

Fiscal Risks in Infrastructure

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INTRODUCTION

Public infrastructure projects are typically large and complex, with long planning, implementation, and operational periods, and as such they are inherently exposed to uncertainties and risks. However, project risks are often not well integrated in infrastructure governance frameworks and receive only moderate attention during major investment decisions. Governments' decision making is typically shortsighted, and the long-term costs and benefits are poorly reflected in most standard budget systems. Moreover, while planning and monitoring systems may help decision makers get an impression of the long-term effects of infrastructure projects, these systems are often limited in their scope and coverage. As a result, risk management of infrastructure projects remains underdeveloped and project outcomes often deviate significantly from expectations or forecasts.

This chapter advocates that better risk-management practices can improve outcomes in public infrastructure projects. The main sources of risk affecting public infrastructure projects are first reviewed. Then the chapter discusses good practices for assessing and quantifying these risks, and finally suggests potential government actions to better manage them.

The chapter identifies inadequate project design, costing techniques, and risk-sharing arrangements as major sources of cost overruns, project delays, and low social dividends. It finds that all countries, regardless of income, can strengthen their infrastructure governance framework by gradually incorporating a risk-management function. Governments should identify potential sources of risk early in the project cycle to support better-informed policy actions and ensure that fiscal risk assessment becomes an integral part of project management.

ASSESSING AND MANAGING FISCAL RISKS IN INFRASTRUCTURE

Risks in infrastructure can materialize as large fiscal costs with significant macro-economic implications. Tables 11.1 and 11.2 summarize cross-country data for large projects in the transport and energy sectors. They show that, on average, governments have paid approximately 33 percent more than originally budgeted for roads, railways, tunnels, and bridges (Table 11.1). Similarly, cost overruns are

TABLE 11.1.

Transportation: Cost Overruns		
Transportation Asset Type	Range of Estimations	
	Based on Flyvbjerg (2017)	Based on Cantarelli and others (2010)
Roads (average, %)	24	20
Railways (average, %)	40	34
Tunnels and bridges (average, %)	48	33
<i>Estimations based on:</i>		
Number of projects	1,603	806
Number of countries	17	20
Sample period	1927–2013	1927–2011

Source: IMF staff compilation, based on Flyvbjerg 2017 and Cantarelli and others 2010.

TABLE 11.2.

Energy: Cost Overruns and Delays		
Energy Source	Cost Overruns	Delays
Total energy	66	...
Hydroelectric dam (average, %)	71	64
Nuclear reactor (average, %)	117	64
Thermal plant (average, %)	13	10
Wind farm (average, %)	8	10
Solar facility (average, %)	1	0
Transmission (average, %)	8	8
<i>Estimations based on:</i>		
Number of projects	401	
Number of countries	57	
Sample period	1936–2014	

Source: IMF staff compilation, based on Sovacool and others 2014.

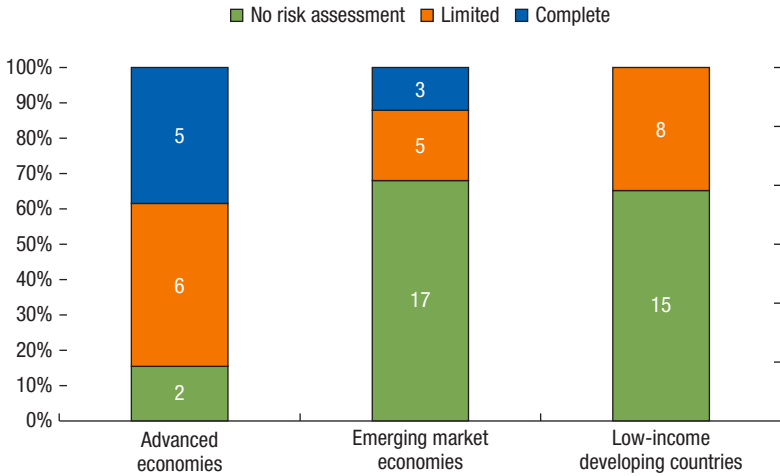
Note: The ellipses in the "Total energy" row denote that there are no data available for total energy on average delays.

estimated at 66 percent for the average of the energy sector, while project delays can reach up to 64 percent in complex projects such as hydroelectric dams and nuclear reactors (Table 11.2).

Public Investment Management Assessments (PIMAs) conducted so far show that a reactive approach to infrastructure fiscal risks remains the norm, with action taken only after things go wrong. Risk assessments are not systematically included in project appraisal procedures, particularly in low-income developing countries and emerging market economies (Figure 11.1).

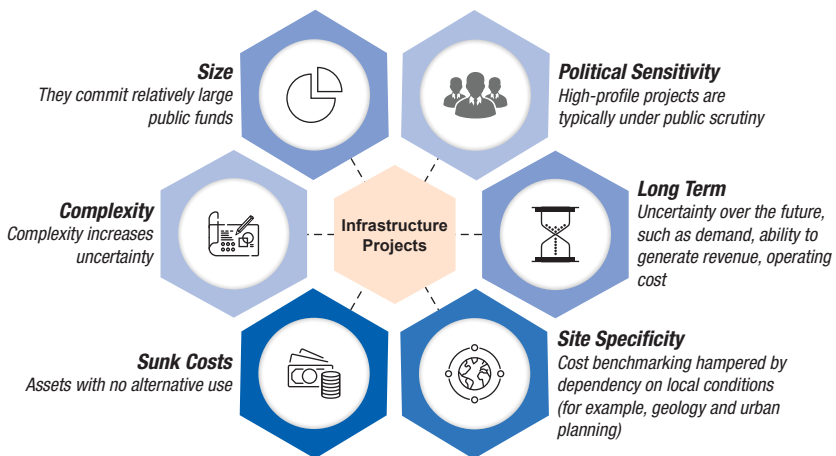
The Nature and Sources of Fiscal Risks in Infrastructure

Infrastructure projects have distinct characteristics that make them particularly risk prone (Figure 11.2). Some sources of risks are project specific; that is, directly linked to project design, construction, and operation. Other sources of risks are market related, such as changes in prices and interest rates. A third source of risks, so-called *force majeure*, transcends projects and markets and would include, for

Figure 11.1. Risk Assessment in Project Appraisals, PIMA Database

Source: PIMA database, July 2019.

Note: There were 61 total PIMA assessments: 13 in advanced economies, 25 in emerging market economies, and 23 in low-income developing countries. PIMA = Public Investment Management Assessment.

