

Contracting Arrangements and PPPs for Sustainable Development

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Abstract:

This paper extends a discussion of the investment cycle in another G-24 paper (Ahmad, 2017), in which the questions concerning “what” to invest in and “where” are addressed. This paper examines the “how” of investment for sustainable development, focusing on options for contracting arrangements, such as PPPs, that would help to involve the private sector, manage risks in the presence of asymmetric information, as well as uncertainty about climate change. It also addresses the strengthening of national and local institutions and the possible role of international financial institutions. In discussing the investment options, the paper also updates an earlier G-24 review of the empirical and theoretical literature on involving the private sector involvement in public investments (Ahmad, Bhattacharya, Vinella, and Xiao, G-24 2015).

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I. Setting the Stage for Private Participation in Public Investment

Given the huge infrastructure gaps faced in advanced and developing countries alike, **there is growing recognition that the private sector needs to be better involved in public investments for sustainable development**, from financing instruments to direct participation with various risk-sharing arrangements (Bhattacharya, Oppenheim and Stern, 2015). A 2015 G-24 paper examined the case of public-private partnerships (PPPs), given the high expectations on the part of many governments, as well as bilateral and multilateral donors (Ahmad, Bhattacharya, Vinella, and Xiao, 2015). In this paper we review the additional empirical evidence on PPPs that has become available since the 2015 paper. We focus on a data register of private participation in public infrastructure (PPIs) established by the World Bank, as well as a large body of theoretical literature that has emerged recently on contracts, as well as the applicability of PPPs in handling uncertainty that is a feature of climate change. This paper is a continuation of a discussion of the investment cycle, in which the “what” and “where” are addressed in the companion G-24 papers (Ahmad, 2017), and the “how” is taken up below.

Among both theorists and practitioners, two highly topical questions are: (1) whether public agencies, or private firms, or both in cooperation, should develop infrastructure projects; and (2) if so, under what organizational and contractual forms?

Private involvement in public infrastructure is subject to asymmetric information that triggers incentives for cost reduction through cuts in quality, unless quality is contractually well-defined, specified and monitored as argued in G-24 (2015). In addition, PPPs create possibilities of game-play across levels of government, and incentives to hide liabilities at lower echelons. This often substitutes for tax reforms and obfuscates accountability as liabilities are pushed to future generations or to higher levels of government. The reduced linkage between taxation and spending affects “yardstick competition”, and can lead to a buildup of liabilities through poor decision-making. Elections are also often a trigger for reneging on contracts by both the public and private parties, giving rise to a host of political economy problems, especially pronounced in multilevel states (including those with unitary constitutions, but especially problematic in multiparty federal states). The importance of own-source taxes at lower levels of government to ensure sanctity of contracts, including for PPPs, is typically ignored by policymakers, although there are important exceptions (see Milbradt, 2016; Ahmad, Bordignon, and Brosio, 2016).

The failure in the EU to implement IPSAS requirements to register liabilities in general government balance sheets, also required under the IMF’s GFSM2014 framework, contributed to **surprises and the depth of the post-2008 crisis**. Therefore, contractual (in)completeness, on one side, and monitoring and control, on the other, are critical issues in the choice of

delegation of projects to the private sector. France has only recently begun to implement the IPSAS/GFSM requirements.

In Section II **we focus on some of the preconditions for PPPs, including both the tax regime and incentives emanating at different levels of government.** We also review the **PFM framework, particularly the recording of liabilities** as this critically governs incentives to cheat — involving the public and private partners and between levels of government. In Section III we present some updates on PPPs and forms of contractual arrangements.

In Section IV, **we examine a range of possible contracting types,** including the pros and cons of **unbundling the different stages of the project life-cycle** suggested by Bhattacharya et al., 2016. It is important not to lose the advantages of risk-sharing that apply with PPPs, **particularly the interdependence between tasks at different stages of the project life cycle.** However, uncertainty associated with climate change poses different challenges. With public ownership, many of the incentive problems disappear and the bundled or unbundled options are seen to be equivalent.

Section V **links back to the overall investment agenda,** presented in the companion G-24 paper, and highlights areas for further work, including **on institutions and information-sharing at the local, national, and supranational levels.** The latter is particularly important given the focus on cross-border investments from the EU to Asia, Africa, and Latin America. The international financial institutions (IFIs) also have a role to play, particularly in ensuring the sanctity of contracts and recourse with investments by cross-border investors, as well as technical support.

II. Some Recent Evidence on Preconditions for PPPs

After some irrational exuberance concerning PPPs in the international community and in countries, it was recognized that this was often due to the attractiveness of “kicking the fiscal can down the road”, including in the EU. McKinsey Global Institute (2016) had a more balanced perspective: **“PPPs are often discussed as a solution but they are not a panacea.”** The main advantages are bringing into public infrastructure private capital through risk-sharing devices in an innovative manner that helps to close the key infrastructure gaps. The other motivation is to introduce greater efficiency and market discipline in the management and execution of the project than might be possible with the public sector.

The typical critiques are that (1) governments may use off balance-sheet investments to circumvent budget constraints; (2) windfall private-sector profit margins may accrue; (3) inappropriate risk transfer (with e.g., regulatory changes, land access, and traffic volumes) may

increase capital costs; and (4) non-standard or insufficient project size may increase administrative costs (McKinsey Global Institute, 2016).

In addition to the above, our focus is on whether and how **asymmetric information generates political economy problems and across levels of government and game-play** between the public and private partners. Further, the absence of appropriate incentives can create commitment problems and incentives to renege on contracts (see G-24, 2015). In addition, the new literature on climate change and uncertainty suggests that PPPs that focus on risk-sharing may not be the appropriate contracting model in every case. **And yet, the case for involving the private sector remains strong, including the use of PPPs.** We examine this issue further in Section IV.

1. Key Preconditions: Local Own-source Revenues

There is clearly a potential for PPPs in meeting public infrastructure needs, although the preconditions need to be explicitly recognized. National governments and international agencies alike should try to assist lower levels of administration, particularly cities and municipalities, where many of the PPPs are typically to be found.

As discussed in the G-24 companion paper (Ahmad, 2017), it **may not be appropriate to set user charges to cover costs.** There may well be implicit tax/subsidies or guarantees involved that affect budget allocations over the short to medium term. Problems typically arise when governments operating under an annual budget framework are unable to meet commitments under future budget scenarios. The problems tend to be magnified when elections result in new administrations that may have different priorities. Also, there is often a tendency of the private parties to claim cost escalations prior to, or just after, elections. And if subnational governments are able to either hide costs (a practice common in some Latin American countries with single term limits, thereby enabling administrations to pass on the costs to their successors) or pass them on to higher levels of government, the incentives to renege on contracts are intensified.

A proper system of local own-source revenues is needed before cities can borrow for investment purposes in a sustainable manner. This linkage is important to align incentives for a clean environment. It is important also to recognize that PPPs represent local liabilities, and the repayment schedule needs to be linked to own-source revenue generation. Otherwise, there is a risk of liabilities building up unnoticed until there is a crisis, as was the case in Europe since 2008 (Ahmad, Bordignon, and Brosio 2016).

Unfortunately, international experience with raising revenues at the city and local levels leaves much to be desired. Most developing countries generate negligible revenues — Latin America, that perhaps does better than other regions, manages just 0.3 percent of GDP — as opposed to advanced countries such as the US, UK, and France that collect over 3 percent of GDP. Part of the problem is that countries have adopted the US institutional model based on ownership and valuation that is exceedingly difficult to administer (the UK under Margaret Thatcher abandoned it), given rapidly changing property rights and prices. Also, the administration of local-level taxes tends to be regarded as separate from other taxes, particularly the VAT and income taxes, and therefore is left to under-staffed and ill-equipped local administrations that rely on direct contact with taxpayers. This contributes to corruption and misses the important interlinkages of information on local assets as a key element in the income tax base. Yet, local-level taxation has significant potential, especially in rapidly growing cities and metropolitan areas within developing countries. The linkage between local own-source revenue generation and city-level investment and service delivery is critical to meeting the SDGs. These issues are discussed in greater detail in G-24 Ahmad 2017a—(see also Ahmad, Brosio, and Gerbrandy, 2017), and are not pursued further here.

2. Key Preconditions: [Full Information on Liabilities Generated](#)

Without full information on the buildup of liabilities, known to the private partner but not the government, it is impossible to properly assign risks or manage the PPP process efficiently. Moreover, if the liabilities are not known to the local governments managing the PPP projects, they will be a black box to the central government that is responsible for overall macroeconomic management and implementation of fiscal rules at the national and sub-national levels. For these reasons, IPSAS 32 requires that PPP liabilities be recorded in the general government balance sheet, the latter being a critical element of the IMF's GFSM framework. The issue of accurate measurement and reporting of liabilities is increasingly important given the emphasis on PPPs in meeting SDG goals (see Ahmad, Bhattacharya, Vinella, and Xiao, 2015). This is an issue now also in China, that is basing its rebalancing strategy for sustainable and clean growth partly on PPP contracts.

The absence of consistent and full reporting on PPPs within countries and across the EU, led to the failure of the practice of relying on the market to discipline local governments during the post-2008 economic crisis (see Ahmad, Bordignon, and Brosio, 2016). Local governments could hide liabilities by, for instance, bypassing regular payment channels, dealing with local banks, and parking liabilities in PPPs. The additional and largely hidden liabilities has added to the magnitude of the crisis, but there is plenty of evidence also that funds have been misappropriated in several cases. The presumption that markets would discipline local

governments, without the need for standardized reporting of transactions and arrears, such as with the OECD/IMF Government Financial Statistics standards, is generally not a viable option without full information on current and future payment streams.

It is common for countries to purchase expensive Integrated Financial Management Information Systems (IFMISs), often with IFI support, without thinking through how it might affect the processes and procedures across government entities, and the architecture of connection between line agencies and sub-national governments. It is also common for line agencies or local governments to act independently of the Ministry of Finance or Treasury and purchase their own systems, often with incompatible charts of accounts that make it virtually impossible to generate data on general government operations — either the economic classification that would also cover the buildup of liabilities, or the functional or program classifications that make it possible to report on the key SDG deliverables, such as spending and outcomes on education or health care, for instance. Thus, many countries such as Pakistan, are only able to report on budgetary central government operations and not functional spending or outcomes necessary for the SDGs. This data has to be generated manually, and cannot easily be verified. The absence of Treasury Single Accounts means that the usual cross-checks in being able to follow the flow of funds is missing. This opens the door also to rent-seeking and possible game-play between levels of government.

