data confirms a bias against capital expenditures in LAC. Cavallo and Serebrisky (2016) report that total expenditures in LAC in 2007–14 increased by 3.7 percent of GDP but that more than 90 percent of the increase corresponded to current expenditures; only 8 percent was devoted to longer-term investments. These findings are bad news for infrastructure in the region.

A new narrative could focus on smarter rather than more investment in infrastructure. Countries could focus on delivering the same quality and quantity of infrastructure services with fewer resources by increasing the efficiency of infrastructure delivery. A study by the McKinsey Global Institute (Dobbs et al. 2013) concludes that advanced and developing economies could save 40 percent on infrastructure expenditure just by investing resources more efficiently. The figure of 40 percent is a rough estimate averaged across infrastructure sectors and countries, but it highlights the size of potential efficiency gains.

What would it mean for LAC to achieve efficiency gains of 40 percent in infrastructure delivery? Based on the average investment rates between 2008 and 2015, total savings could reach about 1 percent of regional GDP. However, there is no precise estimation for LAC. How would LAC achieve these kinds of efficiency gains? This report aims to answer this question by identifying and quantifying sources of potential efficiency gains, from planning and project selection to physical development to project implementation and maintenance. This report further shows how the infrastructure gap in LAC can be closed by making public spending in infrastructure more efficient.

Figure 5. Index of current and capital expenditure on infrastructure in Latin America and the Caribbean, 1995–2015



Source: Ardanaz and Izquierdo (2016).

Sources of Potential Efficiency Gains in Public Infrastructure Spending

Figure 6. McKinsey estimates of potential efficiency gains in infrastructure spending

Source: Adapted from Dobbs et al. (2013).

Quantifying efficiency gains in infrastructure delivery requires first estimating infrastructure needs (the demand side) and then estimating the potential savings from meeting those demands (the supply side). Assessment of demand is beyond the scope of this report.[2] It focuses instead on the supply side, using the model of Dobbs et al. (2013) to identify through a simple structure the components and processes of the project cycle of infrastructure delivery that can be improved to generate efficiency gains (figure 6). To provide evidence on possible efficiency gains in public investment in LAC, this report takes the same

[2] The most common approaches to measuring the infrastructure gap define the infrastructure a country or region needs to (a) meet a target growth rate; (b) achieve a specific objective, such as a coverage rate (for example, 100 percent of access to water and sanitation); or (c) achieve an infrastructure stock similar to a given country or group of countries. McKinsey (2016) estimates global infrastructure investment needs of $57 trillion between 2010 and 2030. LAC accounts for about 10 percent of that amount. For estimates of infrastructure needs in LAC and other regions, see Calderón and Servén (2003); CAF (2013, 2014); Fay and Yepes (2003); Kohli and Basil (2010); Perrotti and Sánchez (2011); Bhattacharya, Romani, and Stern (2012); IDB (2013); and World Bank (2017).

approach, producing qualitative and quantitative evidence for potential productivity gains within each of the components of infrastructure delivery in LAC: project selection, delivery, and maintenance.

The McKinsey Global Institute (2016) estimates that global infrastructure needs account for $3.3 trillion annually through 2030 in a business-as-usual scenario. Productivity improvements could reduce this amount by 40 percent. Potential gains fall into three categories: improving project selection and optimizing infrastructure portfolios (20 percent of total gains), streamlining delivery (40 percent), and making the most of existing assets (40 percent).

1. **Improving project selection and optimizing infrastructure portfolios**: Governments must use precise selection criteria to ensure that proposed projects meet specific goals; develop sophisticated evaluation methods to determine costs and benefits; and prioritize projects at a system level, using transparent, fact-based decision making.

2. **Streamlining delivery:** Delivery can be made more efficient by speeding approval processes, investing heavily in the early stages of project planning and design, and structuring contracts to encourage time and cost savings. Contracts can lead to cost savings by, for example, encouraging the application of lean manufacturing to construction or adopting construction techniques such as prefabrication and modularization.

3. **Making the most of existing assets:** Governments should get the most benefit from their existing capacity by boosting asset utilization, optimizing maintenance planning, and expanding the use of demand management measures.

Improving project selection and optimizing infrastructure projects falls entirely in the realm of the public sector. Streamlining delivery and making the most of existing assets involve both the public and private sectors. The public sector is responsible for procurement of public works and state-owned firms that provide infrastructure services, while the private sector plays a role in cases where governments in the region allow private participation in infrastructure, ranging from management contracts to privatization. Regardless of who builds or operates infrastructure, the public sector plays a role in the performance of infrastructure service providers, through economic and technical regulations.

This report provides evidence on possible efficiency gains in public investment in LAC, highlighting some of the principal opportunities for improvement at different stages of the delivery process. Further research should assess whether and where public-private partnerships generate efficiency gains and allocate those gains across the different components of infrastructure delivery.

Improving Planning and Project Selection

Source: Adapted from Dobbs et al. (2013).

Early-stage planning and design can be a key source of savings, since avoiding changes after construction has begun, reduces costs. One of the most powerful ways to reduce the cost of infrastructure is to avoid investing in projects that do not address clearly defined needs ("bridges to nowhere") or deliver sufficient benefits (McKinsey Global Institute 2017). "Investing in the investment process" can raise returns on investment while maintaining fiscal and debt sustainability (Collier 2008). Globally, choosing the right combination of projects and eliminating wasteful ones could save $200 billion a year (McKinsey Global Institute 2017). When upstream planning is done properly, countries can select the projects with the highest social rates of return. In simple terms, proper planning, and project selection avoids "white elephants," projects that should never be undertaken.

LAC has tried to improve project selection by creating national systems of public investment (known as SNIPs, their Spanish acronym). SNIPs regulate public investment processes, guiding projects from the early stages of formulation and feasibility to ex post evaluation. The hypothesis underlying the creation of SNIPs is that better capacities to analyze and evaluate projects improve the quality and quantity of infrastructure projects.

In 2010 a SNIP network was created to help strengthen the functioning of these systems. The network, which is supported by the Economic Commission for Latin America and the Caribbean (ECLAC) and the Inter-American Development Bank (IDB), includes 16 countries (Argentina, Bolivia, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, and Uruguay).

How well are LAC countries planning for infrastructure and selecting projects? Sound evaluations of national

Box 1. Components of the International Monetary Fund's Public Investment Management Index (PIMI)

1. **Strategic Guidance and Project Appraisal**
   - Nature of strategic guidance and availability of sector strategies
   - Transparency of appraisal standards
   - Observed conduct of ex ante appraisals
   - Independent review of appraisals
2. **Project Selection and Budgeting**
   - Existence of medium term planning framework and its integration to the budget
   - Inclusion in budget (or similar) for donor funded projects
   - Integration of recurrent and investment expenditures in budget
   - Nature of scrutiny and funding supplied by legislature, including its committees
   - Public access to key fiscal information
3. **Project Implementation**
   - Degree of open competition for award of contracts
   - Nature of any complaints mechanism relating to procurement
   - Funding flows during budget execution
   - Existence and effectiveness of internal controls, such as commitment controls
   - Effectiveness of system of internal audit
4. **Project Evaluation and Audit**
   - Degree to which ex-post evaluations are conducted
   - Degree to which external audits are produced on a timely basis and scrutinized by the legislature

Source: Dabla-Norris et al. (2012).

systems of public investment are scarce. The International Monetary Fund developed an index—the Public Investment Management Index (PIMI)—to analyze performance (box 1). It captures the institutional environment underpinning public investment management systems at four project stages: appraisal, selection, implementation, and evaluation. Its sample of 71 countries includes 41 developing countries. Table 1 displays the results for the 10 LAC countries in the sample.

The index—which ranges from 0 (least efficient) to 4 (most efficient)—indicates that countries in Europe and Central Asia have the most developed public investment management processes (1.90 score on average). At the bottom of the ranking is Sub-Saharan Africa (on average below 1.50), where countries are weak in all stages of the public investment management process. Cross-country variations are wide, however. Indeed, South Africa is the world's top performer. The LAC average is 1.83; Brazil, Colombia, Peru, and Bolivia score above the average.

The PIMI index includes only 10 of 26 LAC countries. To overcome this limitation, the IDB developed a revised version of the IMF methodology and used it to assess all countries in the SNIP network (Contreras et al. 2016). This index includes a new dimension and two subdimensions. The new dimension ("general characterization of the public investment cycle") captures the operational characteristics of the SNIPs that affect all stages of the public investment cycle. The subdimension "methodologies on project preparation and evaluation/social pricing" is included in the "strategic guidance and project appraisal" dimension; the subdimension "selection criteria" is included in the "project section" dimension.

LAC countries seem to divide into four groups (figure 7). The bottom two groups, which are below the LAC average, include Costa Rica, El Salvador, Panama, Paraguay (the worst performers) and Guatemala, Honduras, Nicaragua, and Uruguay (the second-worst performers). Countries with good strategic planning and evaluation usually rank better in terms of project selection efficiency (correlation between these variables is 0.75).

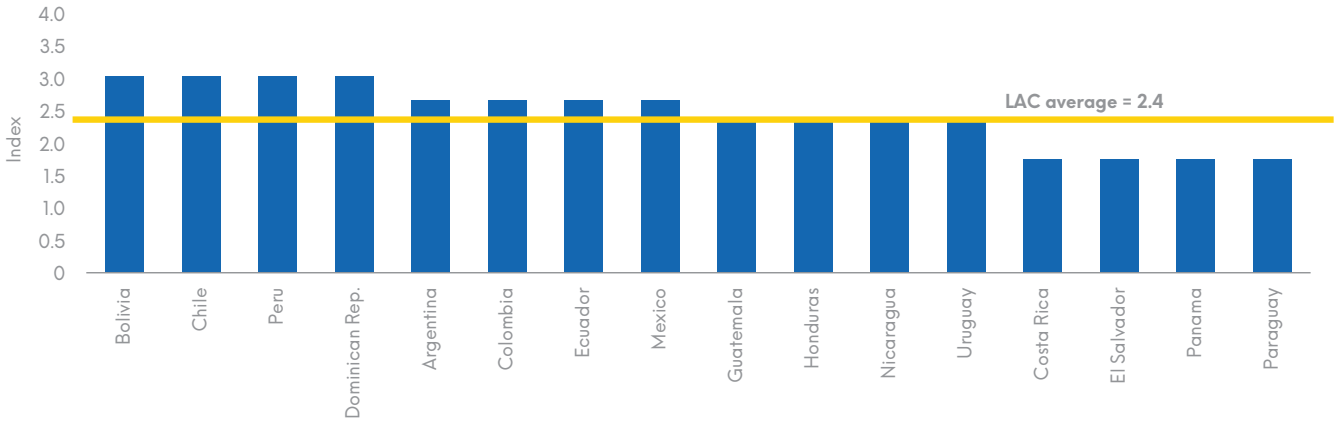
[3] The other dimensions of the index are project implementation, project evaluation and audit, and general characterization of the public investment cycle.

Table 1. Public Investment Management Index (PIMI) in selected countries, 2012

Country	Appraisal Score	Selection Score	Management Score	Evaluation Score	Total Score
Brazil	3.00	2.80	3.33	3.33	3.12
Colombia	4.00	2.80	2.13	3.33	3.07
Peru	2.83	3.60	2.67	1.33	2.61
Bolivia	2.83	2.00	2.93	2.00	2.44
El Salvador	0.83	1.60	3.33	1.33	1.77
Jamaica	1.83	2.40	1.33	1.33	1.72
Barbados	0.50	2.00	0.93	1.33	1.19
Trinidad and Tobago	0.00	2.40	1.33	0.67	1.10
Haiti	0.00	1.20	1.73	1.33	1.07
Belize	0.00	0.80	0.27	0.00	0.27
LAC average	1.58	2.16	2.00	1.60	1.83
Top performer worldwide*	4.00	4.00	2.80	3.33	3.53
World average	1.33	1.60	2.00	1.33	1.57

Source: Dabla-Norris et al. (2012).
Note: Values range from 0 (least efficient) to 4 (most efficient). Countries are ordered from most efficient to least efficient according to the Total Average Score (a simple average of the four components of the index). * The worldwide top performer is South Africa.

Figure 7. Inter-American Development Bank index of public investment management efficiency in selected countries, 2015

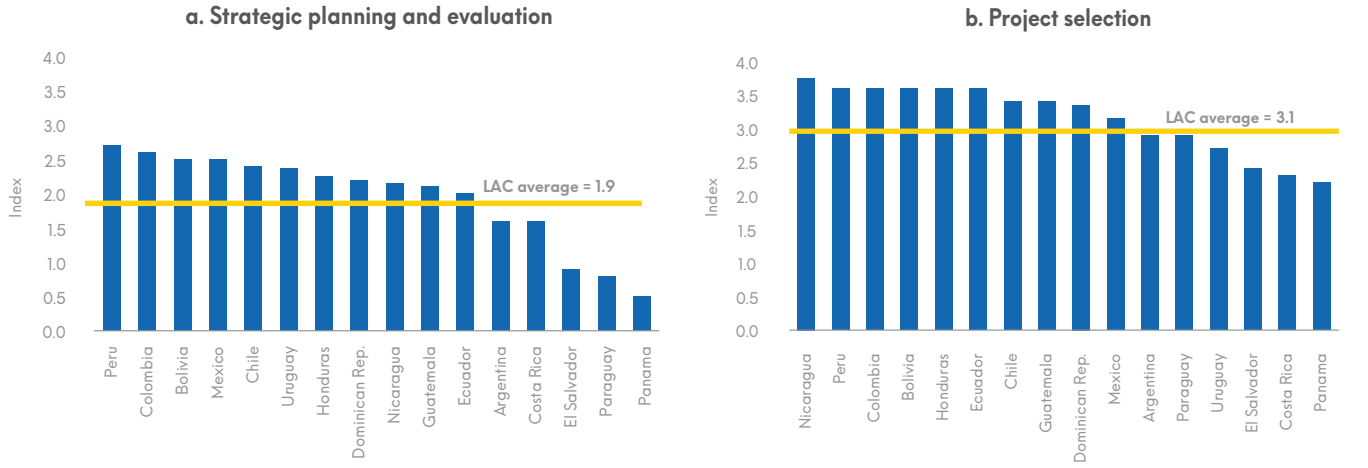


Source: Contreras et al. (2016).
Note: Values range from 0 (least efficient) to 4 (most efficient).

Figure 8 presents the results for the strategic planning and evaluation and project selection dimensions, the most relevant dimensions to the planning phase of infrastructure delivery3 These scores are low, averaging just 1.9on a 0–4 scale, or 47.5 percent of the top score. The efficiency of project selection is 77.5 percent of the top score.

The results from Contreras et al. (2016) are consistent with other efficiency-related public management indexes, such as the World Economic Forum's Global Competitiveness Index and the World Bank's Governance Index. One should expect a positive correlation between the efficiency of public investment management and competitiveness and governance. In fact, the correlations between the IMF and IDB indexes and those indexes are not significant. Some countries with low PIMIs, such as Costa Rica, Uruguay, and Panama, have good competitiveness and governance rankings. These results suggest that even good levels of competitiveness and governance do not guarantee efficiency of public investment management.