Figure 11.2. Characteristics of Infrastructure Projects

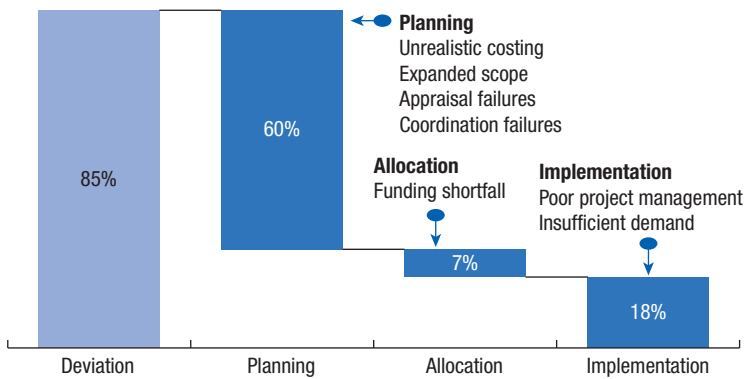
Source: IMF staff.

example, natural disasters and civil disorder. Last, government actions and inactions can also be a major source. Annex 11.1 summarizes main risk factors at each stage of the public investment cycle (planning, allocation, and implementation) classified by these sources of underlying uncertainty.

Fiscal risks frequently originate from weaknesses in the early stages of the project cycle. To illustrate this, 20 infrastructure projects around the world, delivered through both traditional procurement and public-private partnerships (PPPs), were evaluated.¹ Out of this sample, 17 projects faced some type of change from the original plans, which materialized in a combination of cost overruns, project delays, and shortfalls in funding and demand (Figure 11.3; see Annex 11.2 for the list of projects and their main characteristics). More than two-thirds of the deviations originated from the planning and allocation stages and happened because of government actions or inactions related to, for example, unrealistic costing, expansion of project scope, inadequate coordination across levels of government, or weaknesses in appraisals. Deviations originating from the implementation stage, which includes procurement, construction, and operation of infrastructure assets, were more diverse, emanating not only from government actions or inactions, but also from factors outside government control, such as project- and market-related risks or force majeure.

Sources of fiscal risks at different stages of the project cycle are correlated. Risks originating from one stage of an infrastructure project can have significant knock-on impact later in the project cycle. For example, a project with strong political support may be subject to unrealistic costs estimates to avoid rejection at

Figure 11.3. Identifying Sources of Fiscal Risks



Source: IMF staff estimation based on various sources (for example, audit reports, ex post evaluations).

Note: Percentage is calculated based on the number of projects in the sample ($n = 20$). Details of project sample are shown in Annex 11.2.

¹ The selected project sample comprises infrastructure projects from countries with different development levels, delivered through both traditional procurement and public-private partnerships, and covering various economic and social sectors. Yet, it is not representative, and has been mainly determined by data availability.

the planning stage. Once cost overruns materialize during implementation, it generates funding shortages because the budget allocation is insufficient.

There are also compound sources of risk, such as unsolicited proposals and early contract termination.² The acceptance of unsolicited project proposals can create large deviation from strategic priorities and prevent competition during procurement. Low capacity among public procuring entities to identify, prepare, and evaluate infrastructure projects, and the incentive to move projects off budget are often main reasons why unsolicited proposals are accepted (Engel et al. 2019). Another example of compound sources of risks with potentially large fiscal costs is early termination of long-term contracts, such as PPPs. Contract termination can reflect many risk factors, including public entities poorly understanding contractual clauses regulating termination, private partner bankruptcy, or policy changes introduced by government after the contract is awarded.

Assessing Fiscal Risks in Infrastructure

When assessing infrastructure risks, governments should assess the potential direct and indirect fiscal impact. Cost overruns have direct fiscal impacts, whereas delays, quality shortfalls, or failure to realize benefits may have indirect impacts on fiscal outcomes. Similarly, both traditionally procured projects and PPPs are exposed to risks, although there is sometimes a misperception that PPPs are “risk free” for government. The *composition* of the public sector investment portfolio also affects the magnitude and likelihood of risks materializing. For example, a large share of investment projects linked to one strategic economic sector, such as roads, may excessively expose the government to shocks affecting that sector, with potential spillovers to the rest of the economy.

Assessing fiscal risks in infrastructure is often challenging because information is limited and inaccurate. Data on construction costs and cost overruns are typically scarce, and even when information is available, governments do not necessarily have the skills to put it to good use. In some countries, databases include historical data on road construction costs (for example, Uruguay, Georgia) but they are not used for budgeting road construction costs, nor for estimating possible deviations from the budgeted amounts.³ Although many governments in recent years have reinforced their fiscal risk teams and included infrastructure in their activities, the methodologies for risk quantification are still underdeveloped.

Assessing complex projects that require forecasts of demand for infrastructure services over the long term is particularly challenging because of uncertainty related to project- and market-specific risks (Box 11.1). It is more difficult to estimate demand for greenfield projects (that is, newly built and with no track record) than

² An unsolicited proposal is a proposal made by a private party to undertake a public-private partnership project, submitted at the initiative of the private party rather than in response to a request from the government.

³ Some techniques for studying deviation and fiscal risk are presented in Irwin (2007).

Box 11.1. Examples of Challenges in Estimating Demand

Estimating the future demand for an infrastructure asset is a complex task, involving identification of alternative options, analyses of consumer preferences, estimates of relevant prices (for example, gas for cars), and macroeconomic forecasts. These estimations may fail for the ramp-up period after construction, and even fail for the whole life of the asset. Some researchers consider institutional factors affecting demand forecasts, such as the “optimism bias” or the “strategic misrepresentation” of the projects by politicians and public managers willing to maximize the chances of having them approved (see Flyvbjerg 2003). There are several examples of actual demand being much lower than expected demand:

- Roads and highways, such as the Indiana Toll Road (half of forecasted trucks for some time), Madrid-Toledo AP-41 (with only 10 percent of expected demand), Sidney Cross City Tunnel (with a higher-than-50-percent demand shortfall), and several highways in Korea;
- Railways, such as in Korea, where a survey (KOTI 2014) showed that actual ridership of urban railways is only 26 percent of the original estimate, with many lines at around 10 percent of the estimate;
- Metro lines, where, for example, the Busan metro line in Korea had 85 percent fewer passengers than estimates, and the Yongin Everline light rail metro line in Seoul had 77 percent less, with periods when effective demand reached only 10 to 15 percent of initial forecasts; and
- Airports, where, for example, the Ciudad Real Airport in Spain failed to secure demand forecasts for the project and had to be closed a few years after construction.

The KOTI (2014) survey found that the Seoul Subway Line 9 public-private partnership, with a minimum-revenue guarantee, was receiving compensation from government because, although its demand was 7 percent above contractual expectations, its revenue was just 62 percent of the expected, because of government-determined low fees, losses from free transfers to other lines, and higher-than-expected free ridership.