In a rare admission, the Internal Evaluation Group of the World Bank admits that despite **having spent \$3.5 billion in 75 countries, “having a fully functional IFMIS in place is not a sufficient condition as a good budget management tool”** (World Bank, 2016, p.23). Unfortunately, many of the systems do not track the full GFSM-classified budget, with its economic, functional, program, and project classifications in the chart of accounts that enable accurate and timely information, including on liabilities from PPPs, to be generated. And some countries that might score highly on the individual rankings (see Table 1), might miss out key elements that affect the ability and incentives for officials to “cheat”, as is becoming clear with the Panama cases as well as the investigations in Brazil and other countries.

Many IFMISs in emerging market economies, put in at great expense, require mapping tables to generate GFSM-consistent data for inclusion in the GFS yearbook. In many multilevel countries, only data on central government budgetary transactions were included in the GFS Yearbook. As a result, even functional classification was excluded, and there was no information at all on provincial and local transactions. In the context of increasingly decentralized delivery of the SDG goals, this poses a significant challenge that needs to be coherently addressed. Even senior IFI staff claim that “it may be simply illusory to expect

countries to adopt budget classification and accounting system that are GFSM, if not IPSAS compliant” (Cangiano, Gelb, and Goodwin-Groen, 2017, p. 10).

Despite the heavy expenditures on TSAs and IFMISs, with IFI support, **real performance has been made in tracking general government liabilities in developing countries**, especially at the sub-national level. China has made better progress than most developing countries and other BRIC countries, (except for Russia) in addressing both the GFSM framework and TSA, in that there is a clear goal, and uniform standards are being developed. However, the reforms are not complete, especially with regard to the treatment of liabilities at the lower levels of government including in the more advanced regions of the country (see Ahmad and Zhang, 2017).

The liabilities do not go away and, as in the EC countries, **treating PPPs as a mechanism of “kicking the fiscal bucket down the road” is tantamount to storing up problems for the future**, as well as opening the doors to gamesmanship across levels of government. Unfortunately, IPSAS 32 and GFSM2014 requirements for reflecting potential liabilities continue to be ignored in many countries and regions, and are not on the radar of many expensive, technical assistance programs on IFMISs, including those supported by IFIs.

Table 1: World Bank, IEG Evaluation of Budget Management Systems*

Country	TSA Status	FMIS Coverage	Core Functionality	Ancillary Features	Technical Aspects	Total System Strength
Max score	10	25	40	15	10	100
Afghanistan	8	25	22	8	8	71
Bangladesh	6	15	9	5	3	38
Cambodia	5	10	25	4	7	51
Ghana	2	9	34	5	9	59
Indonesia	7	23	35	13	10	88
Kazakhstan	8	25	29	4	8	74
Lao PDR	6	11	18	3	7	45
Liberia	2	9	26	7	8	52
Malawi	7	11	16	4	5	43
Malaysia	7	23	39	14	9	92
Maldives	3	17	26	3	8	57
Mozambique	2	15	26	6	8	57
Myanmar	8	2	8	1	3	22
Nepal	7	19	18	5	6	55
Pakistan	7	15	26	9	9	66
Philippines	6	2	10	0	0	18
Russian Fed.	8	25	29	4	9	75
Sierra Leone	2	9	24	5	7	47
Thailand	7	23	39	11	10	90
Vietnam	7	23	34	3	8	75
Zambia	3	14	22	7	8	54
Zimbabwe	2	13	26	8	9	58

* Note: green = passable; red = unsatisfactory; yellow = room for improvement. Source: World Bank, 2016.

3. What Do We See?

PPPs represent 7.5 percent of infrastructure investment in major developing countries, albeit with much higher shares in some, such as Brazil (over 25 percent), and only about 1 percent in China (see Figure 1, and McKinsey Global Institute, 2016). While the proportion of PPPs relative to the total infrastructure is very small, it needs to be kept in mind that China invests 8.6 percent of GDP in public infrastructure — or more than North America and Western Europe combined.

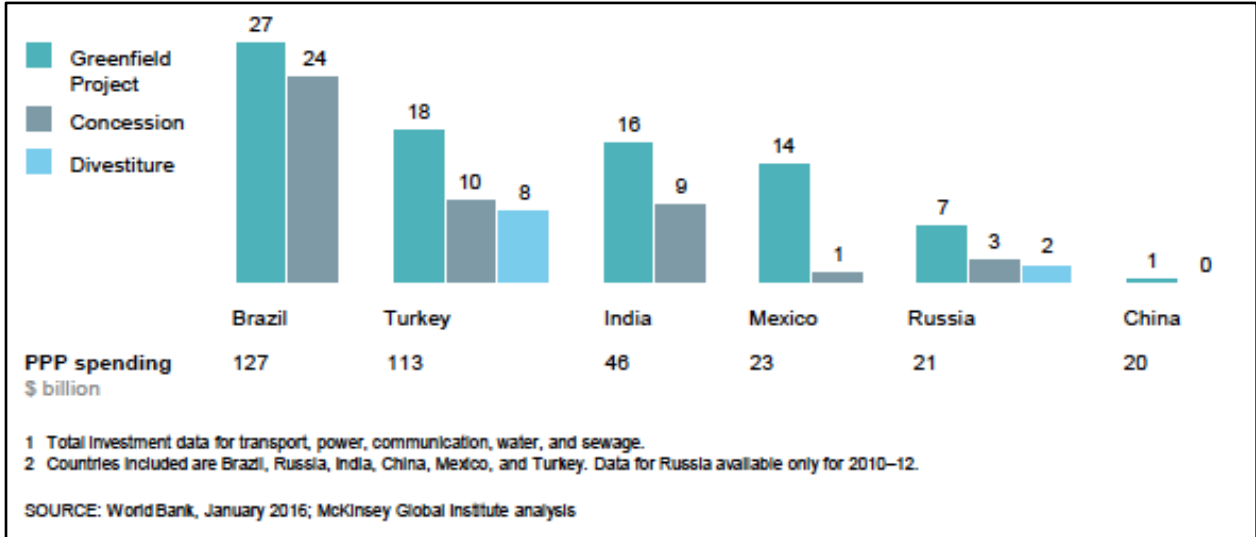
While the relative share is very much lower than in Russia or Mexico, the absolute amount of PPP spending in China is more or less the same. As pointed out in G-24 (2015), PPPs in China are sharply lower than in the 1990s, they have begun to rebound with improvements in PFM and monitoring arrangements, and in the search for rebalancing and enhanced cross-border connectivity (Ahmad, Niu, and Xiao, 2017).

However, as seen in Ahmad and Zhang (2017), difficulties with balance sheets at the county level would mean that most of the PPPs should be handled through central or provincial IFMIS systems and recording of liabilities. This would also be consistent with possible development of property taxes in the large metropolitan areas — indeed, there has been experimentation in both Shanghai and Chongqing.² Thus, an asymmetric reform of local taxes, PFM and PPPs would appear to be entirely feasible in a sustainable development strategy.

We examine the major stylized information from the World Bank’s Private Participation in Infrastructure Database. (<https://ppi.worldbank.org>). There are 7,305 projects recorded since 1990 with a total investment of US\$2.6 trillion. The most important sectors were electricity, ICT, and Roads. It is worth noting that there has been a sharp decline in numbers of projects and total investments since the economic crisis in 2012 (Figure 2, based on the PPI database).

² These were variants on the US-style ownership and valuation models, but not very successful (see Ahmad, 2017b).

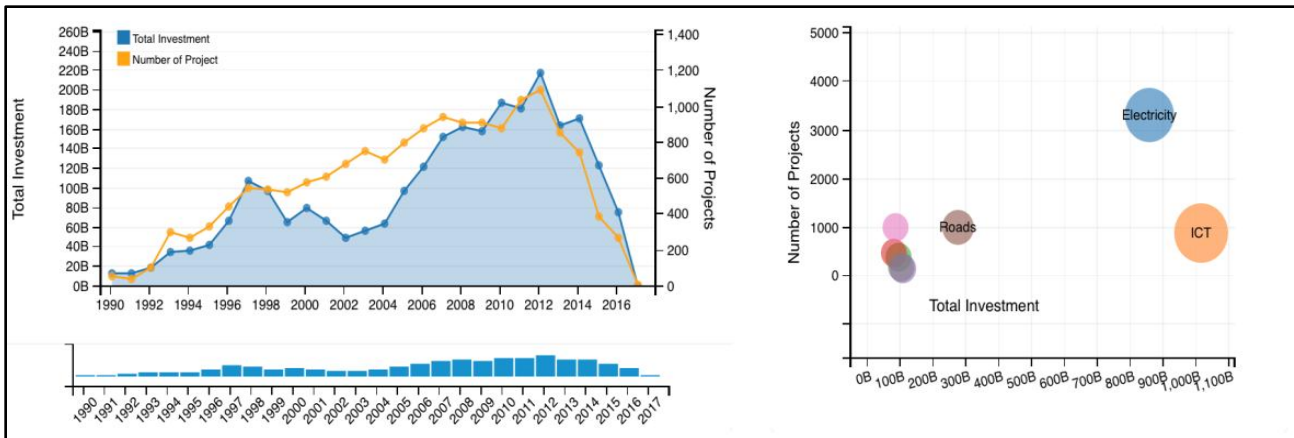
Figure 1: PPPs in Emerging Market Economies



Some of this is likely related to the growing realization of the incentive problems with PPPs, particularly in multilevel countries such as India. Country patterns are seen in Figures 3-7 (based on the PPI). These show the sectoral distribution of projects as well as the aggregate allocation of investments in Brazil, China, India, Russia, and South Africa.

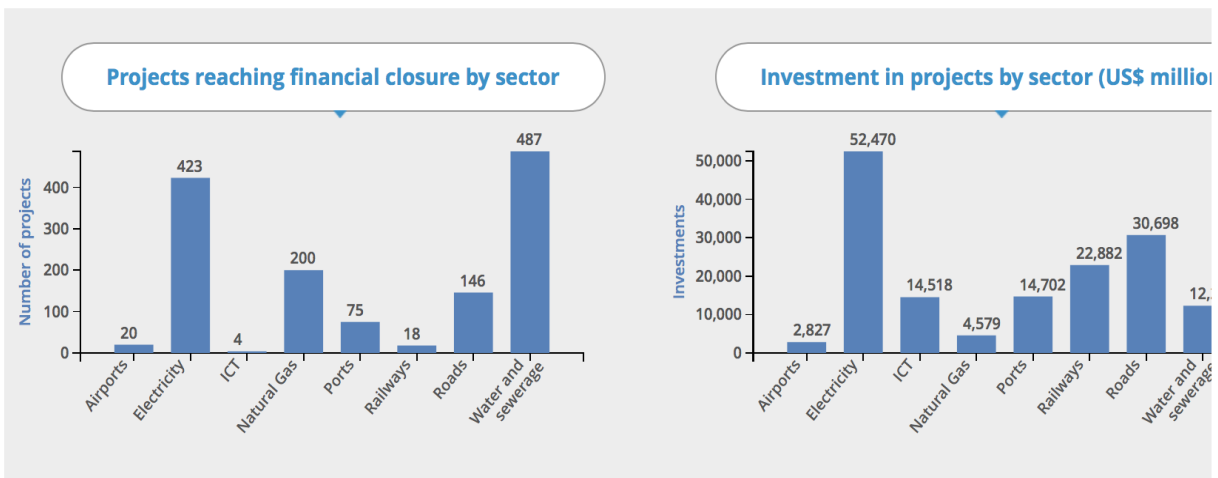
It is noteworthy that in each of these countries, with the exception of South Africa, the electricity sector has the highest number of projects, and/or the highest allocation of resources. The ICT sector is striking. In South Africa it amounted to both the highest number of projects and investment. In India, Russia, and China, a relatively smaller number of projects accounted for the highest, or near-highest, magnitude of investment. These are relatively large projects and easier to monitor at the national or provincial levels.