Figure 8. Inter-American Development Bank index of efficiency of strategic planning and evaluation and project selection in selected countries, 2015

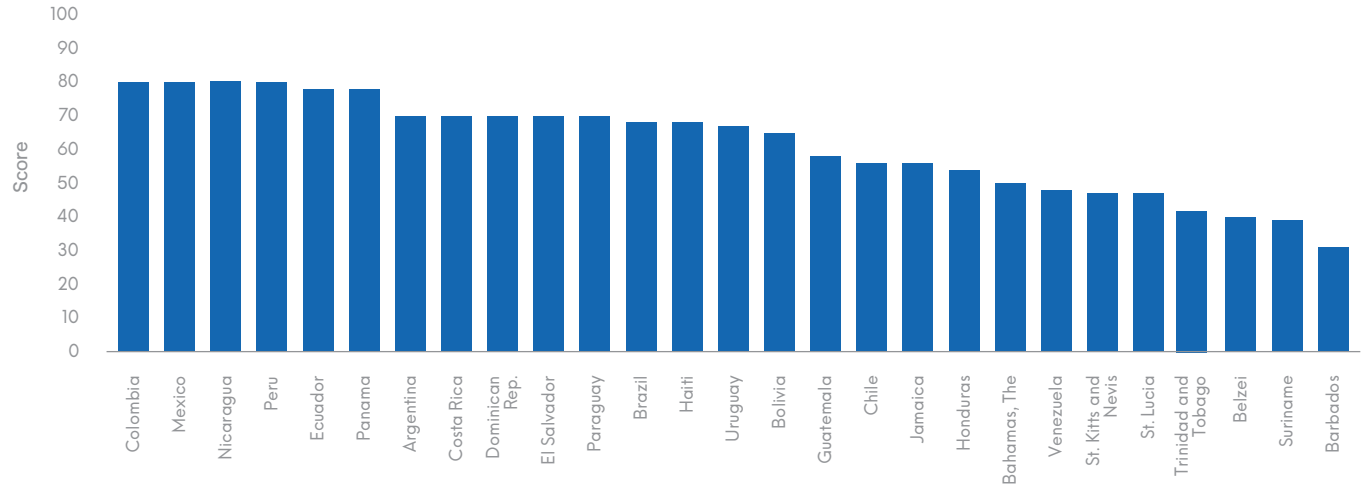


Source: Contreras et al. (2016).
Note: Values range from 0 (least efficient) to 4 (most efficient).

Low PIMI scores should be interpreted with care, as they are based on subjective assessments. Still, they strongly suggest the need for improvement in LAC. Furthermore, regarding project selection, the great value of an improvement in the selection capacity is invisible: bad projects are avoided, and those that remain are the most necessary, that is, those with the highest social rates of return.

Another way to evaluate the efficiency of public management of investment is to examine the private sector's perspective toward the public procurement cycle. Since 2015 the World Bank has been measuring how the private sector does business with governments by benchmarking public procurement[4]. It assesses procurement life cycles in 180 economies, which it scores from 0 (worst) to 100 (best). Figure 9 shows this indicator for LAC countries.

Figure 9. World Bank benchmark of needs assessment, call for tender, and bid preparation in selected countries, 2017



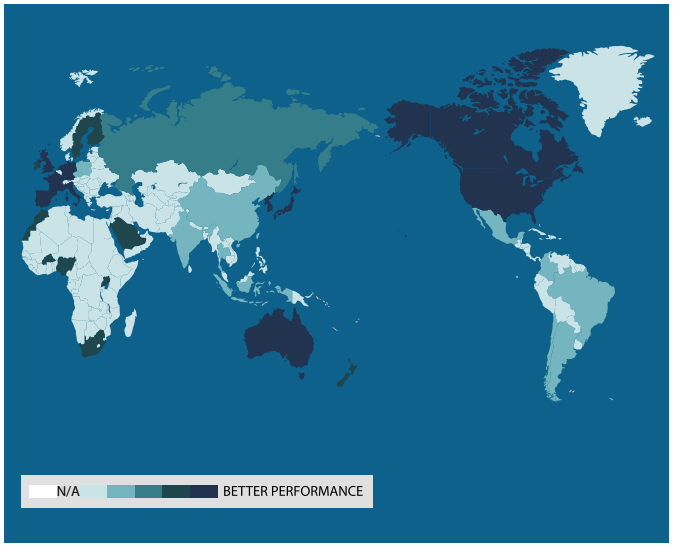
Source: World Bank (www.bpp.worldbank.org).

[4] http://bpp.worldbank.org/

In 2017 the world's top performers were Russia (100), Canada (98), and the United States (98). Top performers in LAC were Colombia, Mexico, Nicaragua, and Peru (80). The LAC average was just 62. Counterintuitively, the correlation between the bid preparation dimension of the World Bank measure and PIMI efficiency scores for LAC countries included in the sample is close to zero.

To identify policies and practices that lead to sustainable and equitable infrastructure through efficient markets, better decision making, and delivery, the Global Infrastructure Hub (2017) created InfraCompass, a framework to help countries deliver infrastructure more effectively, and to provide a better understanding of a country's infrastructure market. Figure 10 shows the results for the 49 analyzed countries, which together account for 90 percent of global GDP and 75 percent of the world's population.

Figure 10. Global quality of infrastructure delivery, by country, 2017



Source: InfraCompass (http://infracompass.gihub.org/).

According to InfraCompass, emerging economies are catching up with developed countries in terms of the quality of their infrastructure; these countries have dominated the list of top improvers over the past decade. Performance in infrastructure delivery is considerably lower in LAC, where no country performs at the level of advanced economies.[5] The report finds that rapid policy development—including better governance through reduced corruption, improved regulatory quality via enhanced rule of law, and simplified permit procedures and land administration—has contributed to the strong performance of emerging economies. Table 2 summarizes the results of the PIMI, the World Bank's Benchmarking Public Procurement database, and Infra Compass.

The country grouping exercise in table 2 is based on a qualitative assessment. The observed differences in country ratings across indexes point to the need for more robust and comparable data and methodologies. The comparison of these indexes suggests that LAC countries fall into four groups in terms of planning and project selection:

- **Group 1 (very strong):** Chile, Colombia, Mexico, and Peru
- **Group 2 (strong):** Bolivia, the Dominican Republic, Ecuador, and Nicaragua
- **Group 3 (weak):** Argentina, Costa Rica, Guatemala, Honduras, and Uruguay
- **Group 4 (very weak):** El Salvador, Panama, and Paraguay.

We exploit data from IDB's Emerging and Sustainable Cities (ESC) Program to estimate the potential efficiency gains at the city level that might result from better planning and project selection. The program assesses a city's infrastructure investment needs based on various urban planning scenarios. Input variables include assumptions about changes in the size of the population, parameters on population densities, and construction unit costs per infrastructure type. Outputs are the developed area and the associated infrastructure investment needs. They are compared across three development scenarios: trend, intermediate, and optimal. The trend (or business-as-usual) scenario extrapolates observed parameters from recent decades into the future. The optimal (or "smart") scenario assumes higher population densities and restriction of development in high-

[5] Global Infrastructure Hub results are based on a compilation of 130 potential metrics from different sources. See http://infracompass.gihub.org/static/data/GIH_InfraCompass_Technical_Methodology.pdf.

Table 2. Indicators of infrastructure delivery in selected countries, 2017

	IMF Public Investment Management Index (PIMI)			World Bank BPP database	Global Infrastructure Hub InfraCompass	
Country	Overall efficiency	Planning evaluation	Project selection	Preparation	Delivery	Planning
Argentina	2.66	1.60	2.90	70	Medium	Low
Bolivia	3.03	2.50	3.60	65	Low	Low
Chile	3.03	2.40	3.40	56	Medium	High
Colombia	2.66	2.60	3.60	80	Medium	High
Costa Rica	1.76	1.60	2.30	70	Low	Low
Dominican Republic	3.03	2.20	3.35	70	Low	Low
Ecuador	2.66	2.00	3.60	78	Low	Low
El Salvador	1.76	0.90	2.40	70	Low	Low
Guatemala	2.35	2.10	3.40	58	Low	Low
Honduras	2.35	2.25	3.60	54	Low	Low
Mexico	2.66	2.50	3.15	80	Medium	Very high
Nicaragua	2.35	2.15	3.75	80	Low	Low
Panama	1.76	0.50	2.20	78	Low	Low
Paraguay	1.76	0.80	2.90	70	Low	Low
Peru	3.03	2.7	3.6	80	Low	High
Uruguay	2.35	2.37	2.7	67	Medium	Low

Note: Dark yellow = very strong; light yellow = strong; light blue = weak; dark blue = very weak.

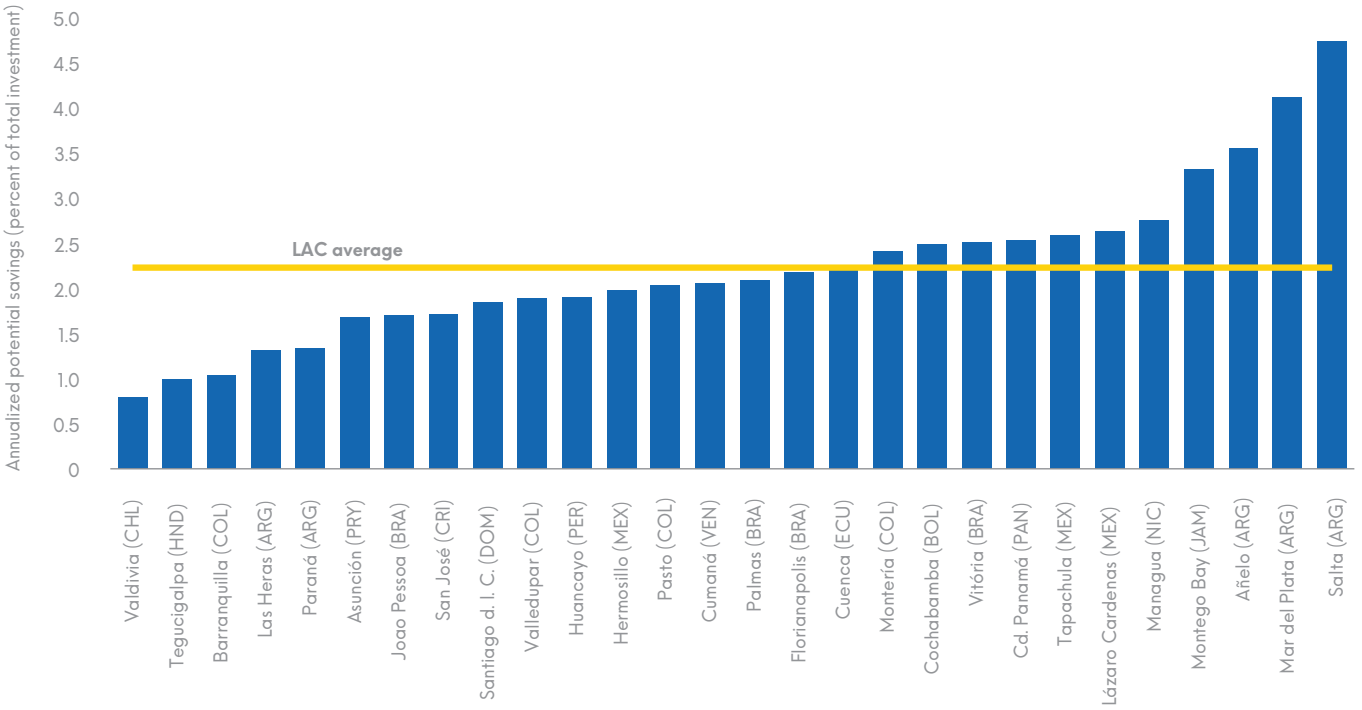
risk or protected areas. The intermediate scenario lies between the other two scenarios (results on it are not presented in this report).

The difference between the trend and optimal scenarios is attributed to better planning, which results from regulations and policies such as appropriate land use planning, zoning rules, and urban growth boundaries, which tend to increase population density, reducing the need for greenfield development. The analysis examines capital expenditures and greenfield developments only; it does not examine operation expenditures or brownfield development.

The sample consists of 28 urban areas in 16 LAC countries, ranging from small towns like Añelo, Argentina to larger metropolises like Asunción, Paraguay. All of these areas are growing very rapidly, both demographically and economically, typically above their national averages.

Figure 11 shows the potential annual savings for each city, expressed as the difference between the trend and optimal growth trajectories. Savings ranges between 0.79 percent a year of total infrastructure investment (in Valdivia, Chile) to 4.74 percent a year (in Salta, Argentina). The average potential savings from better planning

Figure 11. Estimated potential efficiency gains from better planning in selected cities



Source: Data from the Inter-American Development Bank's Emerging and Sustainable Cities (ESC) Program.
Note: Figures show annualized savings achieved by developing along the optimal path rather than the trend path. ARG = Argentina, BOL = Bolivia, BRA = Brazil, CHL = Chile, CRI = Costa Rica, COL = Colombia, DOM = Dominican Republic, ECU = Ecuador, HND = Honduras, JAM = Jamaica, MEX = Mexico, NIC = Nicaragua, PAN = Panama, PER = Peru, PRY = Paraguay, VEN = Venezuela.

is about 2.2 percent of infrastructure investment a year. Across all cities, the sector with the greatest potential for annual efficiency gains through better planning is transport (2.6 percent of total transport infrastructure investment). It is followed by electricity (2.3 percent of total investment) and water, wastewater, and solid waste infrastructure (2.1 percent).

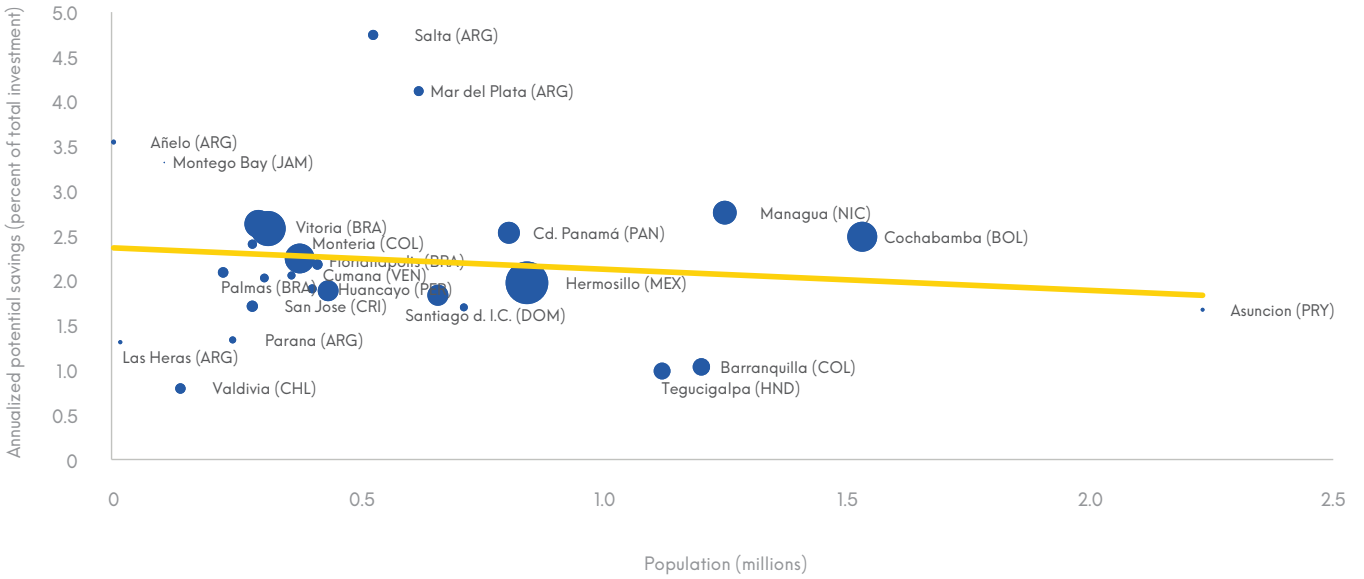
Potential efficiency gains from better planning are negatively correlated with the size of a city's population, suggesting greater potential of planning improvements in smaller cities (figure 12). City size may matter for two reasons. First, small cities often play a catalytic role in economic development (Roberts 2014) and therefore tend to face higher economic and population growth rates than larger cities; their appetite for new and better infrastructure services therefore tends to be higher. Second, compared with larger and more developed cities, most small cities lack critical technical capacity and know-how, which constrains them from engaging in more sophisticated urban planning.