Source: IMF staff.

for brownfield projects (for example, the replacement of an obsolete power plant or the widening of a highway). *Optimism bias*, such as forecasts that overestimate demand for services to make a project financially viable or underestimate the fees to be paid by users to justify a project and make it politically viable, is not uncommon.

Although these challenges affect all infrastructure projects, PPPs are particularly exposed to optimism bias and undue political interference (Annex 11.3). To help countries to understand, assess, and quantify the costs and risks arising from PPP projects, the IMF and the World Bank have developed the Public-Private Partnership Fiscal Risk Assessment Model, PFRAM 2.0 (Box 11.2).⁴ As an analytical tool, PFRAM 2.0 helps country authorities quantify the macro-fiscal implications of PPPs, understand the risks assumed by the government, and identify potential mitigation measures.

⁴ PFRAM 2.0 is accessed at <https://www.imf.org/external/np/fad/publicinvestment/data/pfram2english.xlsm>.

Box 11.2. The Public-Private Partnership Fiscal Risk Assessment Model

The Public-Private Partnership Fiscal Risk Assessment Model (PFRAM) was developed by the IMF and the World Bank as an analytical tool to assess the potential fiscal costs and risks arising from public-private partnership projects. In many countries, investment projects have been procured as public-private partnerships not for efficiency reasons, but to circumvent budget constraints and postpone recording the fiscal costs of providing infrastructure services. Hence, some governments procured projects that either could not be funded within their budgetary envelope or exposed public finances to excessive fiscal risks.

PFRAM provides a structured process for gathering information for a portfolio of public-private partnership projects in a simple, user-friendly, Excel-based platform, following a five-step decision tree: (1) Who initiates the project? (2) Who controls the asset? (3) Who ultimately pays for the asset? (4) Does the government provide additional support to the private partner? (5) What does the public-private partnership contract risk allocation tell us about macro-fiscal risks?

Based on project-specific and macroeconomic data provided by the user, PFRAM generates standardized outcomes. The outcomes include project cash flows, fiscal tables and charts on a cash and accrual basis, and debt sustainability analysis, with and without the public-private partnerships. Sensitivity analysis of main fiscal aggregates to changes in macroeconomic and project-specific parameters is also carried out, and a summary fiscal risk matrix of the project is produced.

Since it started in April 2016, PFRAM has been used not only in the context of IMF and World Bank technical assistance, but also by country authorities—mainly public-private partnership units in ministries of finance—to better understand the long-term fiscal implications of an individual or a portfolio of public-private partnership projects. As an analytical tool, PFRAM helps country authorities quantify the macro-fiscal implications of public-private partnerships, understand the risks assumed by government, and identify potential mitigation measures.

Source: IMF staff.

Correlations between different risks within a project, and correlations between different projects within a portfolio, are another challenge for risk assessment (Box 11.3). Assessing portfolio risks is more than a simple aggregation of project risks. Correlations can be positive and negative, implying that risks related to the portfolio may be larger or smaller than the sum of the risks related to each project. Some project-specific risks may even be reduced when aggregated in a portfolio because of diversification.

Managing Fiscal Risks in Infrastructure

How can governments move from an ad hoc reactive behavior to a proactive mitigation strategy for infrastructure risk? Government actions can aim to reduce the likelihood of risks, reduce their potential fiscal impact, or a combination of both. Some countries, mainly advanced economies, have taken steps to incorporate risk management in policies and practices for managing public infrastructure projects, sometimes embedded in dedicated units. For example, the Public and Private Infrastructure Investment Management Center in Korea

Box 11.3. Correlation of Fiscal Risks in Infrastructure

Materialization of major infrastructure risks is often correlated with main macroeconomic variables. This implies that when those variables move, they impact many infrastructure projects at the same time, amplifying fiscal risks.

There are several examples of many projects being simultaneously affected by macroeconomic volatility. In Mexico, a currency devaluation triggered the materialization of fiscal risks in a large number of road projects. In Colombia, fiscal risks in road projects materialized after a temporary but significant demand reduction caused by economic depression combined with poor internal security. In Spain, several road concessionaires, already suffering from low structural demand and construction cost overruns, went technically bankrupt after the 2008 global financial crisis when highway demand dropped 15–20 percent for several years, and ultimately had to be rescued by government.

Risks may also cancel out. The occurrence of some risks automatically prevents—or reduces the probability of—other risks materializing. For example, a change in law eliminating tolls in road concessions already suffering from low demand and risk of bankruptcy creates a fiscal challenge (compensating the concessionaire for loss of revenue) but eliminates the risks related to demand and revenue generation. Also, a major flooding (or other force majeure event) affecting an independent power producer creates a compensation event but reduces fiscal risk from power-purchase agreements signed with other power producers.

Source: IMF staff.

appraises and manages large public investment projects including PPPs. Since 2005, it has managed to reduce project cost overruns by 82 percentage points. Similar units include the United Kingdom's Infrastructure and Projects Authority and Australia's Infrastructure Australia. Most countries still need to strengthen their risk management to minimize potential fiscal losses and improve project outcomes.

Infrastructure risk management should start at the planning stage early in the project cycle and take a whole life-cycle approach. Table 11.3 identifies key practices to ensure adequate fiscal risk management at the planning phase. It is arguable that the most critical practice is to avoid spending scarce resources on projects that should have been eliminated at an early stage because they do not add value to society (that is, costs are higher than benefits) or do not serve the country's main needs (that is, projects are poorly aligned with government strategies).

Some good risk-management practices at the planning stage have emerged from country experiences. Ireland has strengthened its strategic investment planning through a set of integrated policies.⁵ The plan for social housing (Government of Ireland 2016) is a good example of mitigation measures to ensure adequate interdepartmental coordination.⁶ Many advanced economies

⁵ The National Planning Framework is supported by a 10-year capital plan as an instrument to enable objectives set out in the strategic planning framework.

⁶ Designed to tackle some of the most complex issues facing Ireland—housing shortages, rising prices, and homelessness—the strategy has received a strong political consensus. It is well developed with clear targets (to build 47,000 new housing units over 2017–21), a funding envelope of €5.35 billion, an effective system of planning approvals, and a construction pipeline that stretches across local authorities.

TABLE 11.3.