Figure 2: Numbers of PPP Projects and Aggregate Investment (World Bank data set)



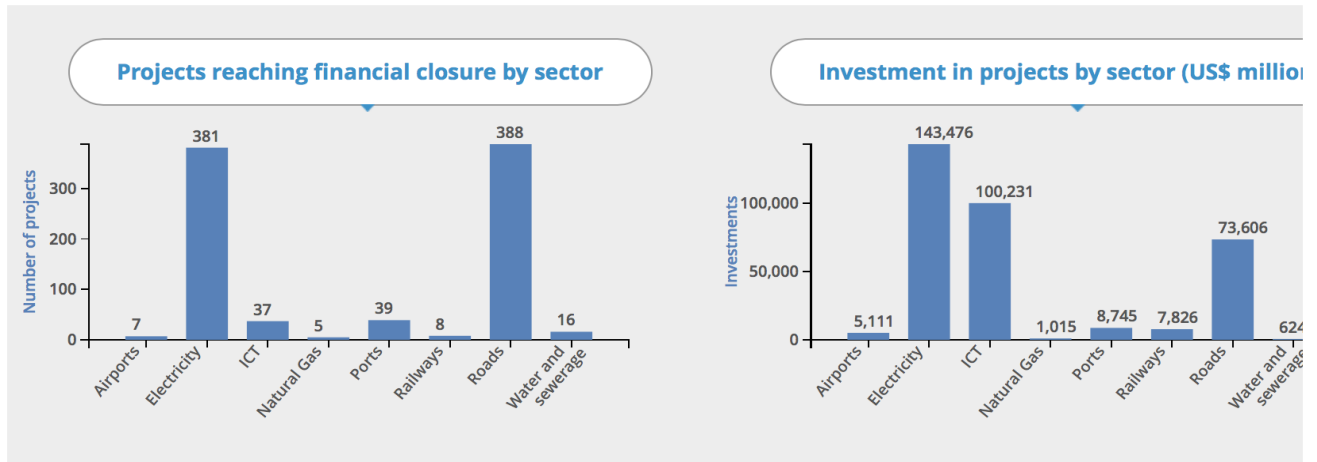
Source: Based on World Bank Data from the PPI

Figure 3: Brazil Sectoral Distribution of PPP Projects and Investments (\$m)



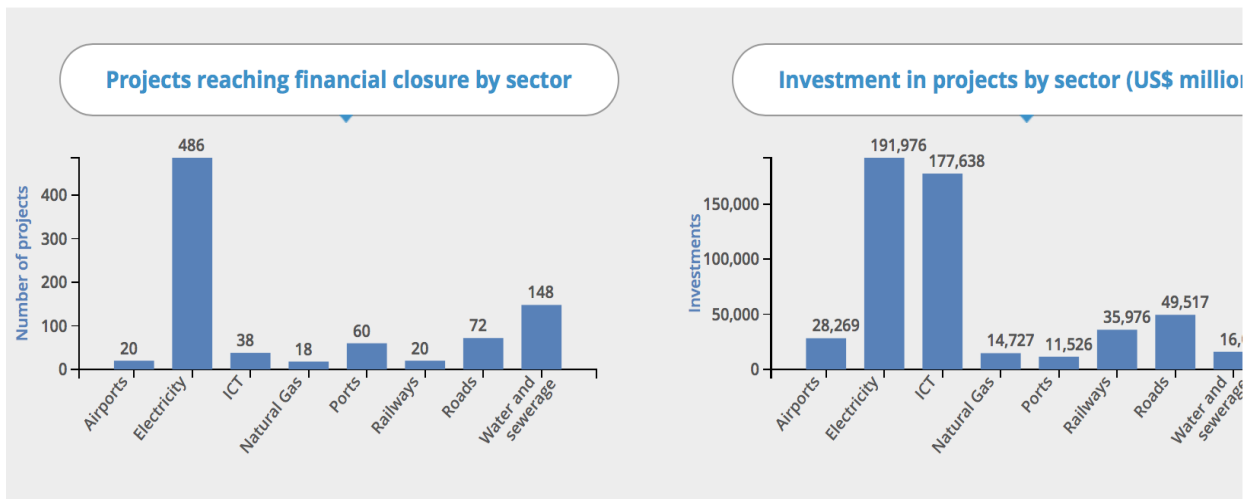
Source: Based on World Bank Data from the PPI

Figure 4: China Sectoral Distribution of PPP Projects and Investments (\$m)



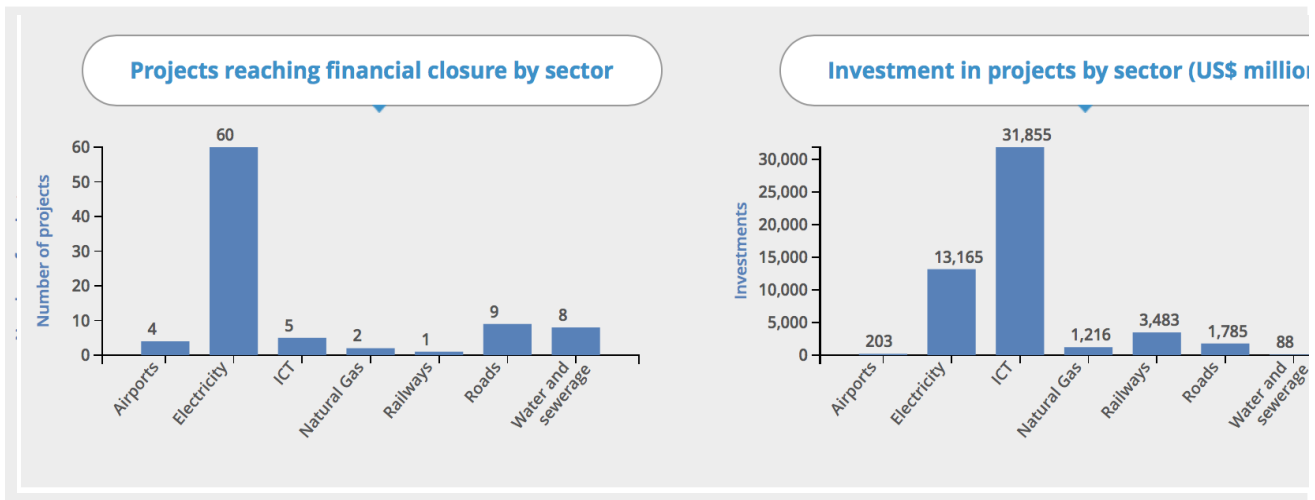
Source: Based on World Bank Data from the PPI

Figure 5: India Sectoral Distribution of PPP Projects and Investments (\$m)



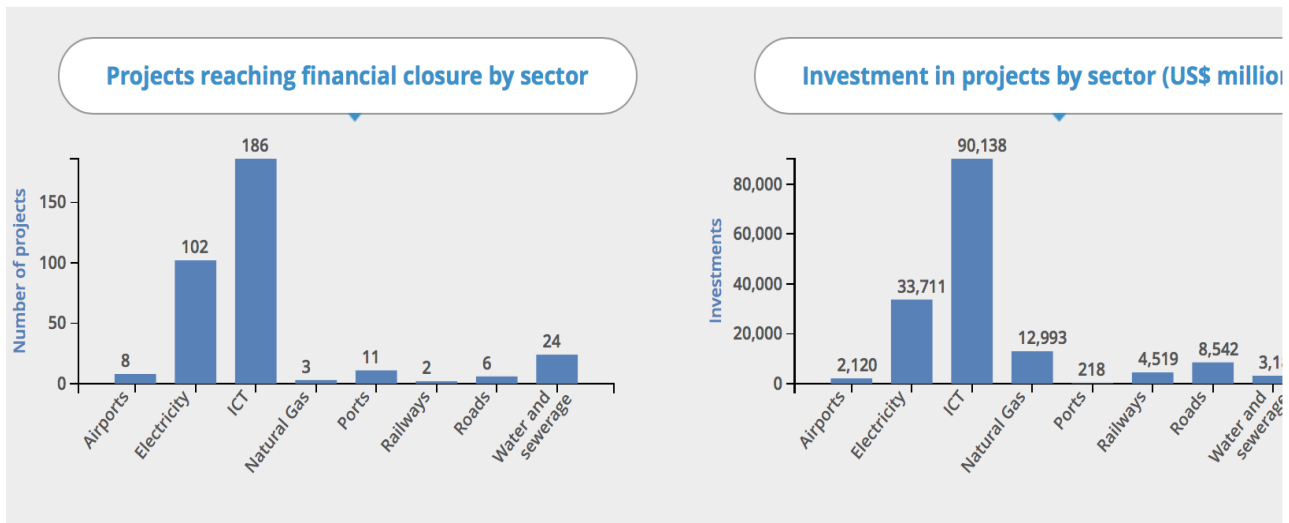
Source: Based on World Bank Data from the PPI

Figure 6: Russia Sectoral Distribution of PPP Projects and Investments (\$m)



Source: Based on World Bank Data from the PPI

Figure 7: South Africa Sectoral Distribution of PPP Projects and Investments (\$m)