When aggregating the city-level data to the country-level, countries with better planning evaluation and project selection indexes, on average, have lower potential for efficiency gains from planning (figure 13). The countries with the highest return from better planning are Argentina, Nicaragua, Panama, Bolivia, Ecuador, and Mexico, in order of importance.[6] Savings from better planning and project selection could reach up to 2.2 percent of annual infrastructure investment. Public investment in LAC averaged 2.5 percent of GDP between 2008 and 2015; 2.2 percent of this amount is equivalent to 0.05 percent of regional GDP.[7]

[6] The results at the country level should be interpreted with care, because some countries include only one observation at the city level. Given the idiosyncrasies of the cities in the sample, the results may not be representative.

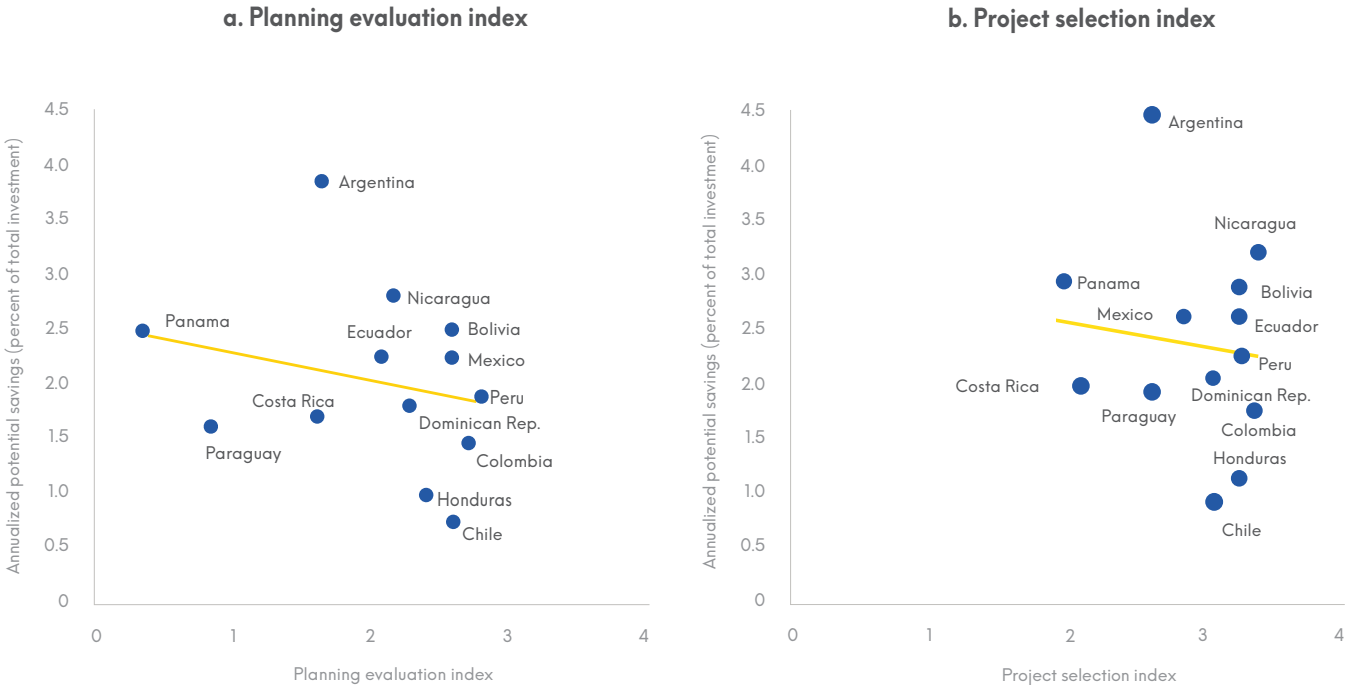
[7] This estimate assumes that all savings come from public investment and that the same efficiency gains can be achieved in general investment and are not city-specific.

Figure 12. Relationship between city size and efficiency gains from improved planning



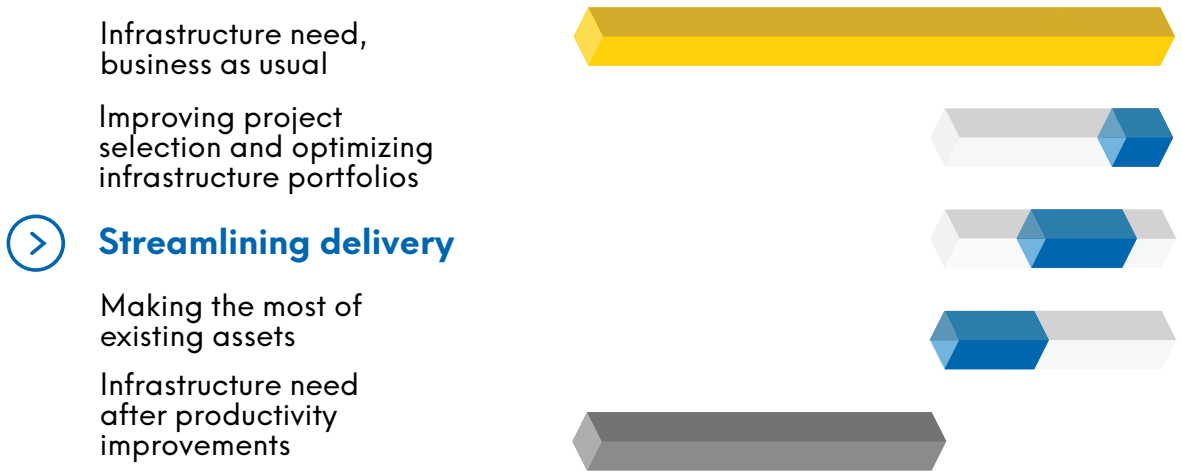
Source: Data from the Inter-American Development Bank's Emerging and Sustainable Cities (ESC) Program.
Note: Bubble size reflects a cities' overall infrastructure investment need.

Figure 13. Relationship between planning evaluation and project selection indexes and potential efficiency gains



Source: Data from the Inter-American Development Bank's Emerging and Sustainable Cities (ESC) Program.

Streamlining Delivery



Source: Adapted from Dobbs et al. (2013).

Streamlining the delivery of infrastructure accounts for 40 percent of the estimated total potential efficiency gains that can be achieved in infrastructure delivery, according to Dobbs et al. (2013). A variety of bottlenecks raises costs. Land acquisition processes, environmental permits, and resettlement agreements usually lack institutional coordination and involve lengthy bureaucratic processes that delay project implementation. Failure to use advanced construction techniques, the high incidence of informal labor, and weak incentives to implement lean supervision systems all increase construction and operation costs. This section examines potential gains from streamlining infrastructure delivery from two sources: reducing cost overruns and delays in construction.

Reducing cost overruns

Cost overruns are common in infrastructure (box 1). In practical terms, cost overruns in an infrastructure project imply that the assets in the project could be built using fewer financial resources. There is a caveat though: Cost overruns are not always necessarily bad, or the result of inexperience, ineptitude, or corruption. Building infrastructure is a difficult endeavor and often cost overruns are to be expected. Investment in infrastructure is large, lumpy and involves high construction risks, mostly driven by the impossibility of anticipating contingencies. Complex geology, archeological remains, natural disasters, and physical and social constraints in urban areas are among some of the variables that cause unavoidable cost overruns.[8] Considering this caveat, the existence of cost overruns is still a clear indicator that efficiency gains can be obtained in infrastructure spending. Globally, they average 28 percent of infrastructure investment (Flyvbjerg, Holm, and Buhl 2016).

Cost performance varies by subsector and project type (Cantarelli, Flyvbjerg, and Buhl 2012). In the transport sector, for example, cost overruns for road, rail, tunnels, and bridges are significantly different (overruns are highest for tunnel and bridge projects). Flyvbjerg (2016) finds that dams have the largest cost overruns (almost double their planned costs). Table 3 shows average overruns by project type.

[8] Further non-technical reasons for Cost overruns could stem from changes in inflation and exchange rate. I.e. if over the life of a loan tenor the inflation in the local country increases faster as in the origin country of the funds (e.g. US) and/or the local currency appreciates, the project costs in USD terms increase. If these changes were not anticipated, they can drive up costs significantly. Especially in the LAC context these macroeconomic considerations might have played an important role in recent decades.

Box 2. What causes cost overruns in infrastructure projects?

A vast body of literature documents the high level of cost overruns in infrastructure construction (Flyvbjerg, Holm, and Buhl 2003, 2004; Flyvbjerg, 2007, 2016; Cantarelli et al. 2010). It posits four main reasons for overruns:

- Information is incomplete.
- Projects are complex, making it difficult to design complete contracts and commit to a schedule of payments.
- Competition and transparency in bidding processes are lacking.
- Agents are unrealistically optimistic, underestimating costs and times.

The development of infrastructure projects takes time. Combining this fact with incomplete information sets the scene for cost overruns. First, contractors may have less incentive to minimize costs as projects are in more advanced stages because the threat of downsizing and removal is less credible as the project progresses (Arvan and Leite, 1990). Second, the complexity of infrastructure projects makes designs often imperfect, and together with the impossibility of complete contracts incentivize contractors to present lower costs for getting the contract, and then renegotiate a higher price (hold-up).

The literature identifies four types of overruns: technical, economic, political, and sociological dimensions (Flyvbjerg et al. 2003, 2004). Among the technical, we find forecast errors and risks, which in infrastructure projects are complex and difficult to specify (and quantify). Economic grounds include principal – agent problems among the public officials who assign the projects and the society that benefits (in principle) from them. The objectives of public agents and societies differ. Thus, incentives are not always aligned so that the decision of public agents is the one that maximizes social welfare. In third place, frequently competition between cities or regions leads to proposals that present underestimated costs; with the aim to gain the possibility of developing the project in their territory and take political advantage of it. Once the work is assigned to one city, reassigning it to another is costly, especially once construction has begun. Finally, beyond the strategic reasons, there is an "appraisal optimism". This means that agents tend to think that the costs, the risks, and the execution time of the projects are smaller than the actual ones. There is a bias toward overestimating one's own capacity to carry out complex projects, which is reflected in underestimating costs and risks, and overestimating the benefits associated with projects.

Box table 2.1. Causes and explanations for cost overruns in infrastructure projects

Type of overrun	Cause
Technical	• Forecasting errors, including price rises, poor project design, and incompleteness of estimations • Scope changes • Uncertainty • Inappropriate organizational structure • Inadequate decision-making process • Inadequate planning process
Economic	• Deliberate underestimation, because of lack of incentives, lack of resources, inefficient use of resources, lack of dedicated funding process, poor financing/contract management, strategic behavior
Psychological	• Optimism bias among local officials • Cognitive bias • Cautious attitudes toward risk
Political	• Deliberate cost underestimation • Manipulation of forecasts • Private information

Source: Cantarelli et al. (2010)

Table 3. Average cost overruns in infrastructure projects worldwide, by project type (percent)

Type of infrastructure	Average cost overrun
Dams	96
Bus rapid transit	41
Rail	40
Tunnels	36
Power plants	36
Buildings	36
Bridges	32
Roads	24

Source: Flyvbjerg (2016).

The size of overruns varies across regions. Using a sample of 806 projects worldwide, Flyvbjerg (2016) shows that LAC has higher average cost overruns (48 percent) than the World average (28 percent) (table 4). According to Flyvbjerg and Sunstein (2016), cost overruns have increased in LAC and decreased in Asia and Europe (no statistically significant trends were evident in other regions). Citing anecdotal evidence, Guasch, Suárez-Alemán, and Trujillo (2016) shows that 75 percent of infrastructure projects in LAC experience cost overruns and 65 percent of projects have delays of 6–18 months.

Table 4. Average cost overruns in infrastructure projects in Latin America and the Caribbean and the world, by type of project (percent)

Project type	Latin America and the Caribbean	World
Dams	103	95
Rail	59	40
Power plants	36	36
Roads	53	23
Total	**48**	**28**

Source: Flyvbjerg (2016).

To complement the scarce evidence for LAC, we created a novel dataset on cost overruns on infrastructure projects financed by multilateral development banks, which funded 10–12 percent of total infrastructure investments in the region (more than 20 percent in smaller economies) (Serebrisky, 2014). We adopted the working hypothesis that infrastructure projects financed by multilateral development banks have lower cost overruns than other projects, because these projects must meet rigorous requirements and are usually subject to higher quality standards for preparation, implementation, and supervision than nationally funded projects. Cost overruns on these projects thus represent a lower-bound estimate of cost overruns.

Projects financed by multilateral development banks provide a unique opportunity to calculate and compare cost overrun data across countries and sectors. Throughout the process of infrastructure delivery, multilateral development banks use standardized processes to generate estimated construction costs at the planning phase, and have the mandate to report actual construction values at the end of the construction phase. Some countries generate similar information, but national reporting systems are heterogeneous and are seldom used to evaluate infrastructure.

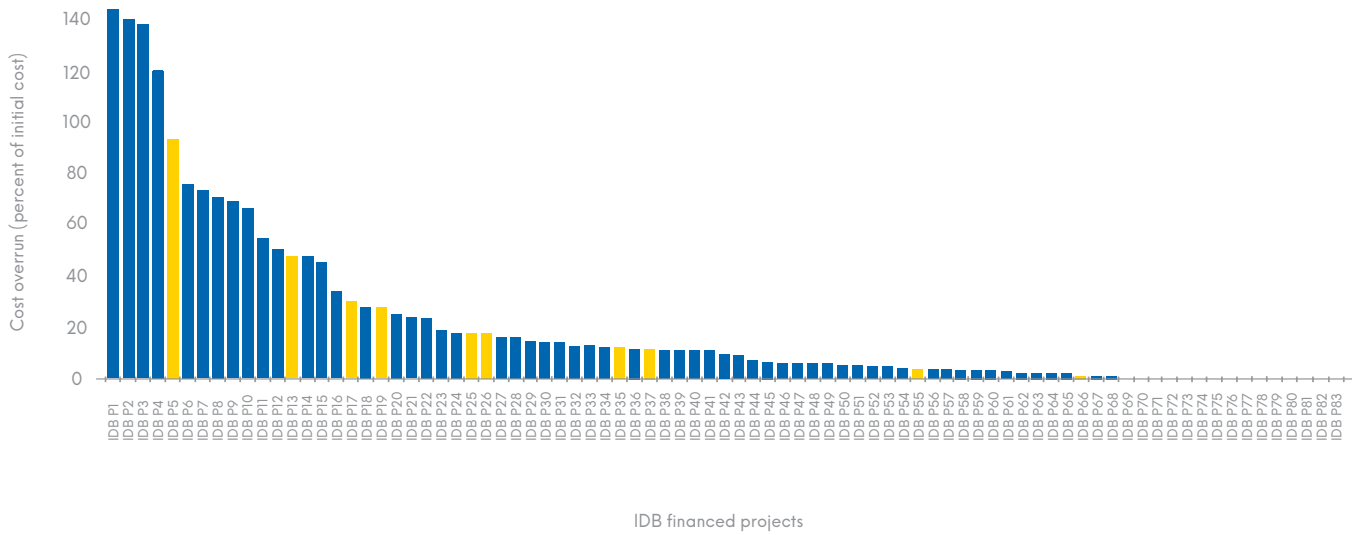
Surprisingly, little evidence is available on cost overruns of multilateral development bank projects.[9] To fill this gap, we studied 84 infrastructure projects financed by the IDB and 148 infrastructure projects financed by the World Bank in the Latin America and the Caribbean region in 1996–2015.[10] The sample includes 142 (48 IDB, 94 World Bank) road transport projects (new construction, maintenance, and rehabilitation); 73 (24 IDB, 49 World Bank) water and sanitation projects (treatment plants, improvement and expansion of distribution networks); and 16 (11 IDB, 5 World Bank) energy projects (transmission).

Some 82 percent of IDB projects suffered cost overruns (figure 14). In 5 percent of cases, the country asked for

[9] Awojobi and Jenkins (2015) seem to have published the only study of cost overruns in infrastructure projects financed by MDBs. They find that hydroelectric dams financed by the World Bank had average cost overruns of 27 percent.