Managing Fiscal Risks in Infrastructure at the Planning Phase		
Action: Planning for Infrastructure	Examples of Good Practices for Fiscal Risk Management	How Are Fiscal Risks Being Mitigated?
Strengthened investment planning	<ul style="list-style-type: none"> Long-term sectoral master plans address current and future needs; medium-term investment plans are aligned to government strategy and Sustainable Development Goals Medium-term investment plans are developed under an affordable funding envelope and prioritized according to government strategy and Sustainable Development Goals Mechanisms are in place for experts and decision makers in different ministries and layers of government to coordinate investment plans 	<ul style="list-style-type: none"> Reduces the probability of later-facing fiscal risks in projects not being perceived as serving real needs and government strategy Forces line ministries to focus on priority projects, reducing the probability of facing fiscal risks in nonpriority projects Maximizes synergies in the development of the project pipeline, reducing fiscal risks originating in project changes because of poor coordination
Strengthened project appraisal	<ul style="list-style-type: none"> Project appraisal includes technical and legal feasibility, financial feasibility (costs and revenues of the project), economic feasibility (costs and benefits for the whole society, including a risk analysis), environmental impact studies (how to mitigate impact on the environment), social impact studies (how to address impact on affected individuals, including resettled persons) Alternative ways to satisfy needs are always considered, particularly by using the existing assets Project appraisal is subject to independent review to facilitate reliable demand estimates and realistic fiscal projections 	<ul style="list-style-type: none"> Increases the consistency of each project proposal, reducing the probability of fiscal risks arising from poor identification of costs, benefits, and risks
Strengthened framework for infrastructure governance	<ul style="list-style-type: none"> Institutions are in place to regulate the quality and price of infrastructure services to end users, and to regulate monopoly and oligopolistic infrastructure markets All public investment projects, regardless of financing mechanism, funding source, and on-budget/off-budget status, follow equivalent appraisal and approval process The formal presentation of unsolicited proposals for infrastructure projects is not allowed or is strictly regulated 	<ul style="list-style-type: none"> Increases the robustness of each proposal, reducing fiscal risk from project changes Projects submitted for approval will present evidence that benefits outweigh project costs, in most risk scenarios Reduces probability and effect of politically induced fiscal risks impacting public-private partnerships and state-owned enterprises Reduces the probability of fiscal risks being created without adequate identification during the planning and ulterior public investment management phases Reduces the probability of fiscal risks from nonpriority projects and from lack of competition

Source: IMF staff.

and, to a lesser extent, emerging market economies and low-income developing countries also assess fiscal risks during project appraisal. Independent review of feasibility studies for large infrastructure projects can strengthen the quality of project appraisal and reduce government exposure to, for example, demand optimism bias and political interference. The United Kingdom's Infrastructure and Projects Authority undertakes assurance reviews on major government projects.⁷ Some countries, like Denmark and Germany, include in their budgets a contingency margin for infrastructure projects to deal with uncertainties in project costing.⁸

Adequate fiscal risk management is also critical during the allocation stage (Table 11.4). Given the long-term nature of infrastructure assets, budget allocation should cover not only construction but also the operation of the asset. Delinking budgeting of capital expenditures (construction) from current expenditures necessary to operate them, including maintenance, increases fiscal risks by generating a bias toward approving new projects instead of properly operating and maintaining existing ones. A well-functioning medium-term budget framework allows government to evaluate project costs and risks beyond the annual budget's restrictions and to better consider options around constructing new assets or properly maintaining existing ones. For example, in Estonia the maintenance of strategic public assets, such as roads and railways, is part of the asset management strategy and is prioritized over new construction.⁹

Proactive risk management of projects and contracts at the implementation stage is also essential (Table 11.5). Ministries of finance¹⁰ should have the capacity to stop projects being implemented if they are not fiscally affordable or the government's risk exposure is deemed too high. Ministries of finance also play a large role in ensuring adequate project funding through efficient cash management of domestic and external resources. Similarly, line ministries controlling investment entities should be able to understand fiscal risks when selecting the procurement method for infrastructure assets, such as traditional public procurement or PPP. When risks are not fully understood and properly managed, the probability of risks materializing as project delays or cost overruns during implementation increases dramatically. In turn, once contracts are awarded the governance framework should promote proactive contract management by implementing agencies and a continuous assessment of fiscal risks throughout the project life cycle.

⁷ See <https://www.gov.uk/government/organisations/infrastructure-and-projects-authority#content>.

⁸ Denmark includes a 30 percent contingency margin in all infrastructure projects.

⁹ As of May 2019, Estonian Railways also has five out of seven projects dedicated to maintenance and renovation (IMF 2019).

¹⁰ In this chapter, the Ministry of Finance is referred to as the central finance authority in the country responsible for public infrastructure. However, in some countries these responsibilities can be shared between the Ministry of Finance and other authorities, for example, a ministry of planning or a ministry of development.

TABLE 11.4.

Managing Fiscal Risks in Infrastructure at the Allocation Phase		
Action: Allocation of Funds	Examples of Good Practices for Fiscal Risk Management	How Are Fiscal Risks Being Mitigated?
Medium-term budgeting	<ul style="list-style-type: none"> The budgeting framework allows for the estimation of medium-term budget ceilings for line ministries Projects are included in a pipeline well in advance, allowing the Ministry of Finance to collect and review information on the projects and their fiscal risks Ongoing projects are protected and given priority over newly proposed ones 	<ul style="list-style-type: none"> Helps ministries improve proposals under the ceilings, using a whole-life costing approach Allows the Ministry of Finance to understand project's fiscal costs and risks, including implicit liabilities, and their evolution as projects mature Reduces the probability of project implementation delays for lack of funding
Unity and integrity of the budget	<ul style="list-style-type: none"> Discussion of current and capital allocations during budget negotiation follows an integrated process Reliable recurrent cost estimates, including maintenance and operational costs, are discussed for each project 	<ul style="list-style-type: none"> Allows and incentivizes line ministries to adopt a whole-life costing approach, integrating capital and recurrent costs Induces ministries to adopt maintenance standards and plans, reducing fiscal risks

Source: IMF staff.

TABLE 11.5.

Managing Fiscal Risks in Infrastructure at the Implementation Phase: Procurement, Construction, and Operation		
Action: Implementation: Procurement, Construction, and Operation	Examples of Good Practices for Fiscal Risk Management	How Are Fiscal Risks Being Mitigated?
Strengthened project management and procurement processes	<ul style="list-style-type: none"> The selection of procurement mode (for example, traditional, design-build, public-private partnership, management contract, operation and maintenance contract) is reviewed by the Ministry of Finance, and long-term contracting (such as for public-private partnerships) is reviewed to assess fiscal costs and risks Appraisal, including financial and economic feasibility studies, is reviewed before and during the tendering process Project implementation plans, including procurement strategy, are prepared for each major project; for public-private partnerships, the concessionaire will be implementing but government will need to develop contract management capacity Preparation and tendering of each major project are led by a skilled project manager, overseen by a project owner/project committee 	<ul style="list-style-type: none"> The fiscal risks created/mitigated by each mode are carefully addressed, identified, and quantified when possible, leading to decisions that do not disregard fiscal risk Project affordability and economic value for society are confirmed, reducing fiscal risk Adequate plans and procurement strategy are critical for efficient pricing, cost containment, timely completion, and quality of assets and of service delivery Pre-tender project development and effective tender steering reduce fiscal issues later