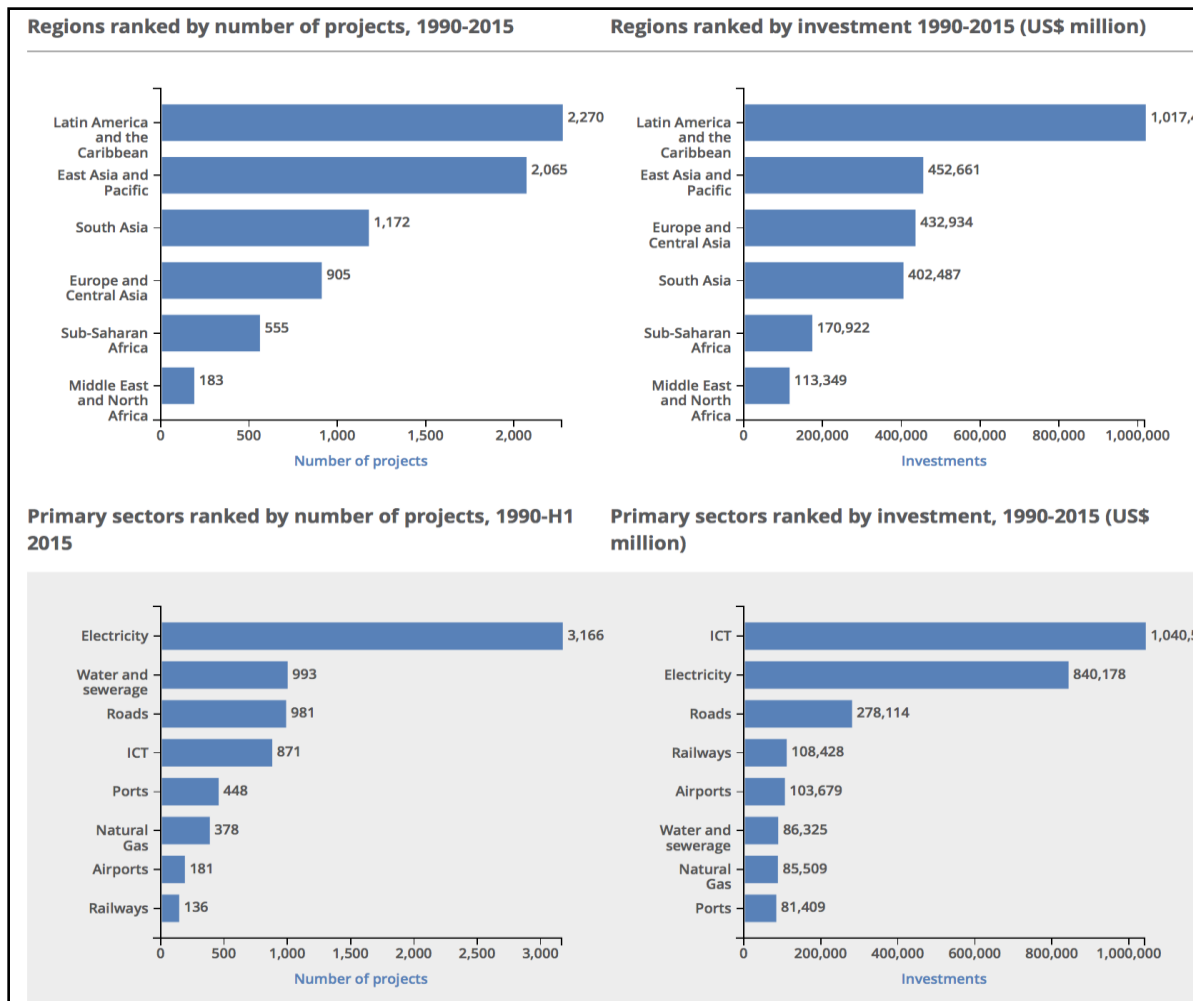
Source: Based on World Bank Data from the PPI

The importance of the ICT sector for PPPs is seen also in Figure 8 that presents a global perspective. However, since “cancelled” or “distressed” projects, without the full information from a properly designed monitoring system, it is hard to disentangle causes: whether it is due to management failures or game play on the part of the private partner, or failure of the

government (at different levels) to provide the requisite budgetary support to cover requisite risks. As pointed out in G-24 (2015), there are incentives for lower levels to pass on liabilities to higher level, while keeping prices low to benefit local inhabitants.

Given the increasing resistance of the private sector in many countries to participate in the “riskier” parts of the project life-cycle, especially the preparation and construction stages, Bhattacharya, et al. (2016) recommend an unbundling so that the state undertakes the initial riskier stages, and the private sector is brought in at the operational stage — for example, through securitization, when the revenue streams are clearly demarcated (see Figure 9). This unbundling of contract types during the project life cycle may well be justified especially with respect to the uncertainty associated with climate change, as we discuss in the next section. However, the unbundling misses the efficiency gains and risk-sharing with the private sector at critical stages of the project life cycle that are at the heart of the PPP-model.

Figure 8: Global Patterns of PPPs



Source: Based on World Bank Data from the PPI

Figure 9: Risk and Financing Considerations in Stages of Infrastructure Project Lifecycle

	Preparation	Construction	Operation
Description	Developer/government organizes feasibility studies; models cash flows, finances; organizes contracts with utilities, operators and construction firms	Construction first build the project to specifications	Separate operating company takes over operation and maintenance of the project
Main risks	Macroeconomic & political risks Technical risks to project viability Environmental and planing risks	Macroeconomic & political risks Construction risks (e.g., of overrun, delay)	Macroeconomic & political risks Demand/traffic risks Operating risks Policy risks (e.g., tariff changes)
Cash flows (stylized)			
Financing moments	During project preparation and feasibility studies the developer seeks patient capital or, often, public funds	Once project is 'bankable' the developer will seek equity investors and debt providers to finance the project	Once construction is complete and started to operate project can be refinanced to reflect the changing risk profile

Source: Bhattacharya et al., 2016.

III. Drawing Practical Conclusions from Economic Theory

In this section, **we review some of the new literature on alternative contractual options, including PPPs.** This enables us to address some very relevant policy concerns, such as the need to ensure greater efficiency and risk sharing with the private sector, relieving administrative constraints, and bringing in private sources of financing. PPPs should not be seen as ‘kicking the fiscal ball down the road.’ Consequently, for an effective utilization of the opportunities inherent to the PPP model, the multilevel fiscal regime and associated business climate agenda need to be properly delineated, including the incentives associated with own-source taxes and information flows on public liabilities.

1. Types of Contracts

Williamson (1985) showed that under some conditions a public firm may exactly replicate the performance of a private firm and be equally efficient (i.e., minimizing cost). In that case there is no efficiency loss in letting a public firm produce some public good or run some facility. On the other hand, Sappington and Stiglitz (1987) show that privatization can replicate public provision in terms of productive efficiency, equity, and rent extraction. When this is the case, privatization can be an optimal solution to the delegation problem. But there are two conditions. First, it should be possible to draw up a complete contract under which any possible contingencies are accounted for, and the government should be able to fully commit to that contract. Second, the government (or policy maker) should be benevolent, i.e., pursue the social interest. The equivalence fails when one of these requirements is not satisfied, and ownership becomes relevant. When contracts are incomplete, ownership matters, even with a benevolent government.

Laffont and Tirole (1991, 1993) and Schmidt (1996a, b) show why contractual incompleteness matters in the relationship between the public and private sectors. First, there is an informational asymmetry about the relevant costs and benefits of the project between the (benevolent) policymaker and the delegated manager. Second, the investments made by the manager are non-verifiable and non-contractible. These aspects are both widespread in practice, though not with exceptions (discussed later). Under public ownership, once the cost of the investments is sunk, the government cannot refrain from expropriating (part of) the associated benefits from the manager. Then, a hold-up problem arises, which leads to underinvestment. Under private ownership, the government can credibly commit not to expropriate the investment, but informational asymmetries are more costly to address. This delivers a first practical conclusion.

Practical Conclusion 1:

In incomplete contracting frameworks, where the investments made by the project developer are non-contractible, projects should be privatized when hold-up problems are severe leading to high productive inefficiencies. Projects should remain public when information problems are especially costly leading to high allocation inefficiencies.

If imperfections only ensue from information problems (moral hazard and adverse selection), but complete contracts can be signed, ownership does not matter. Intuitively, an owner has no special power or rights when all aspects are specified in a contract. This is not the case under contractual incompleteness instead, because the owner has the “residual control rights” and makes all the decisions concerning the non-human assets that are required to develop the project on which the contract is silent (Hart, 2003).

The studies of governments with private agendas that overlap and interfere with social objectives, help us understand in which way non-benevolence breaks the irrelevance result. Of course, these studies also recognize that governments are typically less informed of the relevant costs and benefits of the projects than are the delegated managers. Thus, agency costs are high under private ownership. On the other hand, private (regulated) ownership limits policymakers in their pursuit of their private agendas (rent-seeking) although this depends on institutional arrangements and degree of competition. Obviously, the desirability of private ownership depends on the balance between the two (Shapiro and Willig, 1990).

Practical Conclusion 2:

When governments are non-benevolent, projects should be privatized if the private agendas of officials induce pronounced distortions. Projects should remain public when information problems are especially costly, leading to high allocation inefficiencies.

In many infrastructure (and other) projects, various investments can be utilized which, while desirable (if made in appropriate size), might induce opposite effects on performance. As long as such investments are non-contractible, the desirable ownership structure is the one under which the distortions associated with the contrasting effects are minimized. This case is examined by Hart et al. (1997) regarding prisons. They compare two possible organizational forms, namely the developer of the project is either a publicly-owned firm or a private firm that the government contracts with. In their model, the manager running the activity can make two kinds of investment: one that increases quality, and the other that decreases cost but has a negative impact on quality. Under private ownership, the manager is motivated to innovate: he over-invests in cost-reduction activities and invests moderately (though less-than-efficiently) in quality improvements. The excessive tendency to engage in cost-cutting is removed under

public ownership. Yet, it is then replaced with a weak incentive to engage in either kind of improvement. This is because it is easy for the government (as an owner) to hold up the manager without rewarding him appropriately for his investments. Hence, underinvestment arises in both quality and cost innovations. So, whereas private supply is generally cheaper, it may or may not come along with lower quality than in-house provision by the government. Once again, the determination of which arrangement dominates depends on which distortion is less damaging.

Practical Conclusion 3:

In incomplete contracting frameworks, where the investments made by the project developer are non-contractible and have opposite effects on performance,

- ***Projects should be privatized when concerns with cost (in)efficiencies are more relevant relative to quality aspects.***
- ***Projects should remain public when the adverse consequences of (non-contractible) cost reductions on (non-contractible) quality are large.***

This conclusion does not imply that contracts are useless if they are incomplete. Indeed, in Hart et al. (1997), the contract does play a role, i.e., it defines the extent to which quality-shading can occur.

Under some circumstances, the boundaries between public and private firms are difficult to identify. Whereas we recalled — along the property rights approach to the theory of the firm — that ownership structures (i.e., the allocation of control rights) matter when contracts are incomplete, this approach seems to be too narrow in several projects, the development of which displays a high degree of complexity. Consistent with this, in public debates, privatization often refers to entrusting private parties with governing authority and managerial responsibilities, which are not necessarily paired with a transfer of the asset ownership. Accordingly, not only do contracts on the privatization of infrastructure projects specify the transfer of ownership rights. They also attribute responsibilities about design, construction, maintenance, and modernization. In this perspective, the choice between public and private ownership is not disjoint from the assignment of investment tasks.