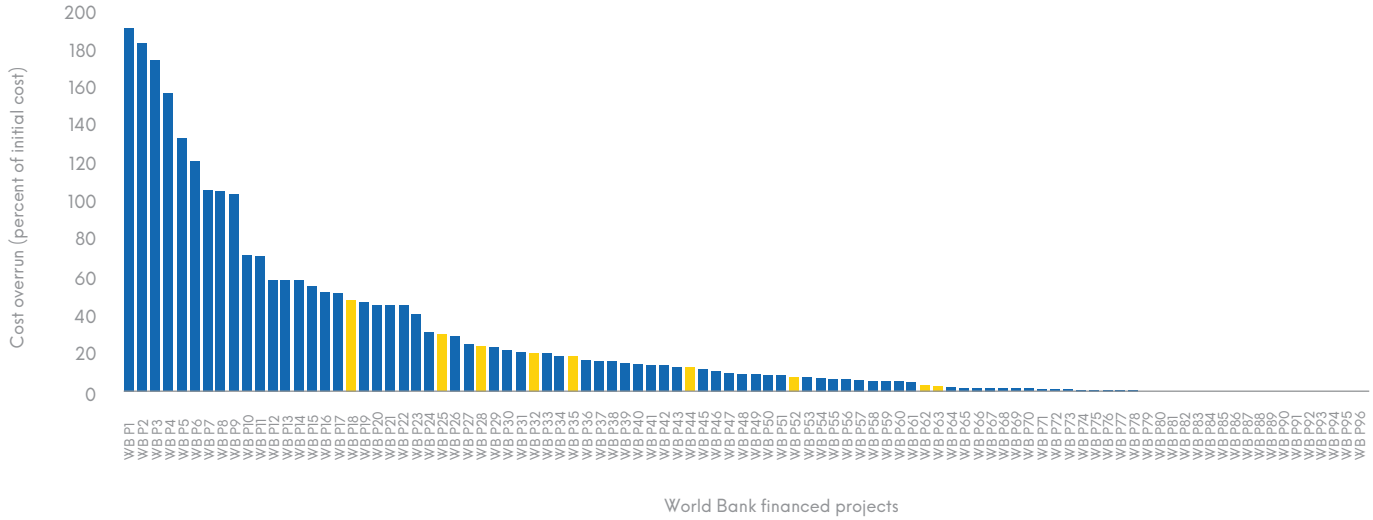
[10] The IDB sample is distributed as follows: 35 percent of projects were in Brazil, 7 percent in Colombia, 6 percent in Haiti, 6 percent in Peru, 6 percent in Uruguay, and 5 percent in Bolivia. The remaining 35 percent of projects were in Argentina, the Bahamas, Barbados, Belize, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Jamaica, Mexico, Panama, Paraguay, and Trinidad and Tobago. The World Bank sample is distributed as follows: 26 percent of projects were in Brazil, 10 percent in Argentina, 7 percent in Colombia, 6 percent in Peru, 5 percent in Honduras, 4 percent in Haiti, and 4 percent in Mexico. The remaining 29 percent of projects were in Belize, Bolivia, Chile, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Jamaica, Nicaragua, Panama, Paraguay, St. Lucia, Uruguay, and Venezuela.

Figure 14. Cost overruns in a sample of infrastructure projects financed by the Inter-American Development Bank, 1996–2015



Source: Inter-American Development Bank Infrastructure Projects Database.
Note: Bars in yellow are complex projects.

Figure 15. Cost overruns in a sample of infrastructure projects in Latin America and the Caribbean financed by the World Bank, 1985–2010



Source: World Bank Infrastructure Projects Database.
Note: Bars in yellow are complex projects.

additional financing from the IDB; in the remaining 95 percent of cases, national counterparts assumed cost overruns. Average cost overruns accounted for 22 percent of total costs of the projects; in four projects overruns more than doubled the project cost.

About 53 percent of World Bank projects suffered cost overruns (figure 15). In 20 percent of these cases, the World Bank assumed cost overruns. Cost overruns accounted for 17 percent of total project costs; some outliers more than doubled the project cost.

In addition to these results, the following analysis allows us to understand whether there is a relationship between cost overruns and project complexity, the specific infrastructure subsector, the country where the project takes place, and time.

Following previous literature, it is interesting to analyze whether complex projects, such as tunnels, plants, or bridges, produce higher overruns. Projects involving complex projects (shown in yellow in figures 13 and 14) do not appear to have had higher cost overruns than other projects; cost overruns were higher in some sectors, but the differences were not statistically significant (table 6).

Figure 16 presents time series data on cost overruns. It shows no improvement over time. The data suggest there has been no learning process, as a high concentration of projects with huge cost overruns (above 60 percent) occurred in recent years, particularly since 2002. There also seems to be no relationship between the government effectiveness index and the average cost overrun (figure 17).[11]

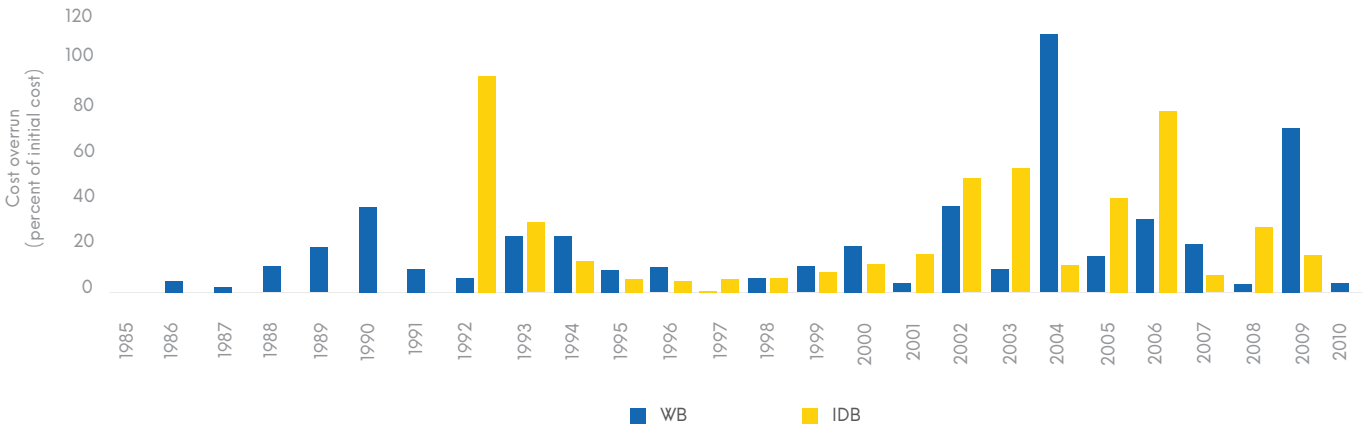
There is a potential to lower cost overruns by 26%. Since public expenditure on infrastructure reaches 2.5% of regional GDP, savings from diminishing regional cost overruns in LAC to a "technical minimum" could reach above 0.65% of regional GDP.

Table 5. Cost overruns in infrastructure projects financed by the IDB and the World Bank, by subsector (percent)

Item	Transport	Energy	Water and sanitation
Average			
IDB	23	16	19
World Bank	18	9	17
Standard deviation			
IDB	33	21	28
World Bank	38	19	34
Maximum			
IDB	144	93	138
World Bank	191	47	174

Sources: Inter-American Development Bank and World Bank Infrastructure Projects Databases.

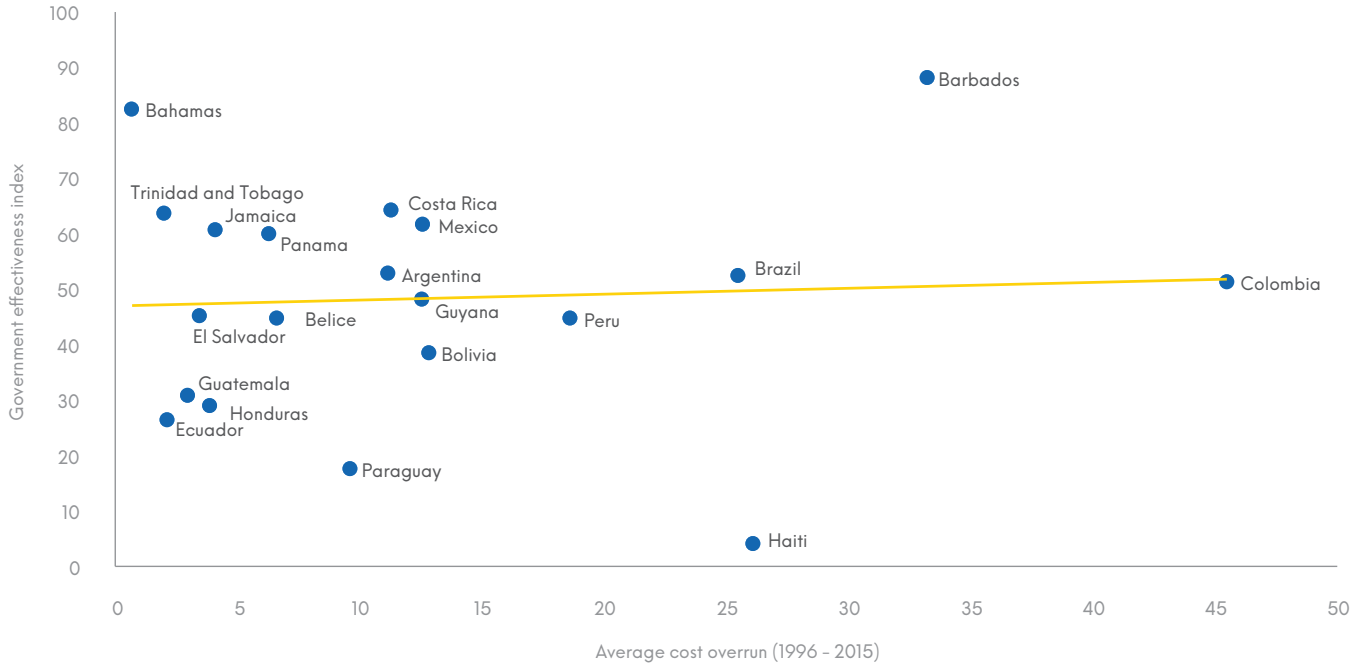
Figure 16. Cost overruns in a sample of infrastructure projects in Latin America and the Caribbean funded by the Inter-American Development Bank and the World Bank, 1996–2010



Sources: Inter-American Development Bank and World Bank Infrastructure Projects Databases.

[11] This index measures the quality of public services, the quality of the civil service and its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to its stated policies. The database includes 200 countries and territories over the period 1996–2015. See http://info.worldbank.org/governance/wgi/index.aspx#home.

Figure 17. Relationship between cost overruns on a sample of infrastructure projects in Latin America and the Caribbean financed by the Inter-American Development and the World Bank and the government effectiveness index



Sources: Inter-American Development Bank and World Bank Infrastructure Projects Databases.
Note: Figures are based on averages for 1996–2015.

Reducing project implementation delays

Delays in project implementation immobilize physical and financial capital and increase a project's costs in a variety of other ways: unit prices can increase, trained staff can leave the project, and needs and priorities of beneficiaries can change (Leurs 2005).

To analyze time delay data, we use project information data from the IDB. The analysis identifies two sources of time inefficiencies: (a) delays between the time the bank approved the project and the borrowing government approved the project's eligibility for financing and (b) delays in the planned disbursement schedule that required an extension of the original closing date of the project.

The analysis is based on 317 IDB infrastructure projects approved between 1997 and 2016.[12] The unit of observation is annual project disbursements. The number of observations is 2,152.[13]

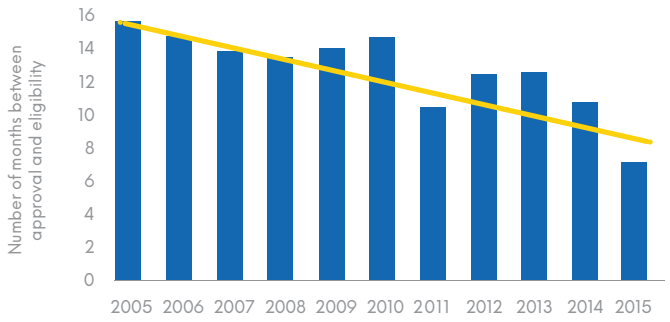
For IDB infrastructure projects approved between 1997 and 2016, 17 months elapsed on average between approval and eligibility. [14] The number declined over time, falling from 16 months. For the projects in the sample, figure 18 shows the total time required to declare a loan eligible since its approval sorted by year. The trend shows a negative slope which illustrates that the eligibility process has decreased over time. Thus, for example, in 2005, the time between the approval of the loan and the eligibility date was 16 months on average, but by 2015 this time had decreased to 7 months.

[12] The dataset started with 407 projects but was reduced to 317 projects after scrubbing the data for missing values and inconsistencies. The average disbursement observation was $97 million.the period 1996–2015. See http://info.worldbank.org/governance/wgi/index.aspx#home.

[13] We considered only investment projects. Emergency loans, policy-based loans, and other lending instruments were not included because they do not usually finance public works and because disbursements of these loans are handled differently.

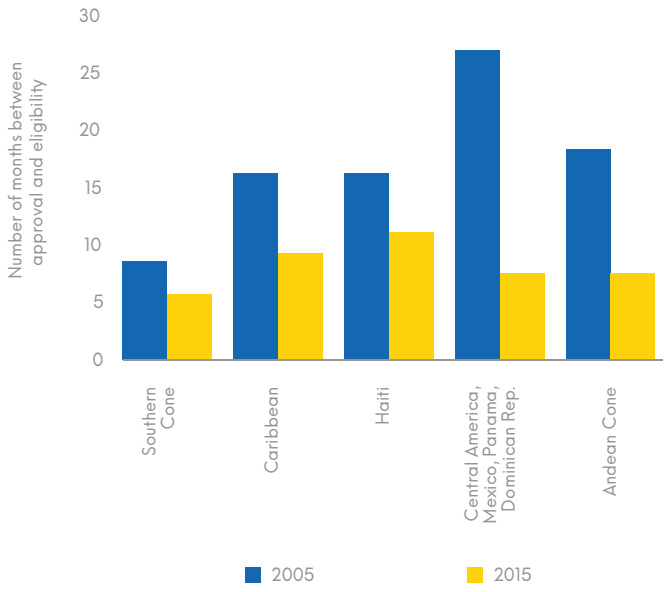
[14] Implementation of an investment loan approved by a multilateral development bank can begin only after the authorities of the borrowing country (usually the executive and/or legislative branches of government) declare the loan eligible. For a detailed explanation of the IDB project cycle, see http://www.iadb.org/en/projects/project-cycle,1243.html.

Figure 18. Average delay between approval of a sample of Inter-American Development Bank projects and granting of eligibility by year, 2005-2015



Source: Inter-American Development Bank Infrastructure Projects Database.

Figure 19. Average delay between approval of a sample of Inter-American Development Bank projects and granting of eligibility by recipient countries in selected subregions, 2005 versus 2015

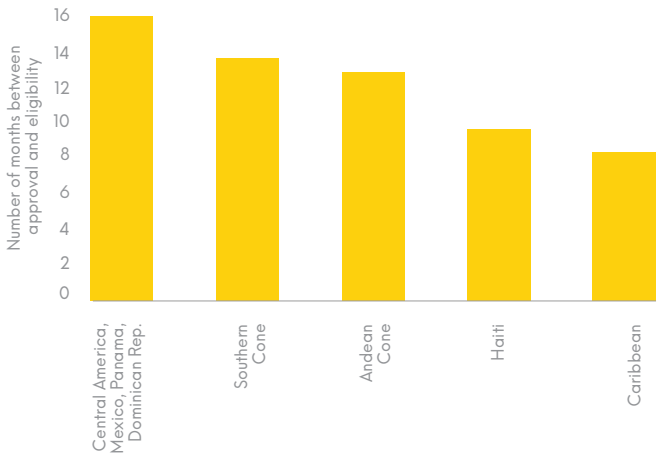


Source: Inter-American Development Bank Infrastructure Projects Database.
Note: Data for the Caribbean and Haiti are for 2006.