(continued)

TABLE 11.5 (continued)

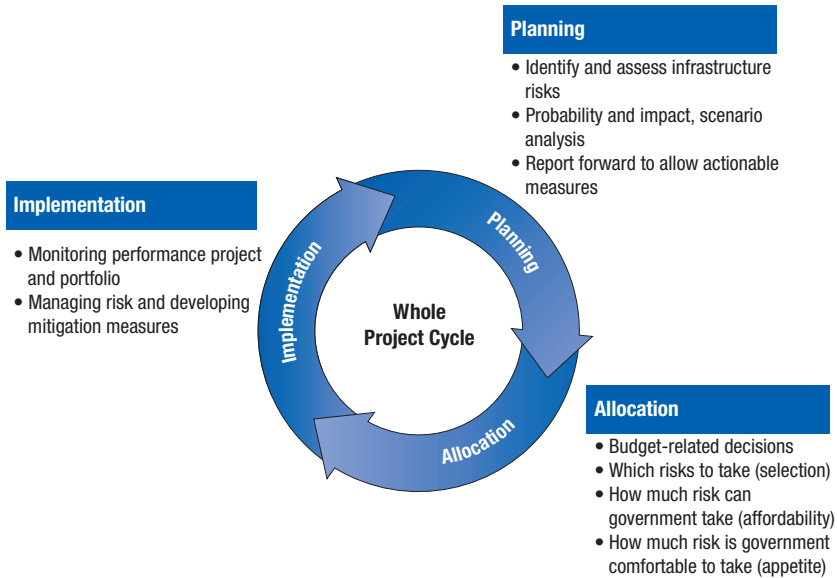
Managing Fiscal Risks in Infrastructure at the Implementation Phase: Procurement, Construction, and Operation

Action: Implementation: Procurement, Construction, and Operation	Examples of Good Practices for Fiscal Risk Management	How Are Fiscal Risks Being Mitigated?
Management of funds disbursement	<ul style="list-style-type: none"> • Project management (or contract management in the case of public-private partnerships) is effective; periodic project reports are provided to line ministries and the Ministry of Finance; and potential issues are immediately addressed or raised for superior decision • Contracts (including public-private partnership contracts and power-purchase agreements) are proactively published in full, and actual payments and project performance are also disclosed 	<ul style="list-style-type: none"> • Effective project management, with good communication with contractors and effective lines of reporting for decision making, helps prevent or reduce fiscal risks • Proactive disclosure increases pressure for good infrastructure governance; helps users compare costs with actual service performance
	<ul style="list-style-type: none"> • Asset value is recorded and depreciated over time, and asset management function is linked to fiscal risk management • Funding plans are integrated with cash management plans; in case of cash rationing, the cost of delaying investment projects is part of decision making 	<ul style="list-style-type: none"> • Allows for effective asset management, reducing global fiscal risk • Reduces the probability of project implementation delays and extra fiscal costs; mitigates fiscal risk in case of cash rationing
Contract management, particularly for long-term procurement (for example, public-private partnerships)	<ul style="list-style-type: none"> • Authorities continuously monitor contract execution and project performance, enforcing contractual agreements 	<ul style="list-style-type: none"> • Reduces the probability of project issues accumulating and leading to major fiscal risks
	<ul style="list-style-type: none"> • Authorities monitor project implementation issues and proactively partner with contractors in finding solutions • Authorities continuously assess risks coming from exogenous change and prevent risks or adapt policy • Authorities continuously assess project risks coming from policy changes, incorporating fiscal cost/risk in decisions 	<ul style="list-style-type: none"> • Reduces the effect of project disturbances and consequent fiscal risks • Reduces the effect of fiscal risks originating in technological, demographic, and other changes • Reduces the probability of government decisions ignoring fiscal costs and risks

Source: IMF staff.

DEVELOPING A RISK-MANAGEMENT FUNCTION FOR PUBLIC INFRASTRUCTURE

A strong infrastructure risk-management function should involve a comprehensive risk-management framework and a clear statement of roles and responsibilities. Risks should be adequately managed over the whole project cycle, from planning to implementation (Figure 11.4), with the cycle being closed by identifying lessons learned and applying them to other projects. A comprehensive framework should comprise management not only of individual major

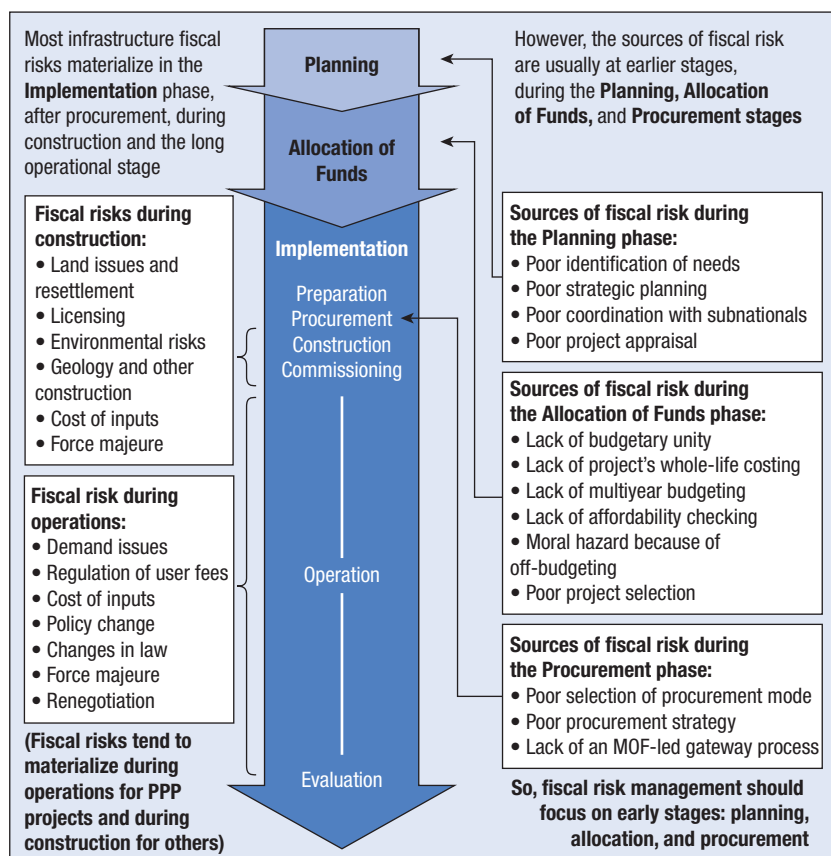
Figure 11.4. A Risk-Management Framework for Infrastructure

Source: IMF staff.

infrastructure projects, but also of the project portfolio, which—as previously noted—can have a risk profile different than the simple addition of individual projects. Moreover, early identification of the main sources and potential fiscal impact of risks is critical to inform investment decisions and to allow public agencies to manage the risks throughout the project cycle (Figure 11.5).