The Hoppe and Schmitz (2010) incomplete contracting model of privatization amends that of Hart et al. (1997) in three respects. First, the investment in quality innovation is socially valuable but increases the cost of the project. Hence, the possibility of the quality innovation having a side-effect on cost (not only the converse) is also taken into account. Second, the government and the manager share the same information and the investments in quality and

cost innovations are contractible control actions. The contract assigns both the ownership rights and the investment tasks, though it does not define the investment levels.

Considering that the implementation of innovations requires access to the essential assets, two options can be envisaged, which the authors refer to as two kinds of public-private partnerships. Under the first kind, both parties are assigned the veto power on implementation. This is tantamount to a joint ownership. Under the second kind, neither party has veto power. The government has the right to implement quality innovations (which are beneficial to society) and the manager has the right to implement cost innovations (which make the project cheaper). Within this framework, two kinds of conclusions can be drawn. First, given the ownership structure, it is possible to understand what the optimal allocation of investment tasks looks like by considering the pattern of investment induced by that particular structure. Second, it is possible to identify the preferable ownership structure, which will depend on the importance of the cost innovation and side effect on quality, the importance of the quality innovation and its side effect on the cost, and the bargaining power of the public and the private parties.

Practical Conclusion 4:

*In incomplete contracting frameworks, where the government and the private manager share the same information, and investments in quality and cost innovations are contractible control actions, the optimal **allocation of investment tasks** depends on whether ownership is private or public, or a partnership is formed.*

- *Under **private ownership**, the manager should be entrusted with the investment in cost innovation; and which party should be in charge of the investment in quality innovation depends on the parties' bargaining power.*
- *Under **public ownership**, the government should maintain the responsibility for the investment in quality innovation; and which party should be in charge of the investment in cost innovation depends on the parties' bargaining power.*
- ***In a partnership**, there should be no veto power. The government should maintain the responsibility for the investment in quality innovation; the manager should be entrusted with the investment in cost innovation.*

This conclusion is explained as follows. Private ownership strengthens the incentives to engage in cost-reduction activities because the benefits of those activities can be fully appropriated, and an efficient level of investment is attained.³ By contrast, the incentives to engage in quality

³ It should be pointed out that this outcome arises when, as considered by Hoppe and Schmitz (2010), the parties agree on setting the quantity (not excessively) *below* the efficient level in the contracting stage. That

improvements are reduced and underinvestment arises. In turn, public ownership strengthens the incentives to engage in quality-enhancing activities, in which the efficient level of investment is attained, whereas underinvestment arises in cost innovations.⁴ A partnership without veto power warrants implementation of both kinds of innovation, replicating the incentives for cost innovations under private ownership and the incentives for quality innovation under public ownership. However, it is unlikely that the two investments occur with efficient size. In fact, one should expect overinvestment to arise in one dimension and underinvestment to arise in the other.⁵

Practical Conclusion 5:

*In an **incomplete contracting framework**, where the government and the private manager share the same information and investments in quality and cost innovations are contractible control actions.*

- **A partnership with no veto power** is preferred to a single ownership when (1) the parties' bargaining power is not very different and (2) the side-effects of the quality and cost innovations are relatively less important.
- A **single ownership** is preferred when (1) the parties' bargaining power is unbalanced and (2) the side-effect of one innovation is important relative to that of the other.
- **Private ownership** is preferred when the side-effect induced by the quality innovation on cost is relatively strong.

quantity can then be upgraded to the efficient level in a later renegotiation. This possibility looks highly plausible as, in practice, it is often the case that the scope of the project is revised and scaled up during its development. If the quantity is set to the efficient level already in the initial contract, then overinvestment in cost innovations arises under private ownership because, as found in Hart et al. (1997), the side effect of the cost-reducing activities on quality is not internalized. On the other hand, too small a quantity leads to underinvestment because the manager does not fully appropriate the benefits generated by the investment in the renegotiation stage. There is an important by-lesson ensuing from these results. Extending the scope of public projects during their development and, hence, letting the projects become less cheap than initially planned, may be a deliberate choice to address the overinvestment problems that would arise if a bigger size were fixed up-front.

⁴ The same observation on the choice of the quantity level applies in this case.

⁵ Again, this is related to the quantity choice made by the parties in the initial contract. In this case, the quantity is a single incentive tool to be used to pursue two goals, namely induce an efficient investment in cost reduction and induce an efficient investment in quality enhancement. In general, the quantity that secures the former goal differs from the quantity that secures the latter, and none of the two goals is achieved as a result of the bargaining process between the parties.

- **Public ownership** is preferred when the side-effect induced by the cost innovation on quality is relatively strong.

This conclusion is intuitive. When one party has strong bargaining power, the critical limit of the single ownership, namely the issue of underinvestment, is less important. What matters is to attain the efficient level of investment in the innovation that is deemed to be important. A partnership is thus less appropriate. When the bargaining power is equal between the parties, the issue of underinvestment in one task that arises under a single ownership is more important, which makes the partnership a more appropriate solution. Of course, the reach and implications of this conclusion cannot be fully understood without identifying what determines the bargaining power of the public and the private party. As Hoppe and Schmitz (2010) suggest, this might be related to the degree of competition.

In drawing up practical conclusions 4 and 5, we have followed Hoppe and Schmitz (2010) and referred to “partnerships” as arrangements under which either the public and the private party both have veto power on the implementation of innovations, or neither has veto power but each is in charge of a single innovation. **PPPs are essentially meant to be contractual arrangements for the development of infrastructure projects with the following key characteristics:**

- The construction of the infrastructure and its subsequent management for the provision of a service are bundled and assigned either to a single private contractor or to a *consortium* of private firms.
- Sometimes the bundle includes also other phases of the project, such as design and finance.

Bundling places PPPs in sharp contrast with traditional procurement, under which the private sector is also involved, but the responsibility for the different phases of the project is assigned to different private contractors. Therefore, **PPPs are intrinsically longer-term than procurement relationships.**

There is also a second feature that differentiates PPPs from traditional procurement: **Under a PPP, the government specifies the *outputs*, namely the service to be delivered and the essential standards to be complied with, whereas the control rights over the ways of accomplishing tasks are transferred to the private contractor.** Throughout the duration of the PPP, the private contractor is responsible for the infrastructure, it may implement innovative systems for service supply and may even use the infrastructure for other income-generating activities (provided that the standards specified in the PPP contract are not diminished). At the end of the contract, either the infrastructure returns to the public sector or it remains with the

private sector, depending on the specific contractual arrangement. By contrast, under traditional procurement, the government specifies the *inputs* and preserves the ownership of the infrastructure during the contractual period and thereafter. **Accordingly, one may consider a PPP as being tantamount to *private ownership with bundling of subsequent activities*, and traditional procurement as being tantamount to *public ownership with unbundling and delegation of subsequent activities to different private contractors*** (Bennett and Iossa, 2006).

2. Bundling or Unbundling?

There are various criteria to be used and aspects to be considered to **establish when the PPP-type institutional arrangement in infrastructure projects is preferable to the unbundled**, and these depend on the terms of residual value and optimal ownership of the infrastructure after the contracts end. This is a major concern for public infrastructure projects with long-term private investments. We will now review the relevant aspects and criteria, based on recent advances on the economic literature, to draw further practical conclusions.

The first aspect that matters and, hence, can be used as a criterion to establish a preference between PPPs and traditional procurement, **pertains to the nature of the links (if any) between the subsequent phases of the project**. To examine this aspect, Bennett and Iossa (2006) use an incomplete contracting model with two subsequent project stages, namely construction of the infrastructure and management and provision of the public service. They represent situations in which investments are non-contractible — as is the case of the delivery of innovations — but ex-post verifiable, because once innovations have been discovered their implementation can be verified. Accordingly, the owner of the infrastructure during the execution of the project is allocated the right to decide on the implementation of the innovations. This entails that under private ownership (PPP) the contractor decides freely whether to implement an innovation or disregard it. Under public ownership (procurement) any innovation requires a new negotiation with the contractor, following which the implementation is or not permitted.

Practical Conclusion 6:

- ***Bundling is preferable when there are positive externalities between the subsequent phases of the project. The case for bundling is weakened when there are negative externalities between the subsequent phases of the project;***
- ***Unbundling is preferable with weak externalities, especially if the provision of the service is long term.***

For instance, a positive externality (or synergy) arises when a building innovation enhancing the quality, hence the social benefit, of the project reduces the cost of management in the

operation stage. When that innovation increases the cost of management, however, the externality is negative.

Intuitively, PPPs perform better in the presence of positive externalities because the latter are optimally internalized when phases are bundled. Incentives to both innovate and reduce the costs of the lifecycle of the project are strengthened. **Traditional procurement performs better with weak negative externalities** because, in that case, internalization is either irrelevant or less desirable. If negative externalities are internalized, the issue of underinvestment, which follows from the hold-up problem under incomplete contracting, is exacerbated. If externalities are weak and the operation phase is long, then bundling restricts competition without inducing any incentivizing effect.

Practical Conclusion 7:

- ***In the presence of positive externalities, control rights on the innovations should be assigned to the private contractor, if the effects in terms of cost and residual value of the infrastructure are strong relative to those on the social benefit; these should be assigned to the government in the converse case.***
- ***In the presence of negative externalities, control rights should be assigned to the private builder of the infrastructure, if the effects in terms of residual value of the infrastructure are relatively strong; they should be assigned to the government if the effects in terms of social benefit are relatively strong.***

The intuition behind this is not very different from that underlying Practical Conclusion 3. We will rather turn to considering the ownership in the post-contractual period.

Practical Conclusion 8:

With positive externalities between project phases, bundling is desirable regardless of whether the infrastructure returns to the public sector or remains with the private contractor after the end of the contract.

If the infrastructure becomes public after the end of the contract, a concern arises with the incentives to invest in innovations by the private partner. The impact on incentives will depend on how and under what conditions the return to public ownership is established. Incentives are reduced, if an automatic transfer clause is introduced in the PPP contract. Hence, clauses of this kind are to be avoided. Incentives are reinforced, if the choice is made through a voluntary negotiation and the partners reach an agreement on a compensation payment to the private contractor. This is obviously a better strategy to follow in terms of incentives. Besides, privileging the negotiation strategy over the automatic transfer clauses strengthens the case for

PPPs relative to traditional procurement. Of course, a necessary condition for the viability of PPPs is to rely on them for projects/services that do not attract strong political or social opposition to the long-term ownership of the concerned infrastructures.

A more nuanced view and comparison and evaluation of PPPs versus traditional procurement, are made when one **goes beyond the presence of externalities** between phases of a public project **and also admits the possibility of the different project tasks being interdependent**. This possibility is accounted for and its implications are examined by Chen and Chiu (2010). As they point out, **interdependence of tasks may amount, first, to substitutability**: making more of one investment decreases the benefits of making more of another investment. For instance, constructing a high-quality hospital reduces the operational cost to be incurred during the management stage (i.e., there is a synergy between construction and operation, as previously described). However, it may make it less likely that the quality is further improved, or that the facility is used for alternative uses (i.e., tasks are substitutes).