Over time, the length of delays declined across all subregions (figure 19). Haiti, Central America, Mexico, Panama, and the Dominican Republic saw the greatest improvement.

We can also identify two phases within the delays. The first is the time between IDB approval of the loan and the government's signature of the loan agreement. The second phase relies more on the beneficiary country: the time between the signature and the enabling of all necessary laws and rules in the country in order to be able to start the implementation of loan components. As mentioned, IDB infrastructure projects wait 16 months on average between approval and eligibility. However, 60 percent of this time occurs between signature and eligibility. Figure 20 shows differences in the average delay in these two phases by country region. There are regions where it takes more than a full year to enable a project, such as Haiti and Central America, Mexico, Panama, and the Dominican Republic, while others require less time.

Figure 20. Average delay between approval of a sample of Inter-American Development Bank projects and granting of eligibility by recipient countries in selected subregions, 2005-2015



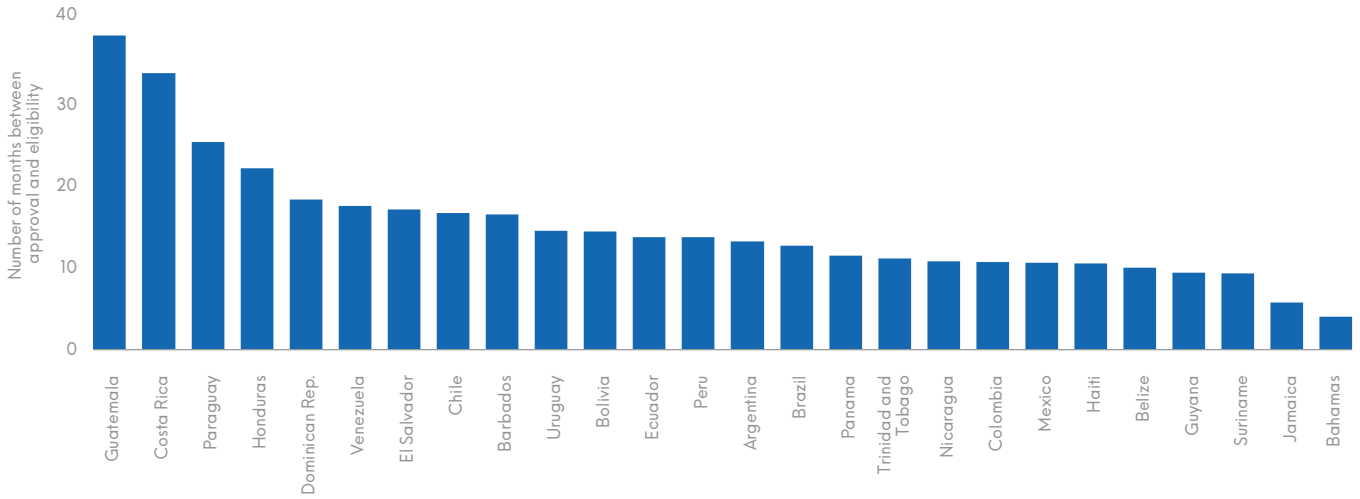
Source: Inter-American Development Bank Infrastructure Projects Database.

Furthermore, the length of delays varies significantly across countries (figure 21). It ranged from 4 months in the Bahamas to 41 in Guatemala.

There is a slight negative correlation between the length of delays on the one hand and the World Bank's government effectiveness index and rule of law indicators on the other: Average delays are shorter in countries with higher indexes (figure 22).

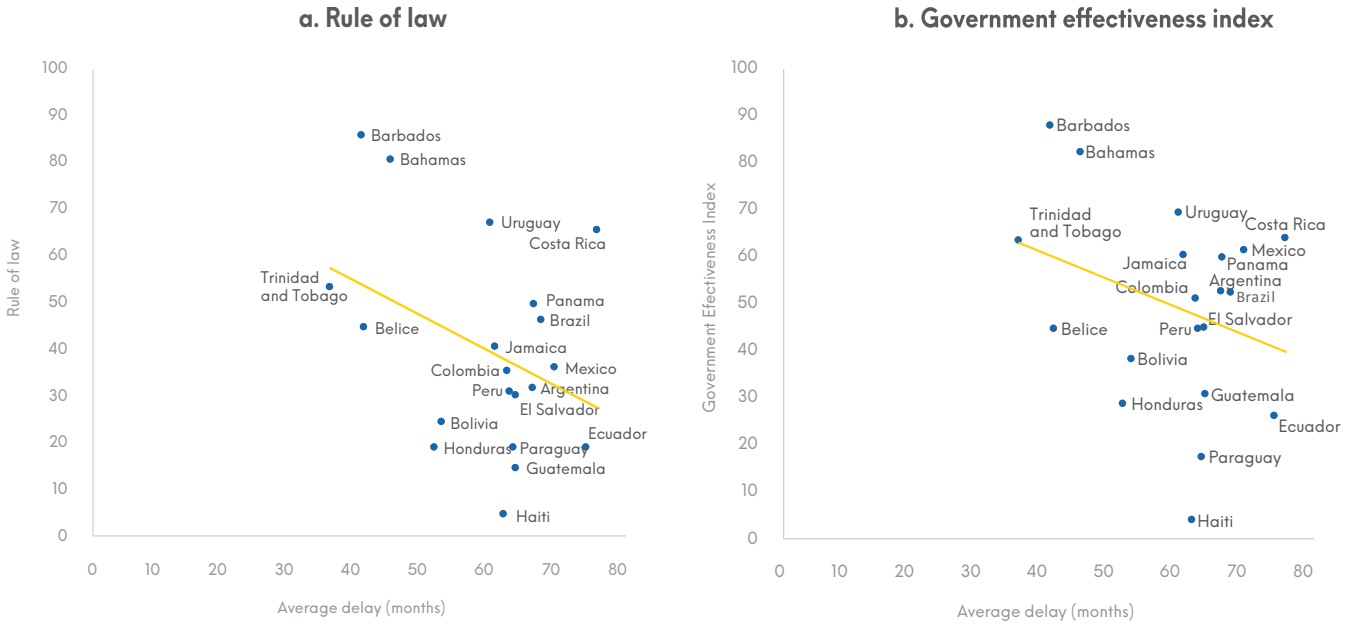
How do these time delays compare to international standards? McKinsey Global Institute (2017) compares the "dealing with construction permits" pillar of the

Figure 21. Average delay between approval of a sample of Inter-American Development Bank projects and granting of eligibility by selected countries, 2005-2015



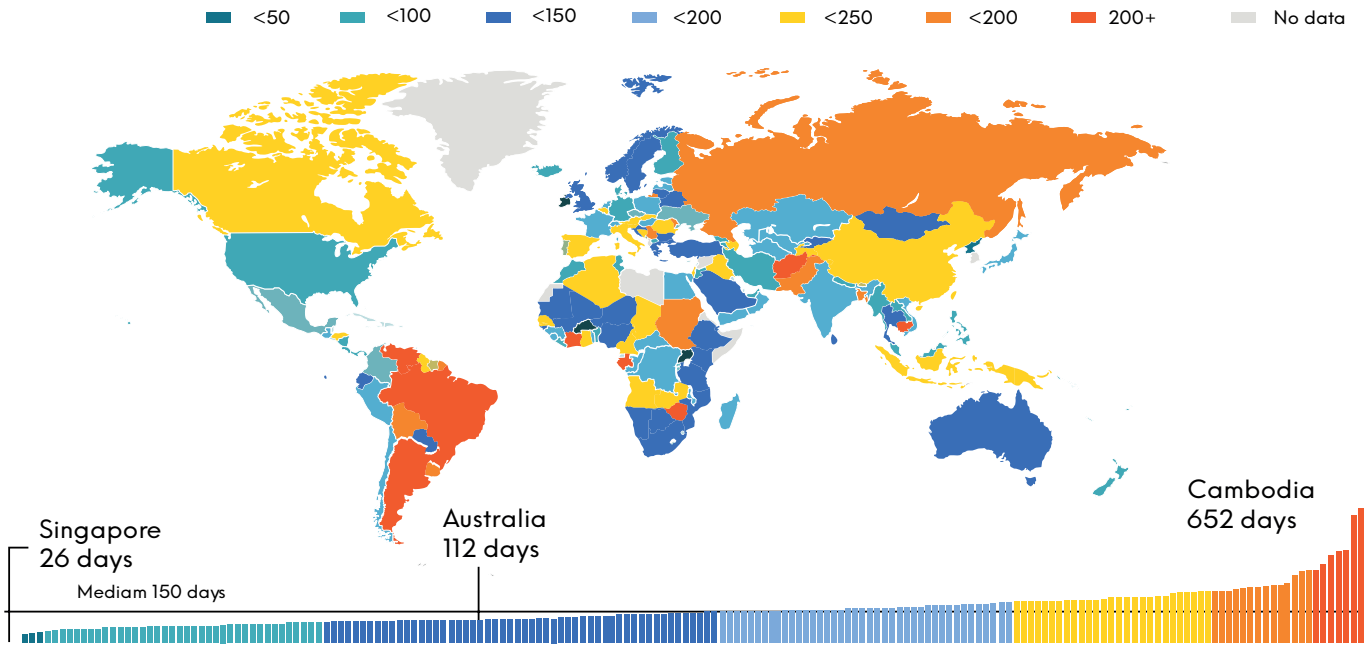
Source: Inter-American Development Bank Infrastructure Projects Database.

Figure 22. Relationship between length of delays in approving a sample of infrastructure projects financed by the Inter-American Development Bank and rule of law and government effectiveness indexes



Sources: Inter-American Development Bank Infrastructure Projects Database and World Bank Government Effectiveness Index.
Note: Data is for 1996–2015.

Figure 23. Global map of days required to complete all permitting and approval procedures for infrastructure projects



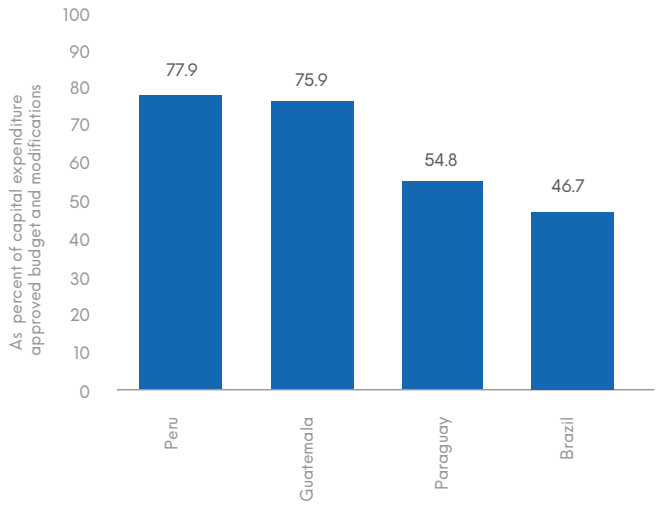
Source: McKinsey Global Institute (2017).

World Bank's Doing Business report, which shows the number of days it takes to complete all permitting and approval procedures to build. Although this data is not identical to the one previously analyzed in this section, it is complementary given that it shows another source of data that aims at documenting causes for project implementation delays. It finds that the process is shorter in developed countries than in developing countries (figure 23). Completing the process takes just 26 days in the most efficient country (Singapore). It takes an average of 181 days in LAC, about a month longer than the OECD countries' average. Within LAC the least efficient country is Barbados, where it takes 442 days to obtain all permits and approvals. Barbados is an unusual case because it also has the smallest number of procedures (nine), meaning that it takes an average of almost 50 days per procedure (permitting costs are also the least in Barbados—just 0.2 percent of total construction costs). In Venezuela, the second-worst performer, it takes 434 days to obtain all permits and approvals; it also has just nine procedures. Argentina takes the third-longest time to complete all construction permits (341 days and 21 procedures).

The shortest delays in LAC are in Colombia (73 days), Haiti (80 days), and Honduras (89 days). Between 2009 and 2011, Colombia eased construction permitting by improving the electronic verification of prebuilding certificates, introducing regulations that categorize building projects on the basis of risk, allowing electronic verification of certain documents, fully adopting the "silence is consent" rule, and introducing a new unified application form for building permits. Haiti processes permits relatively rapidly, but at the highest price in the region (14.9 percent of total construction costs).

Financial costs are direct and measurable consequences of delays in project implementation. Other costs include the loss of political credibility, the cost of delaying the benefits of the improved infrastructure, and the opportunity cost of tying up funds. Time is valuable, and the departure from the scheduled timetable of project implementation creates opportunity costs in the form of resources that could be allocated to alternative uses. We measure the opportunity cost as the financial cost of monetary resources that are not disbursed according to the schedule set at the time of project preparation.

Figure 24. Capital expenditure budget execution in Peru, Guatemala, Paraguay, and Brazil, 2015



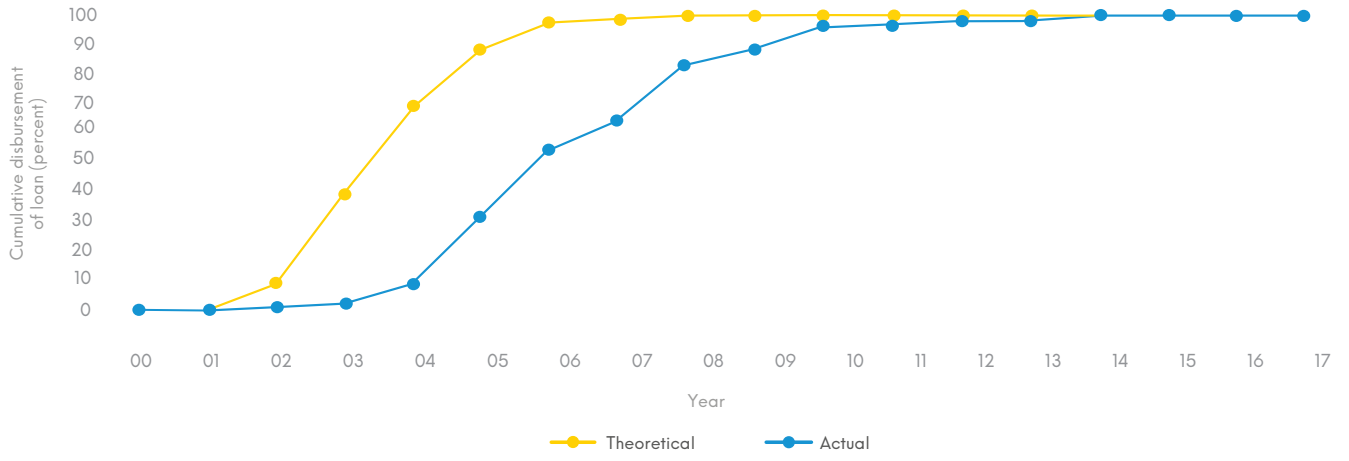
Sources: Open Budget Portal (http://wbi.worldbank.org/boost/boost-initiative), Ministry of Economics and Finance of Peru, Integrated System of Planning and Budget of Brazil.
Note: Data for Guatemala are for the central government. Data for Brazil are for the federal government.

The difference between budgetary allocations and actual capital expenditures is significant in LAC, ranging from 23 to 53 percent (figure 24).[15]

Most of the evidence on the financial costs caused by delays is anecdotal or based on case studies. In light of the lack of actual information on disbursements, we built a theoretical project disbursement curve, based on information for the period 2003-2016 on programmed disbursements in standard project documents, prepared for approval by IDB's board of directors. We then compared the theoretical disbursement curve with the actual disbursement curve, calculated using annual data on project disbursements (figure 25). The theoretical disbursement curve was constructed after reviewing more than 100 infrastructure project appraisal documents, which contain detailed information on implementation schedules. The actual disbursement curve was constructed based on actual disbursements of a sample of 317 infrastructure projects. All disbursements were standardized using their approval date as year 0 with disbursements followed on a yearly basis. Figure 25 shows the comparison between the theoretical and actual disbursement infrastructure curves.