Infrastructure risks should be centrally managed. Given that the government's portfolio of infrastructure projects is critical to an economy, the overall risk-management function will often rest within or be linked to the ministry of finance and will serve as a center of excellence for capacity development. For example, Portugal has empowered a new department in the Ministry of Finance, *Unidade Técnica de Acompanhamento de Projetos* (Project-Steering Technical Unit), to lead the evaluation and procurement of PPPs and large infrastructure projects, and in Colombia a new *PPP subdirectorato* has been created to support the existing fiscal risks subdirectorato. In addition, experts are needed in the different implementing agencies, and the risk-management function will be dependent on efficient mechanisms for information sharing and coordination across agencies. Because many projects have long-term time frames, it will be important to develop clear procedures for coordination, analysis, and assessment at key milestones of project development, implementation, and operations. Table 11.6 outlines some key practices of the risk-management function.

Some countries with significant infrastructure programs, including Chile, Portugal, South Africa, and the United Kingdom, have created gateway processes to contain fiscal costs and fiscal risks. A gateway process is a sequence of decision points where approval by the finance minister is required. It provides a space for

Figure 11.5. The Timing of Fiscal Risk Management Decisions

Source: IMF staff.

Note: MOF = Ministry of Finance; PPP = public-private partnership.

evidence-based decisions and allows the finance minister to have effective veto power over infrastructure projects or decisions that may jeopardize fiscal sustainability, while sectoral policy responsibility remains in the hands of line ministers (Table 11.6).

Data sharing among decision-making entities is critical to inform the selection of policy options for project design as well as risk management at the operational level. A risk-management framework for decision-making purposes should comprise detailed and frequently updated information. This enables intragovernmental cooperation and ensures alignment of goals and processes. Information should cover the full range of relevant explicit and implicit risks, including those for which it is difficult to assess likelihood and probability and those assessed through a qualitative approach, and it should cover both projects and the overall portfolio. This type of information is intended for internal use and typically not published.

TABLE 11.6.

Managing Fiscal Risks in Infrastructure along the Whole Project Cycle

Action	Examples of Good Practices for Fiscal Risk Management	How Are Fiscal Risks Being Mitigated?
Fiscal risk management function	<ul style="list-style-type: none"> Infrastructure fiscal risk managers identify portfolio risk correlation and the bidirectional links between infrastructure and macroeconomic variables Infrastructure fiscal risk managers coordinate with project managers, analyze periodic reports, update the risk registry, and participate in preventive/corrective decision making Infrastructure fiscal risk management is integrated with general fiscal risk management (subnationals, state-owned enterprises, pensions, financial system, and so on) Contingency plans and risk-mitigation measures are in place for each major macroeconomic shock and for natural disasters, and government practices and public-private partnership contracts are designed in ways that mitigate global fiscal risk Major policy changes and project scope decisions are reviewed ex ante by the Ministry of Finance, identifying fiscal risk impact Infrastructure fiscal risk managers have a continuous tracking of major fiscal risks, proactively inviting project managers and other decision makers to address fiscal risks 	<ul style="list-style-type: none"> Mitigates infrastructure fiscal risks linked to specific variables that affect other areas (for example, exchange rates), when jointly managed Allows for preventive measures reducing probability and impact of risk, and for corrective measures mitigating impact Allows for effective understanding of the full impact for fiscal risks related to macroeconomic variables and for effective risk-edging measures Requires development of a global, integrated perception of fiscal risks, and corresponding risk-acceptance and risk-mitigation strategies, reducing global fiscal risk Reduces the probability and impact of fiscal risks created by government action Reduces the probability and impact of fiscal risks created by government action or inaction, or by legislative action or inaction
Effective gateway process for major projects	<ul style="list-style-type: none"> Ministry of Finance is directly involved in steering public-private partnerships and major projects Ministry of Finance reviews documentation of public-private partnerships and major projects For long-term projects such as public-private partnerships, the Ministry of Finance explicitly reviews fiscal risks, including the ones originating from land issues, construction, environment For public-private partnerships, the finance minister has veto power regarding the call for tender, the contract close, and any decision on change orders, renegotiation, termination, or similar In case of public-private partnership renegotiation, termination, or a similar event, Ministry of Finance is in the negotiation team In case a project is affected by demand issues (scarce demand or excessive use), Ministry of Finance engages with the line ministry to discuss solutions 	<ul style="list-style-type: none"> Allows Ministry of Finance to assess fiscal risks Allows Ministry of Finance to assess fiscal risks Allows Ministry of Finance to assess fiscal risks before core decisions, making it possible to block a project or to redesign contractual risk allocation Allows Ministry of Finance to assess fiscal risks before core decisions, making it possible to block a project or to redesign contractual risk allocation Adds bargaining power and therefore reduces probability and impact of fiscal risk Adds bargaining power and therefore reduces probability and effect of direct fiscal risk, and of indirect fiscal risk through political risk

Source: IMF staff.

The government should disclose key information about fiscal risks related to the infrastructure portfolio as part of a comprehensive fiscal risk statement. This would serve two different but overlapping objectives: first, to inform decision making regarding fiscal risks in infrastructure projects and programs; and second, to contribute to overall fiscal transparency, which allows participants and other stakeholders to make informed assessments of the government's fiscal policies. Because risks related to public infrastructure often are correlated with other important fiscal risks, disclosure of portfolio risks is needed for the public and financial markets to have a complete picture of the government's overall risk position.

In general, public risk disclosure will be more aggregate and qualitative than in the government's internal risk-management framework, and the focus will be on explicit risks. A fiscal risk statement will usually be updated and published once a year.

CONCLUSIONS

Although risks cannot be fully eliminated in infrastructure projects, governments can manage them to minimize their fiscal impact. Governments can influence the probability that some risks—particularly those under their control—will happen, assess their fiscal impact, and prepare to cope with the residual risks. In doing so, they need a strong infrastructure governance framework. All countries, regardless of income or development level, can strengthen their infrastructure governance framework by gradually incorporating a risk-management function. It is critical to identify sources of fiscal risks early in the project cycle to support better-informed policy actions, with the focus not only on projects, but also on the overall infrastructure portfolio, to take advantage of project synergies and correlations. Effective data sharing and disclosure mechanisms are also important to ensure that fiscal risk assessment becomes an integral part of project management.

Government should have the capacity and framework in place to monitor and manage different risks accruing from individual projects, and to identify the correlation among these risks and among projects within the overall investment portfolio. Both are relevant from a fiscal risk management perspective and should be dealt with in an integrated and consistent way.