Alternatively, interdependence of tasks also amounts to complementarity: making more of one investment increases the benefits of making more of another investment. For instance, installing higher-quality but more expensive glasses in the windows of a school reduces the operational cost (again, a synergy); in addition, it may be worthwhile also to install a surveillance system to protect windows from vandalism (tasks are complements). In the model of Chen and Chiu (2010), this classification of tasks is paired with a second important element that investments can be contracted upon. In particular, unlike in Bennett and Iossa (2006), the operational task becomes contractible once the infrastructure is in place. This captures the far-from-rare circumstance that the exact terms under which the service will be provided in the operation stage are not defined between the parties until after the infrastructure is built, even though operation by the private contractor is, indeed, accounted for in the contract. **Besides, it makes the practical conclusions to be drawn from this study especially suitable for greenfield projects, in which preserving flexibility in the contracting stage is useful to later adaptation as the initial uncertainty is dissipated and the project becomes more mature.**⁶

⁶ **Projects are said to be greenfield when they are totally new.** They require designing, financing and building in the early stages; and operating and maintaining in the late stages (these tasks can, of course, be accomplished under different possible institutional arrangements). By contrast, **brownfield projects rest on previously existing assets** so that such tasks as design and construction are of a more limited importance. As developing countries are very poorly endowed with existing infrastructure they are much in need of greenfield projects, and the conclusion presented in the text is potentially very relevant for them.

Practical Conclusion 9:

In a framework with **interdependence of investment tasks** and **interim contractibility of the task to be accomplished in operation stage**:

- ***Substitutability favors bundling*** and, under private ownership, the (PPP) consortium for the entire life-cycle of the project over a separate direct contract with the builder during the construction stage.⁷
- ***Complementarity favors unbundling*** and, under private ownership, a separate builder's contract for the construction stage over the PPP consortium/contract for the life of the project.
- ***Under public ownership, e.g., SOEs, integration, and separation of tasks are equivalent.***

When the tasks are separated (unbundling), complementarity is helpful in **lessening the incentives to under-invest in the construction stage** that ensue from the usual hold-up problem. As mentioned above, complementarity involves more investment in the construction stage triggering more investment in the operation stage. Thus, with complementary tasks, the private builder will be more motivated to invest, anticipating that this will induce the manager to invest more, in turn, and that more surplus will be generated. As the operating task can be negotiated at interim, prior to its accomplishment, the builder can negotiate with the manager how they will share the benefits of the operating investment, which will depend on the size of the investment initially made by the builder, whereas the cost of the operating investment will remain with the manager only. This explains why complementarity favours the builder's ownership/full PPP contract. On the contrary, **when the tasks are bundled**, complementarity weakens the incentives to invest in the construction stage because **the private contractor internalizes the impact on the later investment not only in terms of benefits but also in terms of costs.**

Under public ownership, integration and separation are equivalent because, on the one hand, the operating investment can be contracted upon at *interim* and, on the other, the government can veto the implementation of the building innovation after the investment has been made. It is useful to relate this conclusion to Practical Conclusion 6. According to the latter, negative externalities between tasks weaken the case of bundling in favour of separation. It has sometimes been argued that negative externalities are almost negligible in practice, entailing

⁷ Recall that in PPPs the private partner is often a consortium of private firms (rather than a single firm), and that it is in charge of all the phases of the project (rather than solely the construction phase).

bundling to be observed in nearly all projects. In fact, this conclusion should be refined in light of Practical Conclusion 9. Unbundling is a desirable option, even in the presence of (not-too-pronounced) synergies, when the project tasks display sufficiently strong complementarity. Chen and Chiu (2010) discuss this point in light of projects of a different nature, namely schools and IT as cases of complementarity, prisons and transport as cases of substitutability. On the complementarity side, the unsatisfactory performance of several PPP school projects might be because the better the school is constructed, the more valuable it is to also install IT services.

IT projects are better unbundled, in turn, because, once more sophisticated systems have been constructed, it is necessary to exert more effort to learn how to manage them. On the substitutability side, introducing innovations in the design of prisons may well contribute to containing the number of employees necessary to ensure control and security, hence tasks are optimally bundled. Locating electronic surveillance systems in appropriate places may contain the effort that policemen will need to exert to detect violations of speed limits; hence, again, contracting out tasks in a bundle is desirable.

Practical Conclusion 10:

*In a framework **with interdependence of investment tasks** and interim contractibility of the task to be accomplished in the operation stage,*

- **Private ownership is preferable when the residual value of the infrastructure is high and when the social value of the project is low.**
- **Public ownership is preferable in the converse case.**

This conclusion is drawn from the framework of Bennett and Iossa (2006).

So far, we have identified several features of the projects and the contractual environments under which bundling (hence, PPP) is preferable to an institutional arrangement that separates and assigns tasks to different contractors because it provides better innovation incentives to the project developer. However, because **the relationship between the public and the private agents is longer-term under bundling than under unbundling, this benefit is to be contrasted with a potential drawback: the scope for informational asymmetries to develop over time** between the public and the private partners. This implies that a PPP may or may not perform better than traditional procurement, depending on the incentives of the private contractor to gather information for strategic reasons.

Hoppe and Schmitz (2013) develop a model in which the initial contract details only the basic features of the project, whereas additional specifications can be agreed upon later, when the operation phase is to begin and it is then apparent how to improve the project to match the

social needs. Again, the *interim* contractibility of subsequent (*ex-post* verifiable) investments is meant to capture the **necessity of preserving flexibility for future adaptation**, as also accounted for in Bennett and Iossa (2006) and Chen and Chiu (2010). Of course, the second-stage improvements are costly. Hoppe and Schmitz (2013) focus on situations where their cost is not known in the construction stage but the private builder can devote some resources to gather information about it. Information gathering is socially wasteful in that the cost will become known without exerting any effort in the operation stage. The contractor can nonetheless decide to acquire information to appropriate more surplus later in the relationship with the government (a rent-seeking strategy). Whereas the institutional arrangement would be irrelevant in the absence of informational asymmetries between the public agency and the private contractor, it does matter when the latter enjoys an informational advantage.

Practical Conclusion 11:

In a framework with **early design innovation, interim contractibility of the operating investments, and strategic information-gathering on the cost of those investments,**

- ***Traditional procurement is preferable when the government can rely on some precise signal of the effort exerted in innovation, information gathering is cheap, and great importance is attached to the surplus accruing to the private contractor.***
- ***PPPs are preferable otherwise.***

Under traditional procurement, to motivate the contractor to come up with an innovative design in the early stage of the project, the government must provide a reward, based on some signal of the effort exerted to attain that outcome. For the contractor protected by limited liability, this involves granting a rent. Under a PPP, there is less need of a direct reward. The contractor will be motivated to innovate early in the project, anticipating that it will enjoy a rent, if she makes that effort and then gathers information (not available to the government) on the future cost. The perspective of attaining that rent permits a reduction in the rent to be conceded due to limited liability. In other words, the PPP provides a useful tool to motivate the private contractor to develop a design that is flexible enough to respond to the future social preferences in a cost-effective manner because it grants a rent through strategic information gathering. However, the latter is not socially desirable, and the PPP project is actually less cheap than might have been if resources were not disbursed for strategic purposes.^{8,9}

⁸ Hoppe and Schmitz (2013) point out that these results, which are found in a setting where the government observes information gathering, are robust to the possibility of the government not making that observation, instead. However, in that case, *ex-post* inefficiencies may arise under PPP.

In several cases, especially involving climate change, the investments made in the early stages of the projects do not simply affect the environment in which later investments will be made. When *irreversible*, the early investments may represent a *constraint* to the later investments. To illustrate: if high-quality investments are made in the water, transport, or electricity systems early in the projects, then the contractor is committed thereafter to make high operation and maintenance expenditures to maintain the viability of the project. This is potentially problematic when future conditions are *uncertain* in the early stage of the project. Indeed, irreversibility leads to rigidities, i.e., it makes it difficult to adapt the project to the future environmental conditions, which will be discovered only at a later stage. It is thus not surprising that irreversibility will affect the incentives and the decisions of the contractor(s) in the subsequent stages. In turn, this all has implications on the desirability of the different possible institutional arrangements and whether **bundling the subsequent stages is better or worse than putting in place a sequence of shorter-term contracts with different contractors**.

Martimort and Straub (2016) examine bundling in a two-period model with uncertainty, in which a non-verifiable and costly effort (investment) is exerted in each period. Higher effort makes it more likely that the social return to the project will be above its basic social value, i.e., the value it has if no investment is made (or the effort is unsuccessful). Non-verifiability and irreversibility influence the incentives to invest early in the project. A dynamic moral hazard problem arises and rents are generated under limited liability.¹⁰

⁹ The conclusion that rents matter, as evidenced by Hoppe and Schmitz (2013), is also drawn from the more recent findings of Che, Iossa, and Rey (2017). They consider a procurement environment where the procurer pursues two purposes: first, incentivize research effort to create a new idea; second, have the new idea implemented in an efficient (least costly) manner. Provided that the research effort is unverifiable and that the cost of implementing the innovation is privately known, the procurer faces moral hazard *ex ante* and adverse selection *ex post*. A trade-off arises between the two goals, affecting the optimal innovation/follow-up contractual arrangement(s). The implementation of the idea should be assigned to the innovator (that is, the follow-up should be *bundled* with the initial contractor) when the value of the innovation is sufficiently high. In that case, the rents accruing to the innovator represent a powerful incentive tool and reduce the opportunity cost of privileging the innovator over other possible suppliers. By contrast, the implementation of the idea should be assigned to a contractor other than the innovator (that is, the follow-up should be *separated* with a new contractor) when the value of the innovation is low. In that case, the rents accruing to the innovator shade its incentives to innovate and raise the opportunity cost of favouring the innovator over other possible contractors for the implementation task.