Both curves have an S-shape, which graphically depicts how infrastructure projects behave. The start of the curve is the moment zero, which is the approval year. At the beginning, the curve takes time as project implementation begins. This period is the one between the approval and the eligibility (government ratification or congressional authorization), which lasts approximately two years. Given that the curve is cumulative within time, once the first disbursement is made, the curve increases in slope because disbursements start and they accumulate, so towards the end of the project, these accumulated disbursements make up the greater part of the project disbursements.

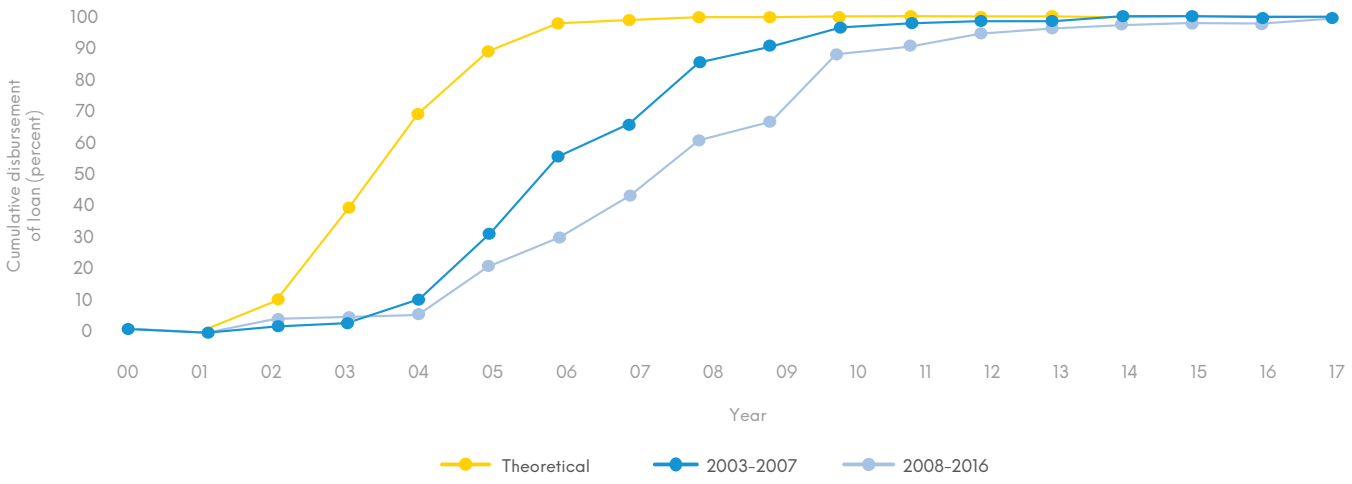
Figure 25. Theoretical and actual cumulative disbursements of a sample of infrastructure loans financed by the Inter-American Development Bank, 2003–2016



Source: Inter-American Development Bank Infrastructure Projects Database.
Note: Figures are based on loans approved in 2003–2016.

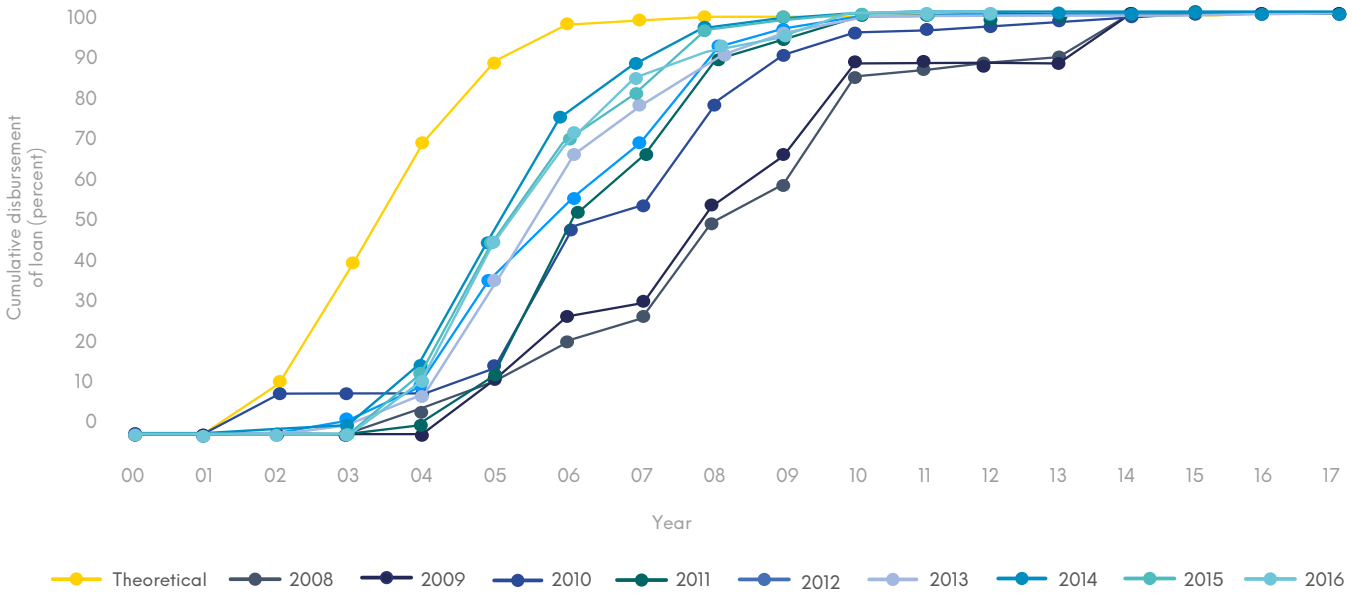
[15] Execution could also be assessed by analyzing the procyclicality of the capital and current expenditure at different points in the economic cycle.

Figure 26. Theoretical and actual cumulative disbursements of a sample of infrastructure loans financed by the Inter-American Development Bank in 2003–2007 and 2008–2016



Source: Inter-American Development Bank Infrastructure Projects Database.
Note: Figures are based on loans approved in 2003–2016.

Figure 27. Theoretical and actual cumulative disbursements of a sample of infrastructure loans financed by the Inter-American Development Bank, 2008–2016



Source: Inter-American Development Bank Infrastructure Projects Database.
Note: Figures are based on loans approved in 2003–2016.

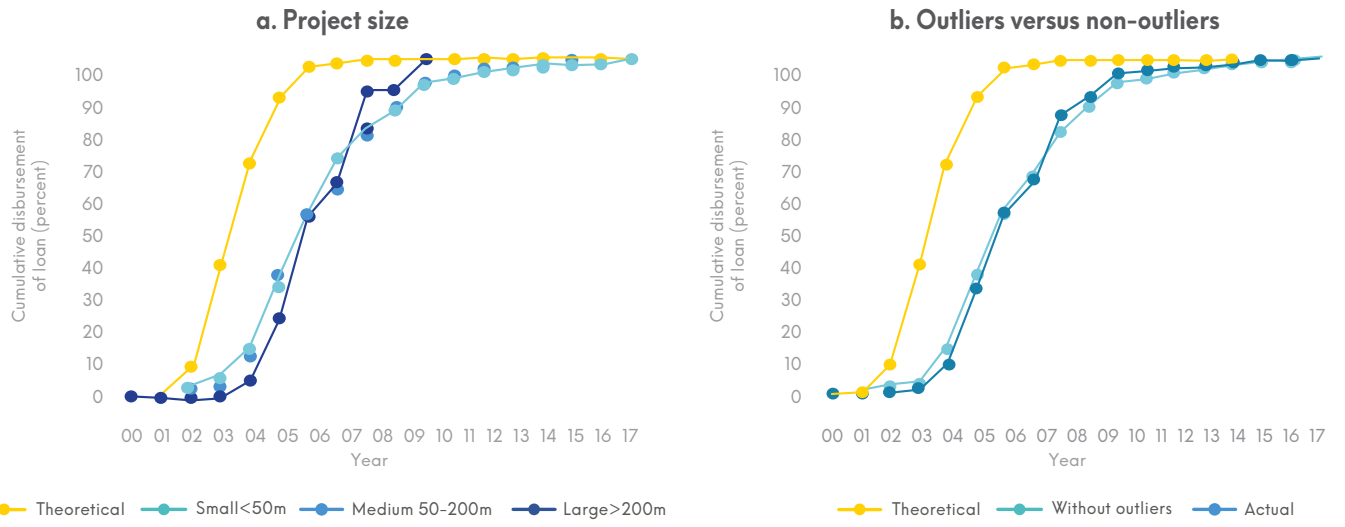
The gap between the theoretical and the actual curves is significant. On the theoretical curve, almost 90 percent of the loan is disbursed by the fifth year. In practice, only 30 percent is disbursed in this period, and the loan term can extend up to 17 years.

This data can be analyzed from different perspectives. First, we analyze the actual curve over the years to see if, despite the delays, the IDB is improving the timeliness of its disbursements. Figure 26 compares projects approved between 2003 and 2007 with projects approved between 2008 and 2016. It finds that delays in disbursement decreased. The 2003–07 actual curve is farther from the theoretical curve than the 2008–16 actual curve, showing that there was improvement in disbursements. In seven years, 42 percent of the portfolio was disbursed between 2003 and 2007. This figure rose to 66 percent in 2008 and 84 percent in 2016 (figure 26). This shows a significant improvement over the past few years, yet there is still room for improvement.[16]

Several variables could affect the disbursement trend, including the size of the project, the infrastructure subsector, and distinctive country characteristics. The analysis suggests that there is no significant difference across different project sizes, and they are all behind the theoretical curve, as shown in panel a of figure 28. However, we do see that large projects accelerate at the end of the actual curve and finish before medium and small projects. Furthermore, panel b of figure 28 shows that outlier projects (both large and small), have the same disbursement behavior and remain behind the theoretical curve.

Regarding infrastructure subsectors (water, transport and energy), the analysis suggests that there is no significant difference between different subsectors, and they are all behind the theoretical curve (figure 29). Moreover, we have compared the disbursement curve for other sectors, such as education and health. Figure 29 shows that the three sectors follow the same path and are all behind the theoretical curve. However, infrastructure projects show a bigger gap from the theoretical curve than the other actual curves, showing that social sectors may disburse more promptly, approximately between the third and tenth year.

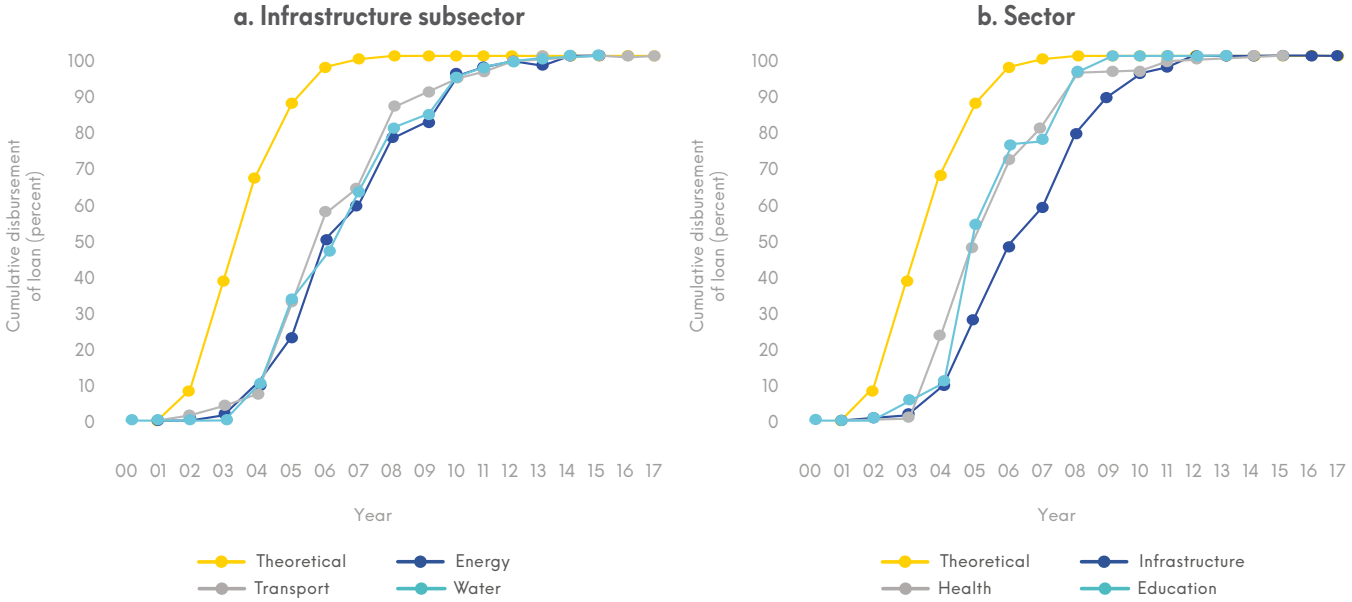
Figure 28. Theoretical and actual cumulative disbursements of a sample of loans financed by the Inter-American Development Bank, by project size and presence of outliers, 2003-2016



Source: Inter-American Development Bank Infrastructure Projects Database.
Note: Figures are based on loans approved in 2003–2016.

[16] Even without implementation delays, the actual curve accelerates at the beginning as the theoretical curve but it is still behind of it, suggesting that there is room to improve while disbursement takes place.

Figure 29. Theoretical and actual cumulative disbursements of a sample of loans financed by the Inter-American Development Bank, by infrastructure subsector and sector, 2003-2016



Source: Inter-American Development Bank Infrastructure Projects Database.
Note: Figures are based on loans approved in 2003–2016.

The actual curves are below the theoretical curves for all countries in LAC. Disbursement appears to be slower in Central America and the Caribbean than in Mexico and South America (figure 30).

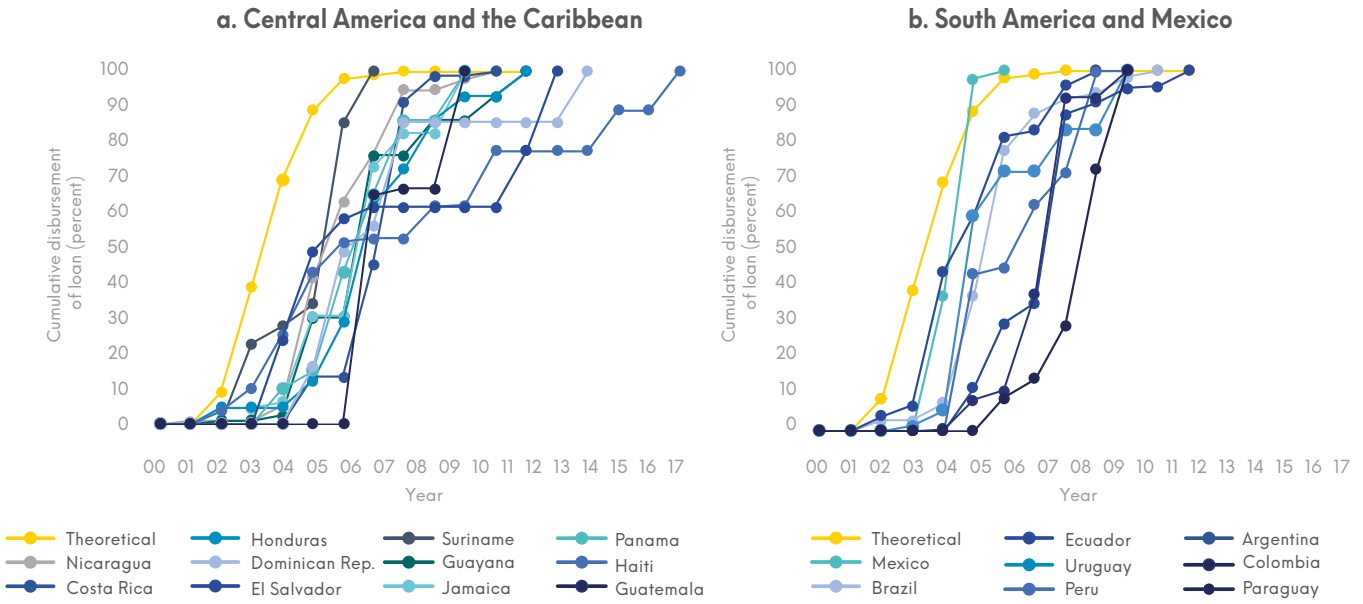
Several conclusions emerge from this analysis:

- There is a gap between the theoretical and actual disbursement curves.
- Over time, the two curves narrowed, indicating that disbursements improved.
- Project size and subsector have no significant effect on disbursements.
- There is no significant difference regarding "outlier" projects (i.e. particularly large or small ones), and they are all behind the theoretical curve.
- Infrastructure loans are disbursed slightly more slowly than loans in education and health.
- There is no significant difference in disbursements across countries, although the gap between actual and theoretical disbursements is larger in Central America and the Caribbean than in Mexico and South America.