Special attention should be given to infrastructure risks that originate early in the project cycle because of government action or inaction. Although infrastructure risks typically materialize as cost overruns and project delays once projects are being implemented, underlying risk factors are often linked to weaknesses in infrastructure governance at the planning and allocation stages. Inadequate project design, costing techniques, and risk-sharing arrangements are prominent sources of cost escalation, project delays, and low social dividends. Yet, these sources of risk all depend on decisions and actions taken by government, and therefore are under a government's control.

ANNEX 11.1. MAIN SOURCES OF FISCAL RISKS IN INFRASTRUCTURE OVER THE PROJECT CYCLE

ANNEX TABLE 11.1.1.

Main Sources of Fiscal Risks in Infrastructure over the Project Cycle

Sources of Risk	How Does Fiscal Risk Materialize?	Project Specific	Market Related	Force Majeure	Government Action
		Source Type			
Planning for Infrastructure					
Unrealistic planning envelope	Planning of investment projects is not constrained by realistic fiscal projections and the volume of projects submitted for approval is excessive				✓
Projects with low strategic value	Project concepts and plans are not effectively aligned with key national and sector priorities and user needs, and so additional projects are needed				✓
Poor coordination	Projects by different levels of government overlap or do not maximize synergies				✓
Poor choice of concept	Project concepts are chosen prematurely, without thorough analysis, and subsequent changes in scope or restructuring may increase costs, benefits, and risks				✓
Poor project appraisal	Allowing project to move forward without evidence that benefits outweigh costs				✓
Poor regulation	Poor competition, quality, or price of services requires government intervention				✓
Off-budget financing	Infrastructure undertaken by state-owned enterprises, public-private partnerships, and other off-budget projects does not receive adequate project appraisal and fiscal risk oversight				✓
Unsolicited proposals	Compound all the above risks				✓
Allocation of Funds					
Lack of multiyear budgeting	Insufficient funds for the timely completion of the project, forcing the government to delay it, change its scope, or delay some other project				✓
Unrealistic costing estimates	Biased capital cost estimates result in requests for additional budgetary funds, project delays, or changes in scope				✓
Unrealistic estimate of recurrent costs	Lack of reliable recurrent cost estimates results in inability to fully maintain and operate the infrastructure and accelerates the reduction in its value				✓
Lack of maintenance standards and plans	Lack of maintenance standards and plans inhibits effective maintenance and prevents adequate funding for proactive maintenance				✓
No prioritization of ongoing projects	New projects are initiated while ongoing projects are delayed				✓
(continued)					

(continued)

ANNEX TABLE 11.1.1. (continued)

Main Sources of Fiscal Risks in Infrastructure over the Project Cycle					
Sources of Risk	How Does Fiscal Risk Materialize?	Project Specific	Market Related	Force Majeure	Government Action
Source Type					
Confusing project financing with budget funding	Financing for infrastructure projects is available (for example, bilateral, private) so projects are approved and proceed to construction, even when budget funding for recurrent expenses during operation is not secure; risks materialize because of a lack of budget funding for operating the project (that is, maintenance costs, availability payments)				✓
Implementation: Project Procurement, Construction, and Operation					
Inappropriate procurement mode	The selected procurement mode (for example, traditional, design-build, PPP, management contract, operations and management contract) leads to excessive fiscal costs or risks				✓
Poor procurement strategy	Inadequate procurement strategy results in poor competition and inefficient pricing				✓
Poor implementation	Inadequate implementation plans prevent timely and efficient project implementation				✓
Poor contract management	Poor monitoring leads to low outcome quality, and poor management of contract changes prevents effective actions to mitigate shocks affecting the project	✓	✓	✓	✓
Financing issues and funds disbursement	Inadequate financing and funding plans, and poor management of funds disbursement originate project implementation delays and additional fiscal costs				✓
Change orders	Additional costs resulting from changes in design and scope during construction				✓
Land cost	Additional costs arising from land acquisition	✓			
Land availability	Construction delays resulting from untimely availability of land	✓			
Change in land use	Additional costs for people resettlement and relocation of activities	✓			
Geological issues	Additional costs resulting from significant geological issues during construction	✓			
Environmental issues	Additional costs resulting from significant environmental protection issues	✓			
Input prices	Additional costs resulting from significant changes in input prices		✓		
Other construction	Additional construction costs resulting from delays and other issues	✓	✓		
(continued)					

(continued)

ANNEX TABLE 11.1.1. (continued)

Main Sources of Fiscal Risks in Infrastructure over the Project Cycle				
Sources of Risk	How Does Fiscal Risk Materialize?	Project Specific	Market Related	Force Majeure
				Government Action
Exchange rate issues	Additional costs resulting from significant increase in nominal exchange rate		✓	✓
Force majeure	Additional costs resulting from force majeure events (for example, natural disasters, war, civil unrest)			✓
Change in law/policy	Additional costs resulting from changes in legislation, regulations, and policy			✓
Demand shortfall	Low use reduces revenue stream and challenges cost recovery	✓	✓	✓
Renegotiation or contract termination	Government low bargaining power or poor negotiating skills leads to efficiency losses; early termination is not well prepared and effectively managed, leading to costs for government			✓
Lack of disclosure	Lack of proactive disclosure of costs and performance reduces governance			✓
Poor asset monitoring	Poor information on value and status of assets prevents effective asset management			✓
Poor management of the asset portfolio	Lack of a broad picture, with interproject risk correlations, prevents integration of infrastructure in overall fiscal risk management strategy and processes			✓
Renegotiation or contract termination	Government low bargaining power or poor negotiating skills leads to efficiency losses; early termination is not well prepared and effectively managed, leading to costs for government			✓
Lack of disclosure	Lack of proactive disclosure of costs and performance reduces governance			✓
Poor asset monitoring	Poor information on value and status of assets prevents effective asset management			✓
Poor management of the asset portfolio	Lack of a broad picture, with interproject risk correlations, prevents integration of infrastructure in overall fiscal risk management strategy and processes			✓

Source: IMF staff.

ANNEX 11.2. SAMPLE OF PROJECTS

Annex Table 11.2.1 presents estimates of risks materialized in selected projects through cost overruns, project delays, shortfall in demand compared with initial estimates (once projects become operational), and inadequate budget funding to operate the assets after construction.

ANNEX 11.3. ASSESSING FISCAL RISKS IN PUBLIC-PRIVATE PARTNERSHIPS

Assessing fiscal risks in infrastructure built through public-private partnerships is particularly challenging, given that they allow governments to transform short-term fiscal costs into medium- to long-term fiscal risks (and vice versa). Using public-private partnerships, a government can convert some fiscal risk (future contingent liabilities) into direct fiscal liabilities (predetermined payments to a public-private partnership concessionaire). In principle, this contractual arrangement could be used for reducing fiscal risk, with government paying the corresponding premium. In practice, it may create more fiscal risk rather than reduce it.