¹⁰ The authors point out that what they refer to are investments which are intended to raise the efficiency (or quality) of the project, in addition to any well-defined investment related to, say, the

Practical Conclusion 12:

In an **incomplete contracting framework with uncertainty**, unverifiable irreversible investments, and limited liability,

- ***Bundling tasks in a long-term contract is desirable when commitment concerns prevail.***
- ***Unbundling and providing for a sequence of shorter-term contracts with different contractors is desirable when flexibility concerns prevail.***

The government agency can structure the inter-temporal profile of rewards to the contractor in charge of the project in such a way that the contractor will find it convenient to raise the early investment, thus creating a *commitment* to a high investment also in a later stage. However, the contractor's reaction will depend also on the importance attached to the preservation of *flexibility*. A responsive contractor will invest much in the early stage and, hence, also in the later stage due to the commitment effect induced by the initial investment. A less responsive contractor will invest little in the early stage and, hence, will be free to choose any convenient level of investment later in the project, when uncertainty will be resolved and it will be possible to make informed decisions. To understand why the issue of underinvestment is mitigated, if the second stage of the project is separated from the first and delegated to a different contractor, **it is useful to consider that irreversibility works as a *negative externality between investments***. We recall from Practical Conclusion 6 that negative externalities weaken the case for bundling tasks because internalization by the contractor in charge of the first shades incentives and is, thus, less desirable. Separation mitigates the issue of underinvestment because, following the early irreversible investment, the second contractor will enjoy less flexibility and be committed to invest, in turn.

contractually specified size of the physical assets. This latter kind of investment is verifiable and, hence, could be disciplined through the contract. One might expect the moral hazard problem associated with non-contractible investments to be especially severe when the physical assets, to which the contractible investments pertain, are *network* infrastructures (such as rail and road systems) rather than *stand-alone* facilities (such as schools and hospitals) and *point-to-point* infrastructures (such as ports and airports). This is because, relative to the latter kinds of infrastructures, the former are more complex systems, requiring more sunk costs and being exposed to less (or no) competition. Considerations of this kind lead Albalade et al. (2015) to suggest that jurisdictions that are inexperienced in contracting out infrastructure projects, begin with stand-alone facilities and point-to-point infrastructures, and move to network infrastructures only after acquiring sufficient expertise.

As usual, the most appropriate organizational form is not a one-for-all solution. It depends on several elements, as Martimort and Straub (2016) show, including:

- (1) The **presence of rents associated with the moral hazard problem** and the availability of instruments to contain them;
- (2) **The concerned sector or kind of project and the environmental specificities;** and
- (3) The likelihood of future **technological improvements** in the concerned sector/kind of project.

Practical Conclusion 13:

*In an incomplete contracting framework with uncertainty, unverifiable irreversible investments, and limited liability, **the case for bundling tasks in a long-term contract is stronger when:***

- ***There are instruments to contain limited liability rents;***
- ***The concerned sector/kind of project is less exposed to the adverse consequences of unpredictable events;***
- ***Technological improvements are expected to enhance flexibility.***

In practice, conceding rents is necessary to address moral hazard because contractors are generally protected by limited liability (or are risk averse). Moral hazard is more easily addressed if there are ways to reduce the rents (i.e., the stake for opportunistic behaviour). Among those ways, one could consider tightening *competition* in the tendering stage, boosting diversification through the acquisition of *financial bonds* to reduce the need for insurance within the contractual relationship, and/or introducing *risk-* and *revenue-sharing mechanisms*.^{11,12}

In general, local public goods provide a good example of sectors/projects less exposed to the potential consequences of unpredictable events/impacts, particularly associated with climate change, with prominent commitment concerns. By contrast, water and sanitation networks and power production projects belong to the category of sectors/projects that are heavily exposed, with pronounced flexibility concerns. However, heterogeneity is the rule rather than the exception and it is often difficult to draw clearly distinct categories. For instance, as far as

¹¹ Mechanisms of this kind are already in use in many utilities and projects such as greenfield concessions for toll highways, as reported in Iossa (2015).

¹² Of course, this calls for fine-tuning complementary institutional mechanisms and raises potential concerns related to *social equality* considerations.

power production is concerned, Borenstein (2012) emphasizes that even generation plants with similar technologies will not have the same exposure, being highly heterogeneous in location, architecture, and other elements. **We can thus expect the concern for flexibility to depend finely on such factors as local climate conditions, particularly for production from new clean sources such as solar and wind generation.** There are also in-between cases, such as transport systems and power distribution projects.

Technological improvements may grant *technological flexibility*. This may work as a substitute for *contractual flexibility*. When this is the case it becomes less important to preserve flexibility by reducing investments early in the project. If so, the case for unbundling is weakened. However, technological progress is uncertain *per se*, and the arrival of improvements cannot be taken for granted.¹³ Again, it depends largely on the sector concerned; technological improvements are less likely in water and sanitation systems but highly plausible in energy projects. This confirms the desirability of bundling in the former case; it makes the conclusion less clear-cut in the latter case.¹⁴

3. Multilevel Considerations

Multilevel governance conditions are important. They suggest that:

- ***Central governments, which typically are in charge of water and energy policy, should be well prepared to design and follow up short-term contracts.***
- ***Local government, which are typically in charge of local public goods, should be well prepared to design and follow up PPPs, instead.***

However, this may be problematic on several grounds.

¹³ See Biglaiser and Riordan (2000) as one of many papers modelling the arrival of technological innovations as a stochastic process.

¹⁴ Technological considerations evidence the need to take a broader view in the choice of organizational forms. In energy production, for instance, flexibility might also be affected by the use of a *mix* of production technologies (or sources). The need of adopting a well-balanced mix of technologies with complementary features has moved to the forefront of regulators' and practitioners' debates in energy markets over the last decades.

1. **PPP contracts may be too complex for many local governments**, which should then receive technical support from a central PPP-management body, perhaps supported by international agencies.
2. **The liabilities associated with PPP contracts should be recorded in the local government balance sheets**. This requires both the GFSM and IPSAS standards to be implemented. Not doing so proved problematic in the EU countries (see Ahmad, Bordignon, and Brosio, 2016), and France has just required local administrations to begin doing so.
3. **It is essential for local governments to have access to local own-source revenues**, to limit the generation of liabilities within a medium-term budget constraint (and, hence, lessen the incentives to engage in strategic game-play). This is critical in the context of the SDGs (see Ahmad, Brosio, and Gerbrandy, 2017).

When the bundling solution is preferable, an additional conclusion can be drawn concerning the preferable form of PPP to be used. As Martimort and Straub (2016) highlight, this also raises the question about whether the infrastructure should return to the public sector after the contract ends, or if it should rather be privatized thereafter.

Practical Conclusion 14:

*In an **incomplete contracting framework with uncertainty**, unverifiable irreversible investments and limited liability, in which bundling of tasks in a long-term (PPP) contract is preferable to a sequence of shorter-term contracts, **the appropriate PPP model is:***

- **BOT (build-operate-transfer)** when effort supply is more elastic to rewards at low productivity levels.
- **BOO (build-operate-own)** when effort supply is more elastic to rewards at high productivity levels.

When the effort supply of the private contractor is more elastic to the rewards it receives at low productivity levels, the optimal reward pattern decreases over time. A PPP contract with decreasing incentives should be operated under a BOT contract. This contemplates the return of the assets ownership to the public sector at the end of the contracting period. By contrast, when effort supply is more elastic to rewards at high productivity levels, the optimal reward pattern increases over time. A PPP contract with increasing incentives could be operated as a BOO contract, which favors divestiture of the assets to the private sector.

4. National Institutions for Private Involvement in Infrastructure

A suitable policy and legal framework is needed for infrastructure projects with the involvement of the private sector and the contribution of institutional investors. Both the legal framework and the public policies should be *credible* and *stable* for a reasonable time. There are several interventions that governmental agencies can make to realize these conditions, such as (to list a few):

1. **Provide for *clear investment opportunities*.** Without a clear understanding that opportunities do exist, it is unlikely that private agents will be available to develop internal knowledge and skills in infrastructure projects, which typically present many specificities. Related to this is the establishment of *well-defined guidelines* and *reasonable timelines* in the period between the project's announcement and its award. This will facilitate the management of the risk associated with project development, thus making opportunities more credible.
2. **Ensure a reasonable *predictability of the cash flow from long-term investments*** in infrastructures, at least in any institutional and political respects. Without (this kind of) predictability, it is unlikely that institutional investors will display an interest in infrastructure projects as, by their very nature, they seek assets that match their long-term objectives.¹⁵
3. **Introduce or reinforce *financial regulations that favour economic and financial stability*.** This entails a few requirements: (1) acquire a strategic view of the impact that regulations can have on the incentives to make long-term infrastructure investments; (2) evaluate whether they permit an appropriate balance between risk and reward; (3) use reliable data and validated accounts to signal the financial realities, particularly with regard to liabilities, associated with the concerned assets (particularly, in greenfield projects).
4. **Address *market failures either with direct interventions or by promoting the creation of investment and/or development banks*.** As Ravallion (2016) points out, failures arise in capital markets due to problems of uninsured risk (including from informational asymmetries), externalities, and contract enforcement. Such banks can be useful in solving these problems in a number of ways. First, they can provide

¹⁵ There are a number of sectors that suffer from a lack of investment predictability, in spite of the critical importance they have with respect to public policy. For instance, this is the case of the energy sector in Europe. Deregulation of the wholesale markets reduced the predictability of the revenues and made it difficult to secure funding for facilities, such as thermal power plants.

loans. Second, they can provide the private sector with a positive signal through their choice of conceding loans. Third, they can channel credible information that enables the private sector to assess risk and take debt. Noticeably, the ability of a development bank to disseminate knowledge underpins its ability to accomplish these tasks. The (direct) provision of funds or the (indirect) provision of insurance against risks that the private sector is not in a position to control, works as a catalyzer of resources, generates political support for the projects, and reinforces their credibility and attractiveness. Over time, the support by investment/development banks should lead to a growing use of dedicated (perhaps, project-tailored) financial instruments — such as guarantees, long-term loans, project bonds — that enhance private-sector participation.

5. **Form a dedicated staff cohort and elaborate standardized procedures at the *central* level to provide technical support and facilitate project development at the *local* level.** Local government staffs, while having a closer knowledge of the local needs, may not have enough expertise to design and follow up the complex contractual arrangements on which long-term infrastructure projects are based (see, among others, Minervini and Vinella, 2016).

There is also considerable scope for *international institutions* to create conditions, assist with an appropriate selection, and support the efficient development of infrastructure projects. To some extent, what international institutions can do overlaps with what governmental agencies should do. In fact, they can replace (or sustain) governmental agencies in performing many of their tasks when these agencies fail to accomplish them. This is especially important for developing countries, in which institutions are poorly prepared and generally weak. Besides, some tasks are too costly to be accomplished at the country level, particularly if the benefits therefrom accrue to more countries, as in the case of trans-boundary projects. Those tasks are clearly better accomplished at the *supranational* level. One such task is the creation of investment/development banks which typically have broader-than-national reach. Particularly, the IFIs and Development Banks represent the primary *supplier of the public good “knowledge”*, and play an important role in channelling capital flow to low-income countries.

Institutional weakness undermines contractual enforcement. Successful development of infrastructure projects is clearly at risk in situations where governmental agencies contracting out the projects attempt to expropriate the private investments during their development. Even more, infrastructure projects are unlikely to be attractive to the private sector in the first place if there are expectations of rent-seeking behaviour.