But what does this gap between the theoretical and the actual curve imply? All these delays represent serious inefficiencies in disbursement that generate costs.There is a value of money in time, and there is an opportunity cost to delayed disbursements that could be invested elsewhere. We have estimated the opportunity cost of the money that was not disbursed as scheduled using potential interest rates that could be earned on the capital. Our results considered an average-size project ($100 million) and an average implementation period (14 years) for different interest rates over the period of analysis.[17] Based on the average interest rate over the period of analysis (4.2 percent), disbursement inefficiencies added 10.5 percent to project costs. Depending on the interest rate, these costs range from 2.8 percent (based on the lowest rate the IDB ever charged since 1997 (0.99 percent) to 19.7 percent (based on the highest rate charged (7.03 percent). This shows that timely implementation can increase efficiency, and if disbursements follow the stipulated schedule, savings could account for up to 19.7 percent of the total amount of the project. Since public expenditure on infrastructure reaches 2.5 percent of regional GDP, savings from improved disbursements schedule could reach up to 0.49 percent of regional GDP.

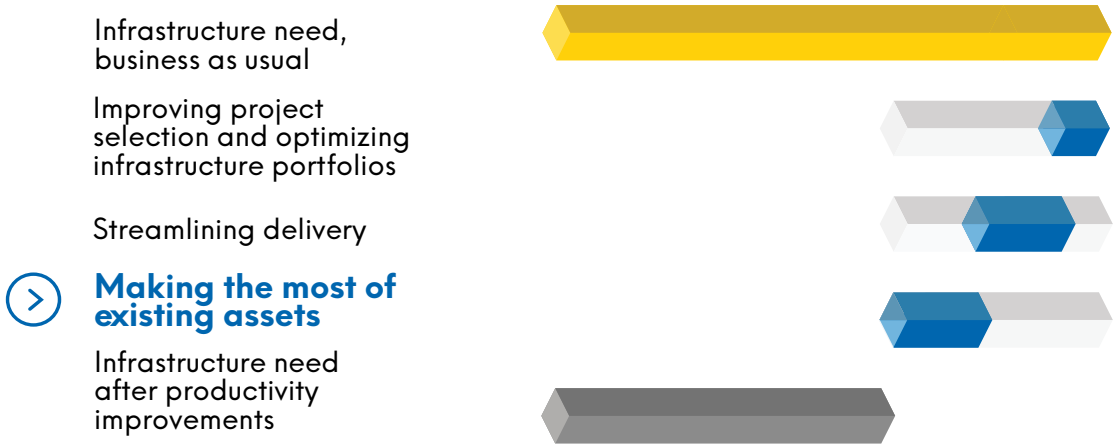
[17] By the 10th year, 96 percent of loans are disbursed; the remaining 4 percent corresponds to closing related procedures.

Figure 30. Theoretical and actual cumulative disbursements of a sample of loans financed by the Inter-American Development Bank, by subregion, 2008–2016



Source: Inter-American Development Bank Infrastructure Projects Database.
Note: Figures are based on loans approved in 2003 – 2016.

Making the Most of Existing Assets



Source: Adapted from Dobbs et al. (2013).

Many countries push for new infrastructure as the only way to improve the delivery of infrastructure services or to respond to increasing demand for services. Deteriorated roads and water and electricity losses indicate that infrastructure assets are not providing quality service. The immediate policy answer tends to be construction of more infrastructure. But in many cases, more and better services can be delivered at a much lower cost by properly maintaining existing infrastructure.

Making the delivery of infrastructure services more efficient has been a key justification for promoting private participation in the sector. LAC took the lead in allowing private sector participation in the provision of infrastructure services in the early 1990s. Since the first steps (by Chile in the 1980s), the region has experienced a wave of private sector participation— in transport, gas, agriculture, public services, and other sectors (Estache, Tovar, and Trujillo, 2004). In the 1990s, profits from private concessions reached 6 percent of GDP in 18 Latin American countries (IDB 2002). Little evidence is available on the benefits of private sector participation.[18] The main conclusion seems to be that there is plenty of opportunity to improve the efficiency of infrastructure services (Andres, Schwartz, and Guasch 2013). According to Dobbs et al. (2013), making the most of existing assets can save around 40 percent in public spending in infrastructure.

Are infrastructure services in LAC being provided efficiently? This is a complex question to address. Infrastructure encompasses different sectors and a wide variety of assets that provide different services. Thus, it is difficult to analyze efficiency in infrastructure as if it were a single, homogenous sector or asset. Findings differ across sectors.

The development of efficiency frontiers has made it possible to assess the efficiency of certain transport

[18] Guasch, Suárez-Alemán and Trujillo (2016) summarize studies dealing with the pros and cons of private participation in the delivery of infrastructure services, citing Estache and Rossi (2010), Gassner et al. (2009), and Parker (2004), among others. Using a representative sample of 220 electricity distribution companies from 51 developing countries for 1985–2005, Estache and Rossi (2010) find that private regulated companies were more efficient than state-owned regulated companies. Gassner et al. (2009) derive similar findings from a sample of 1,200 utilities from 71 developed and transition economies. Parker's (2004) study of Great Britain finds that "without privatization, the introduction of competition in some (network) activities would not have been possible at all, or would have been difficult to promote [...] increased competition and better regulation are likely to be direct consequences of the privatization process."

sectors in LAC (table 5).[19] Serebrisky et al. (2016) find that average technical efficiency of ports in LAC rose from 52 percent in 1999 to 64 percent in 2009 (where 100 percent is perfectly efficient). Suárez-Alemán et al. (2016) find that ports in LAC are much less efficient than top-performing Chinese ports. They show that private sector participation, the reduction of corruption in the public sector, improvements in liner connectivity, and the existence of multimodal links increase the level of port efficiency in developing regions.

Based on information from more than 148 airports worldwide, Serebrisky (2012) concludes that LAC airports are less efficient than airports in Asia and North America. In the best-case scenario, only 6 of 22 LAC airports in the sample were on the efficiency frontier. On average LAC airports were 69 percent as efficient as the frontier.

Other infrastructure sectors, such as energy, water and sanitation, are also far from the efficiency frontier. Estache, Rossi, and Ruzzier (2004) provide estimates of the efficiency of South America's main distribution companies between 1994 and 2000. South America's electricity sector could pursue an approach that relies on performance rankings based on comparative efficiency measures. The authors show that based on modest data publicly available at the moment, the mentioned approach, could yield useful results.

Bonifaz and Barboza (2014) analyze urban water utilities in LAC. They find that private sector companies outperform public sector enterprises and that inefficiency is positively correlated with firm size and the length of a network. Inefficiency in the sector adds 32 percent to costs, according to their estimates.

Analysis of levels of service constitutes an alternative and supplementary perspective on infrastructure efficiency. The role of infrastructure in enhancing productivity becomes clear when the consequences of

Table 6. Results of selected studies on the efficiency of infrastructure in Latin America and the Caribbean [20]

Study	Sector	Main result	Year
Bonifaz and Barboza (2014)	Water and sewerage	Inefficiency increased costs 32 percent.	1999–2010
Estache, Rossi, and Ruzzier (2004)	Electricity	Efficiency was 76 percent (where 100 percent represents perfect efficiency) (regional average).	1994–2000
Serebrisky (2012)	Airports	Efficiency was 69 percent (regional average).	Average 2005–06
Serebrisky et al. (2016)	Ports	Efficiency was 64 percent (regional average).	Average 2000–10
Suárez-Alemán et al. (2016)	Ports	In comparison across developing regions, Efficiency in LAC was just 55 percent (regional average).	Average 2000–10

[19] Stochastic and parametric methodologies, such as stochastic frontier or data envelopment analyses, have been widely used. They involve the development of a production or cost frontier, which represents the optimal combination of inputs in a certain industry. See Suárez-Alemán et al. (2016) for a description of methodologies for estimating efficiency frontiers.

[20] This table comprises a selection of recent analyses regarding the efficien-cy of infrastructure sectors in LAC. For a detailed review of infrastructure efficiency studies, see Worthington (2004) for water utilities, Schuschny (2004) for the electricity sector, or Estache, Perelman and Trujillo (2005) for the transport sector.

low-quality service provision are measured (Serebrisky 2014). For example, LAC loses 16 percent of total produced electricity—a much higher share than the 6 percent lost in OECD countries (Jimenez, Serebrisky, and Mercado 2014). Losses from power outages in LAC reached $68 billion in 2012, according to a World Bank study (2012). In 2010, they represented 1.2 percent of sales in LAC—more than 10 times the 0.1 percent lost in OECD countries; losses were higher in Central America (equivalent to 1.5 percent of sales) and lower in the Caribbean (equivalent to 0.5 percent of sales) (World Bank 2010). Similar losses resulted from water shortages or interruptions in water supply. Losses from breakage or deterioration of merchandise during shipping exceeded $70 billion in 2012.

In the transport sector, unpaved roads are associated with low quality and inefficient transport services. Road safety is receiving increasing attention as the direct consequence of inadequate services provided by infrastructure assets and poor regulation of traffic rules. LAC has low transport infrastructure density given its income level: Its paved road density is similar to that of Africa and about one quarter that of the next-lowest region (World Bank 2017). As a result, road accidents are the leading cause of death among people between 15 and 29. More than 100,000 people a year die in road accidents in LAC, and poor roads are estimated to cost the region an estimated 1–3 percent of GDP (Serebrisky 2014).

Poor transport infrastructure also reduces the region's competitiveness. On the World Bank's Logistic Performance Indicators, LAC ranks close to Sub-Saharan Africa. Its costs more and takes longer to export from LAC than from East Asia, and exporting costs are higher than they are in South Asia. Infrastructure challenges are enormous in LAC, where 106 million people lack adequate sanitation, 34 million people lack drinking water, and 30 million people lack access to electricity (Serebrisky, 2014).

The International Monetary Fund's Public Investment Efficiency indicator (PIE-X) estimates the relationship between the public capital stock and indicators of the accessibility and quality of infrastructure assets (IMF 2015). It uses data envelopment analysis (DEA) to develop the efficiency frontier.[21] Countries are given scores based on their distance to the frontier relative to peer best performers; the less efficient the country, the greater the distance from the frontier and the lower its PIE-X score. Inputs are the public capital stock and income per capita; output is a physical indicator of the coverage of infrastructure networks that combines data on the volume of economic infrastructure (length of road network, electricity production, and access to water) and data on the social infrastructure (the number of secondary teachers and hospital beds) and the quality of infrastructure indicator from the World Economic Forum database.

This analysis reveals efficiency gaps of 40 percent for low-income countries, 27 percent for emerging economies, and 13 percent of advanced economies. Although these scores may be biased and the impact of quality may be lost in the development of the frontier (all variability could be explained by the quantity indicators, as the quality variable is truncated on a 1–7 scale), the results give a sense of the low performance in the developing world.

The IMF study includes only three LAC countries (Bolivia, Brazil, and Chile). To fill this gap, we developed a frontier with quality of infrastructure as the output and public capital stock and income per capita as inputs. Our analysis covers 126 countries, including 19 in LAC, from 2007 to 2013.[22] The results show that LAC performs far worse than the world's best performer (Switzerland), although scores were higher in recent years than they were in 2007–09 (figure 31).

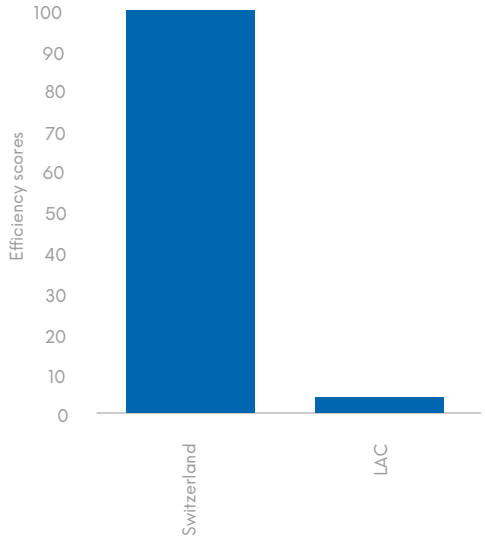
Countries can make the most of existing assets by maintaining them properly. We often talk about the importance of infrastructure for growth and development and keep stressing the importance of investing to expand infrastructure to meet population demands and achieve competitiveness. However, once infrastructure is built, we often take for granted that it will continue to provide services at the level of quality observed immediately after construction is completed. The truth is that infrastructure deteriorates over time. Depreciation of infrastructure assets is non-linear, which is why most

[21] DEA, developed by Charnes, Cooper, and Rhodes (1978), is the most frequently applied nonparametric methodology for estimating efficiency levels in infrastructure. The frontier is obtained by establishing relationships between outputs and different input combinations through linear programming; the degree of efficiency is measured by the distance between the observation and the best practice frontier.

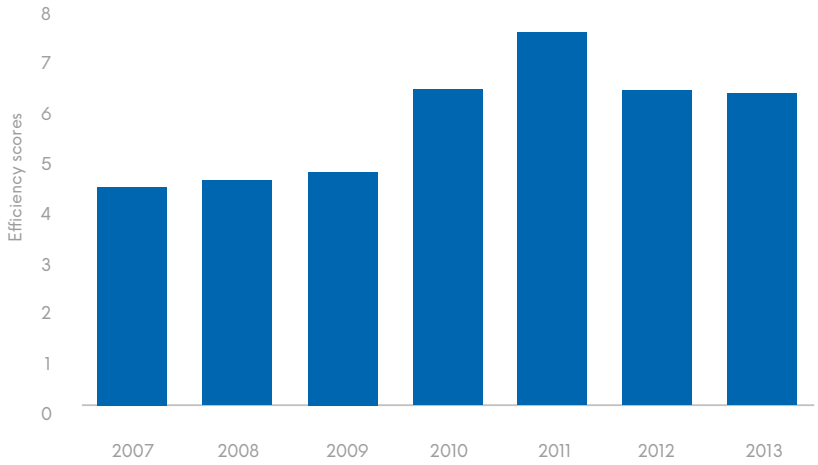
[22] See appendix for the lists of countries.

Figure 31. Infrastructure efficiency scores, 2007–13

a. Average infrastructure efficiency scores in 2007– 2013 of top performer (Switzerland) and Latin America and the Caribbean



b. Annual infrastructure efficiency scores, 2007– 2013 Latin America and the Caribbean



Source: Authors' calculations based on IMF public capital stock and WEF data.

of the time, the deterioration is often not visible until the moment when routine maintenance can no longer reverse the damage (box 3). When maintenance is no longer an option, much more expensive rehabilitation or rebuilding is required.

Lack of proper maintenance increases costs to the provider of the infrastructure. It also imposes operational costs on infrastructure users. In the case of roads, for example, deteriorated infrastructure is associated with vehicle depreciation, increased travel times, higher gas consumption, and more accidents. In the case of electricity, lack of maintenance increases electricity losses, power tripping, system instability, breakdowns, and fires. Poorly maintained infrastructure also sometimes causes firms to invest in infrastructure themselves (buying generators, for example) (Rioja 2016).