There are two main reasons for this, with both under control of government:

- First, as long-term contracts, public-private partnerships create significant risks when applied to projects and sectors with policy volatility or subject to significant change in the medium to long term (for example, technological change, demographic evolution, change in user preferences, change in management practices). For example, the volume of costs and issues created by public-private partnerships involving information and computing technologies led the British parliament to approve a recommendation for government not to use public-private partnerships for this.
- Second, public-private partnership contracts increase fiscal risk when contractual design is not based on a sound business plan—for example, when requiring levels of government payments that jeopardize fiscal sustainability, or when authorizing tolls and other fees that users cannot afford (or government cannot politically sustain), or when assuming unrealistic levels of demand. Portugal had to cancel several public-private partnership contracts during its 2010–14 crisis (paying compensation to concessionaires); Korea had to lower tolls and pay compensation regarding several public-private partnership highways; and Box 11.1 presents several examples of unrealistic passenger-traffic forecasts, many of them leading to fiscal costs.

For these two reasons, instead of being known for their fiscal risk-reduction characteristics, public-private partnerships are seen in some parts of the world as generators of fiscal surprises, as Augusto de la Torre noted in his 2015 paper on public-private partnerships in Latin America (de la Torre 2015).

Public-private partnerships are particularly exposed to optimism bias and political interference. Confidence in optimistic demand forecasts can make governments

ANNEX TABLE 11.2.1.

Estimates of Risks Materialized in Selected Projects

Project	Type	Sector	Cost Overrun (Percent)	Delay (Percent)	Demand Shortfall (Percent)	Funding Shortfall	Main Drivers
Boston Big Dig (Central Artery/ Tunnel Project; CA/T), United States	TPP	Road-Tunnel	478	114	No	No	Unrealistic initial cost estimate and expanded scope; failure to assess unknown subsurface conditions; environmental and mitigation costs
Golden Gate, Chicago, United States	TPP	Bridge	-5	0	No	No	On budget and ahead of schedule.
Port La Union, El Salvador	TPP	Port	55	80	Not operational	Yes	Expanded scope; sedimentation exceeding the original forecast; steep rise of equipment and material prices. Lack of budget funding for recurrent dredging expenditures.
Berlin Brandenburg Airport (ongoing), Germany	TPP	Airport	125	180	No	No	Change in design required new permits, causing significant delays owing to unresolved safety issues; poor project management
ICE Frankfurt-Cologne, Germany	TPP	Railway	116	75	No	No	Changes in project specifications and design; changes in environmental and safety requirements; delays from court challenges and geological problems
Kuala Lumpur Airport (KLIA2), Malaysia	TPP	Airport	114	200	No	No	Scope changes (longer runway, automated baggage system, more parking stands)
High speed railroad Madrid-Valencia, Spain	TPP	Railway	269	...	Yes	Yes	Changes in prices, fiscal austerity force to changes in design. Changes in design to lower costs resulted in lower demand
Couva Hospital, Trinidad and Tobago	TPP	Hospital	0	0	No	Yes	Chinese company financed the construction and transferred the hospital fully equipped to government, but government lacked the budget for operating it
Sydney Cross City Tunnel, Australia	PPP	Tunnel	0	0	71	No	The tollway became insolvent because of low traffic volumes. It has been sold several times.
Forrest Highway, Australia	TPP	Road	406	...	No	No	Changes in scope, design, change in materials

(continued)

ANNEX TABLE 11.2.1. (continued)

Estimates of Risks Materialized in Selected Projects						
Project	Type	Sector	Cost Overrun (Percent)	Delay (Percent)	Demand Shortfall (Percent)	Funding Shortfall
Barts and Hear Hospitals, London, United Kingdom	PPP	Health	...	...	No	Yes
Busan metro line, Korea	PPP	Railway	...	...	85	No
Everline light rail train, Korea	PPP	Railway	...	60	77	No
Ciudad Real Airport, Spain	PPP	Airport	0	0	100	No
West Rail, Hong Kong	TPP	Rail	-27	0	No	No
A8 Augsburg-Munchen, Germany	PPP	Road	-23	...	No	No
Eurotunnel, France- United Kingdom	PPP	Road	100	0	67	No
Highway Madrid-Toledo, Spain	PPP	Road	...	...	90	No
Desalination plants, Australia	PPP	Water	...	...	Yes	No
Izmit water plant, Turkey	PPP	Water	0	0	Not operational	No

Source: Authors.

Note: Ellipses indicate information not available. ICE = InterCityExpress; PPP = public-private partnership; TPP = traditional public procurement.

feel comfortable in providing guarantees on demand (expecting a low likelihood they will be called out). Similarly, private companies may be willing to accept too much demand risk that they may ultimately not being able to afford if expected demand does not materialize. Thus, optimism bias creates explicit and implicit fiscal risks, and their expected value cannot be easily computed for a project (even scenarios are hard to compute, except for the worst-case scenario, the upper bound on demand risk). Therefore, public-private partnerships require strong public investment management institutions and adequate fiscal risk management, to restrict the use of public-private partnership procurement to the projects in which it can deliver efficiency, and to assess and manage their fiscal risks effectively.

Public-private partnerships have the potential for reducing fiscal risk but do increase it when poorly structured and when used for the wrong projects. When well designed and for the right projects, public-private partnerships can reduce fiscal risk by delegating to a private entity the responsibility for implementing the project, with a credible threat of financial punishment in case of poor performance. But, being long-term contracts, public-private partnerships may create government commitments that are not politically or fiscally sustainable over time, leading to renegotiations that affect efficiency and change risk allocation.

Badly structured public-private partnership contracts also create fiscal risks beyond those in traditional procurement. That happens when the business case is not sound or when the private partner is given unfettered power to influence demand, affecting fiscal cost and the quality of public service. For example, contracts for public hospitals need to be designed in such a way that private companies cannot distort the contractually prescribed delivery of service, by denying it or by promoting abusive use of service. Usually, public-private partnership contracts for hospitals pay for availability of infrastructure (independent of volume of use) and (when clinical services are added) include a set of incentive mechanisms, preventing perverse behavior (see Barros and Monteiro 2015). Similarly, public-private partnership prisons are paid according to availability and not volume of use; public-private partnership concessionaires should not have an interest in higher criminality. A famous pathological case (created by corrupt officials) is the kids-for-cash scandal in Luzerne County, Pennsylvania, where judges were receiving kickbacks for sending juvenile offenders to prison, even for minor crimes, because the local public-private partnership prison was paid according to the number of inmates.

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