Danau and Vinella (2015) suggest a solution to this issue, advocating a critical role to international institutions such as development banks. In brief, the government should provide

conditional guarantees to the sponsors of the private contractor: their loans will be paid back, as long as the contractor is in the project and the relationship is in place. The guarantees must be sufficiently high to make private expropriation inconvenient. Indeed, as the private contractor would be unwilling to pay back its debt after it has been expropriated, the guarantees would become effective thereafter. Of course, there is no reason to believe that a government that does not commit to its contractual obligations will then honor its guarantees. This identifies a critical role for international institutions. To ensure that the guarantees become effective if needed, an equivalent amount of money should be deposited with the institution. The latter should then activate the guarantees following an expropriation attempt by the governmental agency. Thus, in weak institutional frameworks, the involvement of a credible third party, such as a multilateral development bank, can contribute to restoring contractual enforcement.¹⁶

IV. Concluding Remarks

By focusing in this paper on “how to invest” we have concluded the discussion of the public investment cycle initiated in the companion G-24 paper (Ahmad, 2017). **The companion paper focuses on the “what” and “where” to invest**, underlining the importance of a proper sustainable growth framework. We highlight the interactions of sustainable investment decisions with tax policy options and institutional arrangements and information flows that influence incentives facing firms, households and governments at different levels. **The tax design options and SDGs are summarized in a separate companion G-24 paper** (Ahmad, 2017a).

Equally important are the interlinkages between information flows and governance institutions — including PFM prerequisites such as recording public liabilities in general government balance sheets (including subnational governments and SOEs). Despite the pessimism of senior IFI staff (Cangiano, Gelb, and Goodwin-Groen, 2017), both the GFSM and IPSAS standards are needed — not to report to the IMF, but as tools of active macro-management and to ensure accountability at different levels of government. Without full

¹⁶ Of course, this does not mean that opportunism is present only on the government’s side. On the opposite, it is pervasive also in the private sector. Actually, the mechanism proposed by Danau and Vinella (2015) is elaborated within a framework in which *both* the government’s and the private contractor’s opportunism are accounted for. After all, if one contractual party does not honour its obligations, then it is reasonable to expect the other party not to comply, in turn, if more convenient alternatives are available during the execution of the contract.

information on the nature, generation and time-profile of liabilities, PPPs can easily become opportunities to “kick the fiscal can down the road”, and create opportunities for “game-play” between different levels of government and between the private and public partners. As seen in Ahmad and Zhang (2017), full information is needed also with respect to SOEs, particularly at the local level.

The choice between alternative contractual arrangements at different stages of the project life-cycle turns on the need to bring in private expertise, risk-sharing, and private finance. The contractual options range from traditional public procurement to PPPs of various types. Asymmetric information makes it possible for the private partner to extract extra rents, and for local governments to hide liabilities. But the private sector may just not be interested in earlier riskier stages of the project life cycle due, perhaps, to lack of credibility of contracts or rent-seeking. This is where multilateral agencies, able to guarantee that contracts will be respected, come into play.

Bhattacharya et al. (2016) argue for different stages to be “unbundled” or treated separately, so that the private sector is brought in when there is a steady stream of income. However, entering PPPs at the operational stage may be tantamount to privatizing the benefits but socializing the risks. Bhattacharya et al. (2016) refer to “securitization” rather than PPPs at the operational stage. This may well be the appropriate option, particularly with respect to uncertainty associated with climate change (Martimort and Straub, 2016). In this vein, Arezki and Sy (2016), with reference to African countries, suggest that development banks should provide financing in the early phases of the infrastructure projects where risks are particularly high.

But there are distinct advantages with “bundling” and full risk sharing with the private sector in all stages of the project life cycle — especially where there is interdependence between activities at the different stages. This may be critical to innovation and efficiency, and to overall cost.

The contract choices can be quite complex. A national office dealing with the operational, legal, and regulatory arrangements, as well as dispute-resolution may be needed. Technical support from countries (including the EU as well as major Asian countries) with experience in designing and managing infrastructure programs may be quite helpful in this regard, as well as the multilateral development banks that have considerable expertise in this area, with useful repositories of case studies.

Multilateral banks and development agencies could usefully reorient their traditional activities and support to developing and emerging-market countries in a manner to support sustainable development. These include:

- Better articulation of the overall growth strategy and parameters for project selection;
- Interactions with the tax regime at the national and local levels, particularly the role of local property taxes to anchor local investments and service delivery and generate accountability;
- Identification of local growth hubs;
- Improved formulation and implementation of support for IFMISs to focus on tracking of liabilities at all levels of government — particularly the GFSM framework and IPSAS standards;
- Support for contracting arrangements at national or local levels, to prevent egregious rents, as well as exchange of information on successful as well as problematic implementation cases, and
- Ensuring that contracts are respected.

Together, the options presented here represent a formidable research and policy agenda for designing and implementing sustainable growth strategies and programs. □

References

- Ahmad, E. (2017). *Public Investment for Sustainable Development*. G-24 Background Paper.
- Ahmad, E. (2017a). *Political Economy of Tax Reforms for SDGs: Improving the Investment Climate; Addressing Inequality; Stopping the Cheating*. G-24 Background Paper.
- Ahmad, E., G. Brosio, and J. Gerbrandy (2017). *Property Taxation Incentives for Meeting the SDGs in Developing Countries*. European Commission Study FED/2016/380-048.
- Ahmad, E., and X. Zhang (2017). "GFSM Framework, Local Balance Sheets and Managing Liabilities — Examples from Municipality K," in Ahmad, E., M. Niu, and K. Xiao (2017) *op cit*.
- Ahmad, E., A. Bhattacharya, A. Vinella, and K. Xiao (2015). "Involving the Private Sector and PPPs in Financing Public Investments." *G-24-GGGI Infrastructure Working Paper 5*, in Ahmad, E., M. Niu, and K. Xiao (2017).
- Ahmad, E., M. Niu and K. Xiao, eds., (2017), *Fiscal Underpinnings for Sustainable Development in China — Rebalancing in Guangdong*. Springer.
- Ahmad, E., M. Bordignon and G. Brosio (2016). *Multilevel Finance and the Eurocrisis*. Edward Elgar.
- Albalade, D., G. Bel, and R.R. Geddes (2015). "The determinants of contractual choice for private involvement in infrastructure projects," in *Public Money & Management*, 35(1), 87-94.
- Arezki, R., and A. Sy (2016). "Financing Africa's infrastructure deficit: From development banking to long-term investing." *Global Views*, No.2, August 2016.
- Bennett, J., and E. Iossa (2006). "Building and managing facilities for public services." *Journal of Public Economics*, 90, 2143-2160.
- Bhattacharya, A., J. Meltzer, J. Oppenheim, Z. Qureshi, and N. Stern (2016). *Delivering on Sustainable Infrastructure for Better Development and Climate Change*. Brookings Institution.
- Biglaiser, G., and M.H. Riordan (2000). "Dynamics of Price Regulation." *Rand Journal of Economics*, 31(4), 744-767.
- Borenstein, (2012). "The Private and Public Economics of Renewable Electricity Generation," *Journal of Economic Perspectives*, 26(1), 67-92

- Cangiano, M., A. Gelb, and R. Goodwin-Groen (2017). "Digitization of Government Payments as a Key Tool of Modern Public Financial Management." IMF Conference on Digital Revolution in PFM, April 23-24.
- Che, Y.-K., E. Iossa, and P. Rey (2017). "Prizes versus Contracts as Incentives for Innovation." *CEPR Discussion Paper No. DP11904*.
- Chen, B.R., and Y.S. Chiu (2013). "Public-Private Partnerships: Task interdependence and contractibility." *International Journal of Industrial Organization*, 28, 591-603.
- Danau, D., and A. Vinella (2015). "Public-Private Contracting under Limited Commitment." *Journal of Public Economic Theory*, 17(1), 78-110.
- Granados, Sergio and Jorge Rodríguez (2013). "*Nueva Agenda Regional: Propuestas para avanzar en descentralización fiscal en Chile.*" Mimeo.
- Hart, O. (2003). "Incomplete Contracts and Public Ownership: Remarks, and an application to public-private partnerships." *The Economic Journal*, 113, C69-C76.
- Hart, O., A. Shleifer, and R.W. Vishny (1997). "The Proper Scope of Government: Theory and an Application to Prisons." *Quarterly Journal of Economics*, 112(4), 1126-1161.
- Hoppe, E.I., and P.W. Schmidt (2010). "Public versus Private Ownership: Quantity contracts and the allocation of investment tasks." *Journal of Public Economics*, 94, 258-268.
- Hoppe, E.I., and P.W. Schmidt (2010). "Public-Private Partnerships versus Traditional Procurement: Innovation incentives and information gathering." *Rand Journal of Economics*, 44(1), 56-74.
- Iossa, E. (2015). "Contract and Procurement Design for PPPs in Highways: The road ahead." *Economia e Politica Industriale*, 42, 245-276.
- Laffont, J.J. and J. Tirole (1993), *A Theory of Incentives in Procurement and Regulation*, The MIT Press.
- Laffont, J.J., and J. Tirole (1991). "Privatization and Incentives," *Journal of Law, Economics and Organization*, 7, 84-105.
- Martimort, D., and S. Straub (2016), "How to Design Infrastructure Contracts in a Warming World: A critical appraisal of public-private partnerships." *International Economic Review*, 57(1), 61-87.
- McKinsey Global Institute (2016). *Bridging Global Infrastructure Gaps*. June.

- Milbradt, G. (2016). "History of the Constitutional Debt Limits in Germany and the New 'Debt Break': Experiences and critique," in Ahmad, E., M. Bordignon, and G. Brosio, eds., (2016).
- Minervini, L.F., and A. Vinella (2016), "Incentives Facing Local Governments in the Absence of Credible Enforcement," in Ahmad, E., M. Bordignon, and G. Brosio, eds., 326-358.
- Monari, Lucio (2017). G-24 Workshop: World Bank and Transformational Engagements, held in Addis Ababa, February.
- Ravallion, M. (2016). "The World Bank: Why It Is Still Needed and Why It Still Disappoints." *Journal of Economic Perspectives*, 30(1), 77-94.
- Sappington, D.E.M. and J.E. Stiglitz (1987). "Privatization, Information, and Incentives." *Journal of Policy Analysis and Management*, 6(4), 567-582.
- Schmidt, K.M. (1996a). "The Cost and Benefits of Privatization: An Incomplete Contracts Approach." *Journal of Law, Economics, and Organization*, 12(1), 1-24.
- Schmidt, K.M. (1996b). "Incomplete Contracts and Privatization." *European Economic Review*, 40, 569-579.
- Shapiro, C., and R.D. Willig (1990). "Economic Rationales for the Scope of Privatization," in *The Political Economy of Public Sector Reform and Privatization*, E. N. Suleiman and J. Waterbury, eds., Westview Press, San Francisco, CA.
- Williamson O. (1985). *The Economic Institutions of Capitalism*, New York: Free Press.
- World Bank, International Evaluation Group (2016). *How to Assess the Capacity of a Government's FMIS as a Budget Management Tool*. Washington, DC.