There are several reasons for the bias against mainte-nance. They include limited resources; poor execution capacity; and corruption, favoritism, and rent-seeking opportunities during the bidding process, which create incentives to ignore maintenance. Construction is more politically attractive than maintenance, citizens place lower value on maintenance projects, and the press focuses on new

Box 3. The typical life cycle of a road

Depreciation of infrastructure assets occurs in a non-linear way. For example, in the case of roads, pavement deterioration begins slowly and accel-erates over time. That is why most of the time, the deterioration process is not visible until the moment when maintenance or intervention cannot reverse the damages. Then the infrastructure needs to be rehabilitated or rebuilt, generating higher costs than opportune maintenance. There are 4 stages to the life cycle of a road when it is not properly maintained.

New: The road has just been built and inaugurat-ed. It is in excellent condition because it is brand new. Slow and imperceptible deterioration: With time, the road slowly starts to deteriorate without being noticed, mainly in the paved surface. This period lasts between 10 and 15 years depending on the quality of the initial construction, traffic, and climate events.

To stop the slow deterioration, routine maintenance efforts must be done. Unfortunately, given that the

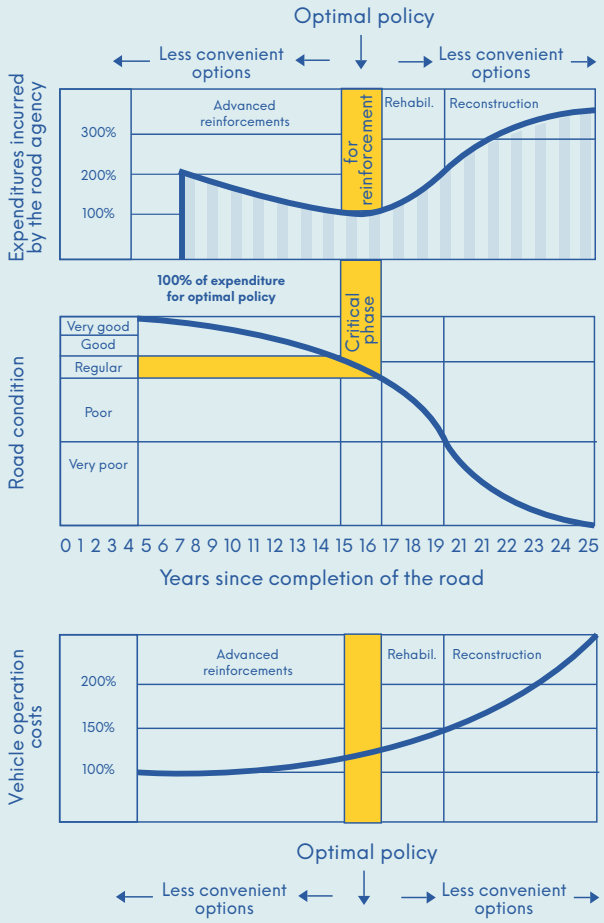
deterioration is imperceptible, maintenance is ignored due to fiscal constraints and more priority is given to roads where deterioration is worst and most perceivable Fast deterioration and breaking point: After several years of deterioration without maintenance, the road starts to deteriorate rapidly. Even at this stage, deterioration probably cannot be identified because the basic structure is suffering, but it cannot be seen. Then surface deterioration starts to show, and at this critical point destruction accelerates and the road passes from regular to poor condition and approaches the end of its service life. This a short period that takes two to five years.

To reverse deterioration, maintenance needs to be done at the beginning of this stage to prevent the accelerated deterioration that occurs after the critical point in which the basic structure is damaged. Ideally, intervention takes place before this critical point, because reinforcing the surface is not costly and preserves the original structure. But If maintenance takes place after the critical point, surface reinforcement is insufficient to protect the basic structure. In that case rehabilitation is needed, which is more expensive than preventive maintenance before the critical point.

Total loss: This stage means the complete deterioration of the road. This stage is very visible. Users can perceive the fissures in the road, and vehicles start experiencing damages when using the road. Unfortunately, at this moment there is no solution to save the road and the only option is to reconstruct, which is more expensive than preventive maintenance or rehabilitation.

As seen above, roads don't depreciate in a linear way, nor does maintenance correct the deterioration in a linear way. There is a critical moment where intervention can save the road. Although it is never too early to maintain infrastructure, the optimum moment for the government is during the "critical phase" which occurs at the end of the first stage when roads are still in good condition. The reason maintenance is not suggested before this time is because although it is useful, the opportunity cost of these resources is higher and maintenance can still be put off a short time. The critical phase is also the last moment before users begin incurring additional operating costs. So, it is the critical phase from their perspective as well.

Box figure 3.1. Typical road life cycle



Source: Adapted from CEPAL (1994).

projects or waits until tragedies occur to call attention to deferred maintenance (Jaffe 2015). This bias against maintenance occurs around the world, but unfortunately evidence is scarce and difficult to get, especially for non-developed countries. This hinders the study of maintenance and strategic decision-making. Recently, some US authors have promoted a campaign to advocate for maintenance. Estimations for the US suggest that from 2004 to 2008, the state road system was made up of 99 percent existing roads and 1 percent new roads. During this period, 43 percent of the road budget went to maintenance of existing roads, and 57 percent went to construction of new roads.

Moreover, estimates for the United States indicate that an annual expenditure of $145 billion is needed to maintain highways and bridges at current performance levels. Other studies have much higher estimates, of up to $194 billion (Kahn and Levinson 2011). The American Society for Civil Engineers estimates that poorly repaired roads in the state of Massachusetts imposed costs on motorists of about $2.3 billion, suggesting that the national figure exceeds $100 billion. Motorists each year pay between $0.50 and $1 tax on gasoline in extra automobile repairs because of poorly repaired roads (Summers 2017).

The earlier necessary maintenance is done, the less it costs. Kahn and Levinson (2011) estimate that in the United States, every $1 spent on preventive maintenance saves $4–$10 in future repairs. Heggie (1995a) estimates that if Africa had invested $12 billion in periodic maintenance of roads during the 1980s, it could have saved $45 billion in rebuilding and rehabilitation costs in the mid-1990s. He estimates that poorly maintained roads raised the cost of repairs by about $14,000 per vehicle (Heggie 1995b).

In Latin America, the attitude towards maintaining infrastructure is very limited. There is no systematic information on how and by how much the region invests in maintenance and on top there are few studies evidencing the lack of maintenance. Besides the scarce evidence on maintenance, the expenditure on maintenance is difficult to track in the national accounts because it is not limited to a single account. Furthermore, maintenance is rarely recognized as an investment expenditure.

Although maintenance is practice of fiscal prudence, there is a political incentive to defer maintenance during times of fiscal constraints, which effectively raises future costs. Classifying maintenance as an investment expenditure, instead of current expenditure, can allow for greater participation in the budget given that it would not be restricted to fiscal rules that constrain current expenditures. Moreover, it can increase the financing sources and ensure the continuity of maintenance, despite changes in government or expenditure cuts.

There are some exceptions to the lack of data on maintenance expenditures. For example, Paraguay publishes maintenance expenditures in its national accounts. In December 2016, the government started a new system in which the company that reconstructs a route is also responsible for its maintenance.

Another country on which there is more information regarding maintenance is Peru. Cusato and Pastor (2007) identified historic rehabilitation investments in roads that today are in bad shape due to the lack of investment in maintenance. They identified roads that were rehabilitated during the 90s, then followed the maintenance they received and assessed the current situation of those roads. This allowed them to identify the gap in maintenance, but also the cost of the later rehabilitation, and compare this to the cost of regular maintenance. They estimate that between 1992 and 2005, Peru spent seven times more bringing neglected roads back into full operation than it would have spent had it provided regular routine maintenance.

The World Bank developed the Road Network Evaluation Tools (RONET) model to help decision makers in Sub-Saharan Africa make maintenance investments (Sub-Saharan Africa Transport Policy Program 2017). It allows them to monitor the condition of roads, simulate road network performance under different maintenance and budget scenarios, and estimate the revenues collected from road user charges and the gap between them and the budget. The tool allows leaders to identify the optimal maintenance standard for each road and the minimum cost to maintain the current condition or reach other levels of service. Several maintenance investments in Africa have been made using this tool. Its success in improving or increasing maintenance has not yet been established, however.

Concluding Remarks

The policy debate around infrastructure, in multilateral development banks as well as in countries, tends to focus on investment needs—that is, how to measure, build and finance the additional infrastructure required to promote economic growth or respond to a growing demand. Much less attention has been paid to the need to improve the quality of infrastructure spending. This report argues that LAC can invest better and can provide more infrastructure services by making better use of available assets.

How and to what extend can efficiency be improved? This report focuses on the main dimensions of the project cycle of infrastructure delivery and concludes that improving the efficiency of infrastructure delivery—by improving project selection and optimizing portfolios, reducing cost overruns and delays, and making the most of existing assets—could have a sizable impact on infrastructure spending. Our quantitative exercises confirm that potential efficiency gains could reach 40 per cent of public infrastructure spending, and identify specific actions to be implemented. In a region for which there is widespread consensus that infrastructure investment is low—and at a level incapable of closing the infrastructure gap required to increase competitiveness and contribute to improve the quality of life of its population — the efficiency of infrastructure spending should be a sensible area for future policy debate and applied research to focus on.

1. Planning of infrastructure. In the LAC region, there is significant room for improvement in the early stages of project planning and selection. The analysis of several indexes that compare institutional characteristics allow to divide countries in LAC in four distinctive groups. The bottom two, which include Costa Rica, El Salvador, Panama, Paraguay, Guatemala, Honduras, Nicaragua, and Uruguay, must strengthen their institutions to improve the efficiency of upstream planning.

It has proven very difficult to quantitatively measure gains from better planning. Relying on infrastructure investment data from cites gathered by the IDB's ESC program, this report shows that annual savings generated by better planning could reach around 2.2 percent of annual infrastructure investment compared to business-as-usual practices, or 0.05 percent of regional GDP.

2. **Streamlining infrastructure delivery,** by reducing cost overruns and time delays in project implementation, has the potential to significantly reduce the required investment in infrastructure. While global cost overruns average 28 percent of the total cost of a project, in Latin America they average 48 percent of project costs, and this share has been rising in recent years. In our sample of multilateral development bank projects in LAC, IDB and World Bank projects similarly suffered cost overruns, and these accounted for an average of 17–22 percent of the total project costs. To calculate potential savings in infrastructure investment we consider that cost overruns (of 22 percent) achieved by multilateral development banks is the most realistic and lowest possible benchmark countries in LAC can achieve when they finance infrastructure investments with their own resources.

Using multilateral development bank projects as a lower bound at 22 percent, there is potential for LAC to lower cost overruns by 26 percent, saving annually above 0.65 percent of regional GDP by limiting overruns to a technical minimum.

Cost overruns in infrastructure delivery usually get most of the attention, but time delays can be, when properly accounted for, as important as cost overruns. After all, time is money. Unfortunately, information on time delays in infrastructure projects is, to date, not readily available. No country or institution collects this information, and when it is available it is impossible to produce cross-country comparisons. Probably the clearest indication of the perennial problem of time delays in infrastructure delivery is budget under-execution.

To study time delays and measure potential efficiency gains from reducing them we followed a similar approach as with cost overruns. We used IDB projects to produce a theoretical disbursement curve (the disbursement schedule produced by experts in the field with ample experience in the field and in the LAC region) and compared actual disbursements against it. While there is a gap between the theoretical curve and the actual curve, there has been a learning process, and over time the actual curve is moving towards the theoretical curve. However, there is still room for improvement.

Project size, outliers, and different infrastructure subsectors showed no significant difference in disbursement patterns, and all are behind the theoretical curve. Infrastructure projects show a bigger gap from the theoretical curve than other sectors, such as education and health. There is no significant difference across countries, and projects in all countries are systematically behind the theoretical curve. However, the gap in Central American and Caribbean countries is bigger compared to countries in South America and Mexico.

Our results value the observed delays in disbursements between 2.8 percent and 19.7 percent of project costs, depending on the interest rate. This shows that timely implementation can increase efficiency, and if disbursements follow the stipulated schedule, savings could account for up to 19.7 percent of the total of the project. Since public expenditure on infrastructure reaches 2.5 percent of regional GDP, savings from improving disbursements could reach up to 0.49 percent of regional GDP.

3. Making the most of existing assets is a fundamental pillar in a strategy that seeks to improve the efficiency of infrastructure service provision. In LAC, there is room for improvement in the efficiency of current infrastructure services, from ports and airports to electricity, water and sewage. We construct a frontier with quality of infrastructure as the output and public capital stock and income per capita as inputs and find that LAC falls behind other countries and regions. LAC, on average, barely reaches 10 percent of the infrastructure efficiency of the top country, Switzerland. On a positive note, the region has increased efficiency levels by more than 50 percent from 2007 to 2013.

   Maintenance could be the answer for a better use of existing assets. We describe optimal maintenance strategies as the least cost option to provide infrastructure services. Producing sector- and region-wide estimates of cost savings generated by optimal maintenance strategies proved to be an impossible task due to the lack of data. As an example for the importance of adequate maintenance, evidence from Peru shows that the country spent 7 times more bringing neglected roads back into full operation than it would have spent if those roads had undergone regular maintenance between 1992 and 2005.

Summing up, LAC countries currently invest about 3.5 percent of their annual GDP in infrastructure, to which the public sector contributes with 2.5 percent of GDP. The analysis carried out in this report concludes that efficiency gains can reach 40 percent of public investment in infrastructure, or 1 percent of GDP. History has taught us that increasing infrastructure investment to the levels required to close the infrastructure gap has proven to be an elusive reality. It might be time to change gears, and convince ourselves that when more investment is not possible, the priority should first and foremost lie on increasing the efficiency of infrastructure spending, from upstream planning to the appropriate maintenance of available assets.

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Appendix: Countries included in the efficiency frontier analysis

A
Albania
Argentina
Armenia
Australia
Austria
Azerbaijan

B
Bahrain
Bangladesh
Barbados
Belgium
Benin
Bolivia
Bosnia and Herzegovina
Botswana
Brazil
Bulgaria
Burkina Faso
Burundi

C
Cambodia
Cameroon
Canada
Central African Republic
Chad
Chile
China
China
Colombia
Costa Rica
Croatia
Czech Republic
Côte d'Ivoire

D
Denmark
Dominican Republic

E
Ecuador
Egypt
El Salvador
Estonia
Ethiopia

F
Finland
France

G
Gabon
Gambia, The
Georgia
Germany
Ghana
Greece
Guatemala
Guinea

H
Honduras
Hong Kong SAR
Iceland

I
India
Indonesia
Iran
Ireland
Israel
Italy

J
Japan
Jordan

K
Kazakhstan
Kenya
Korea
Kuwait

L
Lebanon
Lesotho
Lithuania
Luxembourg

M
Madagascar
Malawi
Malaysia
Mali
Mauritania
Mauritius
Mexico
Moldova
Mongolia
Montenegro
Morocco
Mozambique

N
Namibia
Nepal
Netherlands
New Zealand
Niger
Nigeria
Norway

O
Oman

P
Pakistan
Panama
Paraguay
Peru
Philippines
Poland
Portugal

Q
Qatar

R
Romania
Russia
Rwanda

S
Saudi Arabia
Senegal
Serbia
Sierra Leone
Singapore
Slovak Republic
South Africa
Spain
Sri Lanka
Swaziland
Sweden
Switzerland

T
Taiwan Province of China
Tajikistan
Tanzania
Thailand
Togo
Trinidad and Tobago
Turkey

U
Uganda
Ukraine
United Kingdom
United States
Uruguay

V
Venezuela
Vietnam

Y
Yemen

Z
Zambia
Zimbabwe